A MANUAL ON THE RUDIMENTS OF

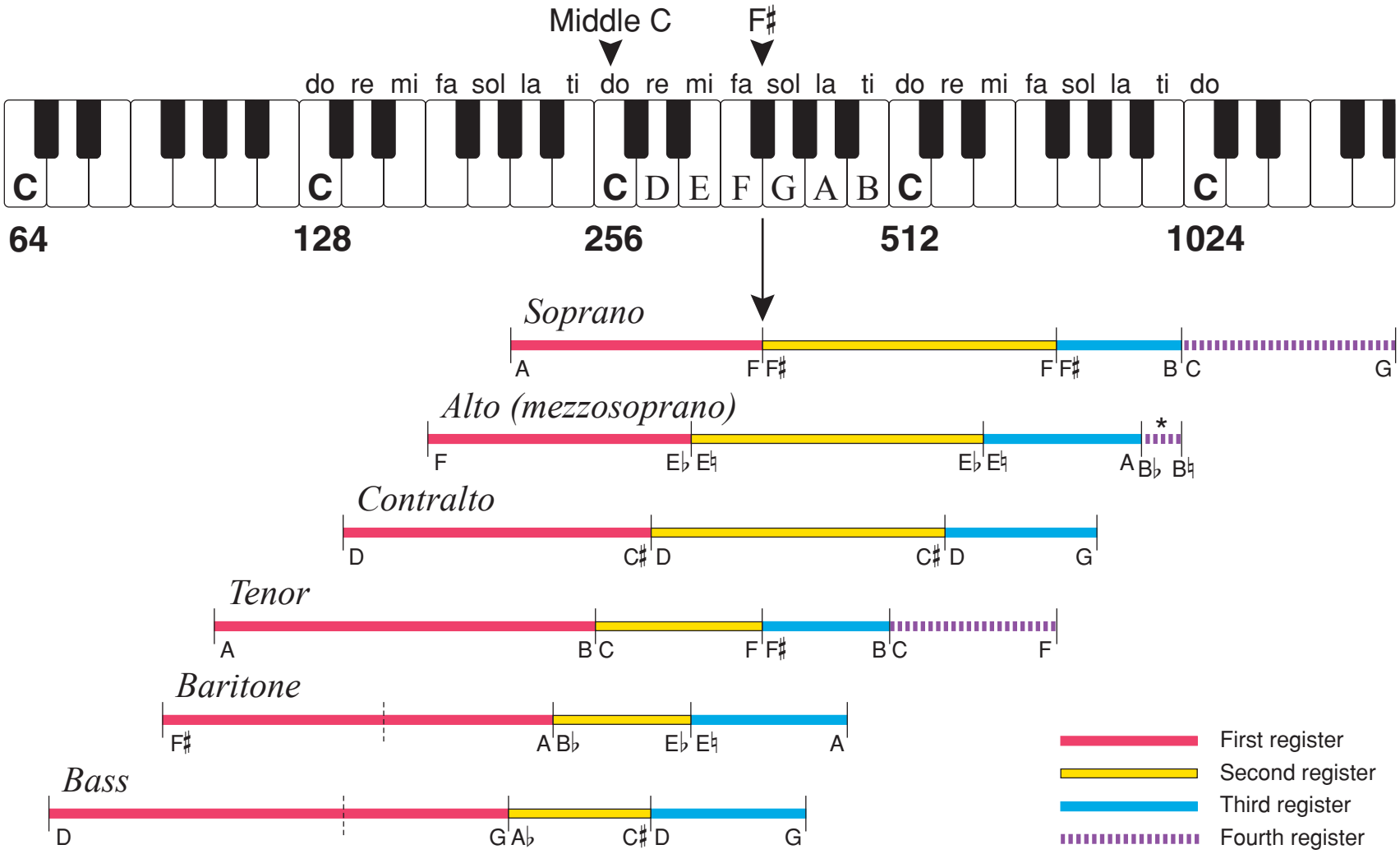
Tuning and Registration

BOOK I

Introduction and Human Singing Voice

Schiller Institute

The Six Species of Human Singing Voice, and Their Registers



* Mezzosoprano “Verdiana” is not strictly a fourth register; see Chapter 4.

Figure 2.12 Mozart, "Agnus Dei" from "*Coronation*" Mass, K. 317, at C = 256

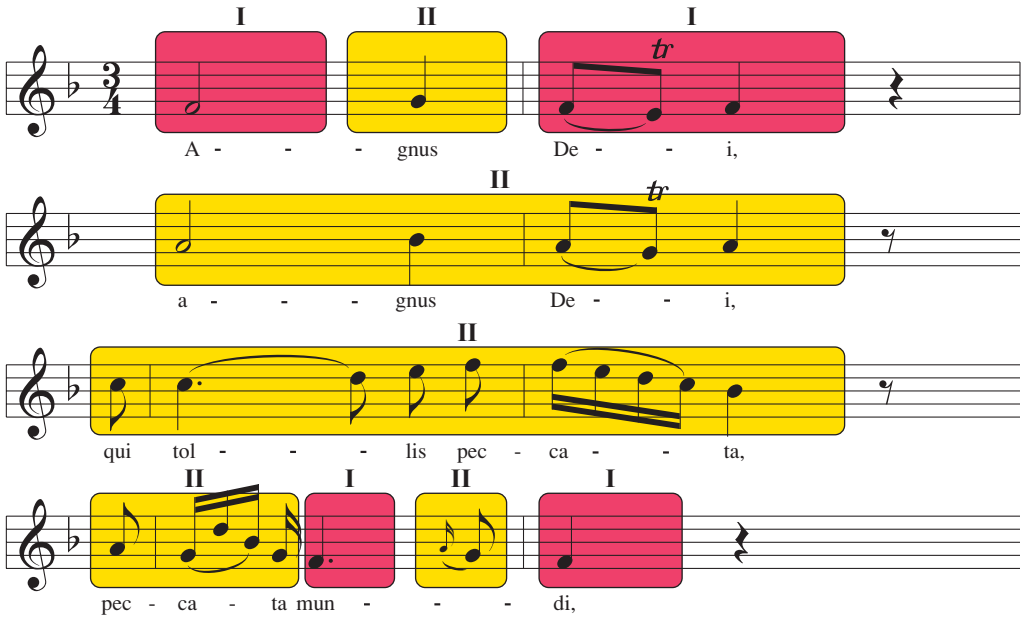
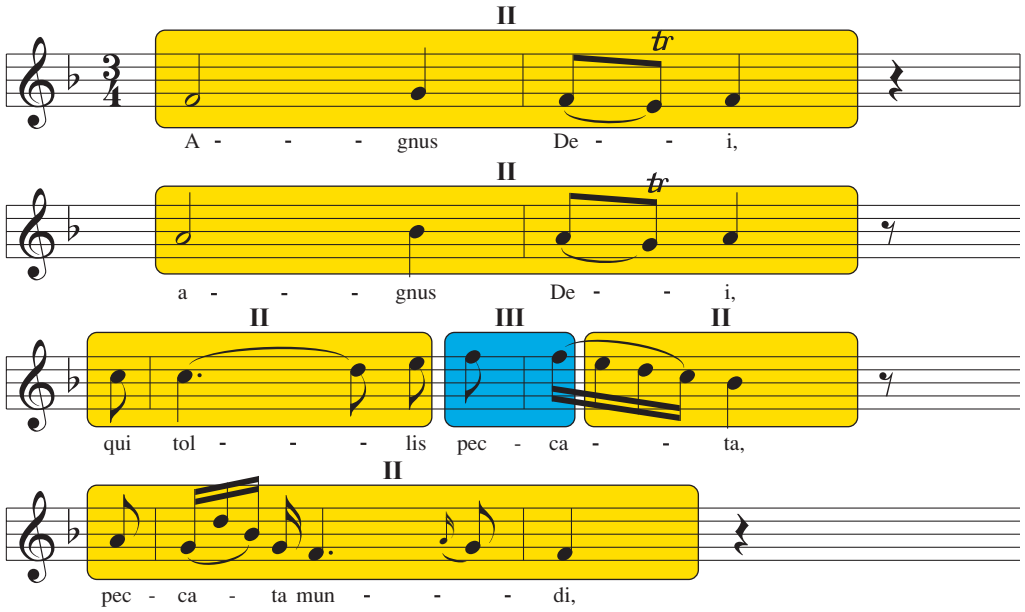


Figure 2.13 Mozart, "Agnus Dei" from "*Coronation*" Mass, K. 317, at A = 440



C = 256 and the Registral Color Scheme

The biologically-determined registers of the human singing voice are best represented by a color scheme which follows the visible electromagnetic spectrum. Notes to be sung in the first and lowest ("chest") register are highlighted in red, second-register ("central") notes in yellow, third-register ("head") notes in blue, and fourth-register ("superhigh") notes (not shown) in violet.

The two figures at left, from Chapter 2, show this color scheme as applied to the difference between Mozart's intended registration at C = 256, and the registration of the same passage when sung by a soprano at the modern A = 440 Hz tuning or above. The modern tuning turns Mozart's poetic intent upside-down.

The practical necessities of black-and-white printing have made it necessary to modify this color scheme in the body of this manual. However, students and teachers are encouraged to mark study-scores according to the full-color scheme presented here, so that identification of voice species and register in a vocal or instrumental score gradually becomes just as natural and automatic as the identification of key and time signatures.

"This music manual is without any doubt an excellent initiative. It is particularly important to raise the question of tuning in connection with bel canto technique, since today's high tuning misplaces all register shifts, and makes it very difficult for a singer to have the sound float above the breath. When an F-sharp becomes a G, . . . everything is misplaced half a step, and the technique fails. . . .

"I also like in the manual the hypothesis that instrumental music, too, is an imitation, a derivative of vocal music. Also instrumental music sounds false when played at a high tuning; the sound is as unnatural in instruments as in voices. . . . What is true for the voice, is also true for instruments."

—Carlo Bergonzi

Harpsichord by Hans Moermans, 1584. The inscription encapsulates the Classical Idea: "Without science, art is nothing."

Frank Hubbard Harpsichords, Boston, Massachusetts

This manual is designed to provide teachers and students of music with a ready reference on the elementary aspects of Classical well-tempered tuning and voice registrations of singers and instruments. It grew out of a collaborative project launched by American statesman and economist Lyndon H. LaRouche, Jr., with the intermediate aim of re-establishing a working grasp of the principles of Classical polyphonic composition as exemplified in the works of J.S. Bach, Mozart, Beethoven, Schubert, and Brahms; and with the ultimate aim of applying those principles to spark a new Classical renaissance which can lift mankind out of the cultural rubble of twentieth-century Romanticism and Modernism.

Book I is primarily concerned with introducing the student to the rudiments of Classical musical science, and demonstrates the primacy of the human *bel canto* singing voice and its biologically-determined registration for all rigorously creative musical composition. As LaRouche states in the Foreword, "The vocalization of Classical poetry, according to elementary *bel canto* principles of vocalization, is *song*. The participation of singers representging two or more of the biologically determined species of singing voices (soprano, tenor, etc.), *is the essence of Classical well-tempered polyphony.*

Book II (in preparation) will deal with the application of vocal-polyphonic principles to musical instruments, and will provide a series of technical appendices.

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Book I INTRODUCTION AND HUMAN SINGING VOICE

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D E D I C A T I O N

This manual is dedicated
to the living memory
of
Wolfgang Amadeus Mozart
(1756 –1791)

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FOREWORD

One of the more striking examples of the lunacy to which a modern positivist's academic mentality may lead sometimes, is the occasional episode, during which a university instructor informs his class that science has been unable to show that life (such as that of university instructors) is possible. Lately, since the wider, post-World War II popularization of the Boltzmann dogma, as "information theory," the positivist professor might concede that although the existence of life is contrary to the Second Law of Thermodynamics, it is a remote chance, a statistical possibility.

In that way, we forewarn our readers against such a positivist's misinterpretation of some following observations on the subject of electromagnetic determinism, respecting the characteristic metrical features of musical science. Man, and life in general, existed long before positivists first appeared on this planet. Such fundamentally characteristic features of *natural music* as 1) *bel canto* vocalization, 2) voice-registration, and 3) a well-tempered scale with middle C set at approximately 256 cycles, are biologically determined, and thus inherent truths of existence predating the first physicist or musicologist. The fact that something exists, is, statistically, necessary and sufficient proof of better than 100% certainty that the laws of the universe have brought about that existence in a necessary and sufficient way. The necessity of *well-tempering*, of *bel canto*, and of middle C set approximately at 256 cycles, was, in each respective instance, discovered centuries, or even, perhaps, millennia ago. These characteristic features of the "musical universe" are, like the existence of mankind, natural phenomena, not something whose existence requires academic midwifery.

The included task of science, is the search for truth, to bring the method by which human opinion is formed into conformity with the Creator's laws. In that connection, we, as discoverers, depend upon what physical scientists often term "crucial experimental" evidence. The existence of mankind is such a crucial-experimental fact. It is not something to be proven possible; it has occurred. Rather, we must bring prevailing opinion-making into conformity with the proof, that the existence of mankind as a self-developing, and the dominant species of our Solar System, has been a necessary and sufficient result of the most fundamental lawfulness of universal nature.

Similarly, the crucial-experimental facts from which *musical science* is obliged to begin, are each and all facts of biologically determined *vocal polyphony*. Musical science begins with the subject of singing. Since the adult singing-voice species (soprano, mezzosoprano, tenor, etc.) are naturally, biologically determined, musical science starts here, focused upon what is demonstrated, by crucial experiment, to be *well-tempered polyphony*.

We can not begin with the phenomena of man-made musical instruments, since these are not natural phenomena.

The proofs of the natural principles of *bel canto vocalization* and *voice-registration*, are directly crucial-experimental reflections of the *biology* of the human species. *Bel canto* is demonstrated to be nothing but the human being's most natural, relatively least-effort, most efficient method of speaking and singing, by virtue of the biologically determined characteristics of the healthy expression of the human genotype. This was proven experimentally by musicians no later than a half-millennium ago, and almost certainly much earlier than that.

The vocalization of Classical (e.g., strophic) poetry, according to elementary *bel canto* principles of vocalization, is *song*. The participation of singers representing two or more of the biologically determined species of singing voices (soprano, tenor, etc.), is the essence of *Classical well-tempered polyphony*.

It is determined, in a similar way, that each species of singing voice has, naturally, four *potential* registers, each with a distinct quality ("color") of voice relative to each and all of the remaining three. It is also determined, that for each such species of singing voice, the places (on the scale) at which the transition from one register to an adjacent one must occur, is biologically determined, and that this place of "register shift" is fixed such that the place itself may not be shifted frequently without possibly irreversible damage to the singer's voice.

Similarly, the extreme ranges of the voice, for each species, have certain approximate upper and lower limits, for most of the trained voices in the singing population; by exception, some trained adult singers may command extended ranges. Once we apply these natural, crucial-experimental facts to the canonical-polyphonic vocalization (*bel canto*)

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of any singable piece of Classical poetry, we force upon the whole body of musical science the crucial-experimental proof, that the musical scale must be based upon the *natural bel canto* characteristics of healthy singing, upon Johann Sebastian Bach's *well-tempered polyphony*, upon the *naturally* fixed characteristics of voice registration respecting each biologically determined species of singing voice, and upon a value of middle C of approximately 256 cycles.

After that, and no earlier, we consider the man-made musical instruments. As a practical matter, we delimit the span of *our* study to the development of instruments during the recent 500 years, approximately. Although stringed instruments (e.g., the lyre, woodwinds, and horns of one form or another), extend into very ancient history, we lose nothing on principle, if we limit our attention to the main lines of development of keyboard and Classical orchestral chests of instrumental voices over a period beginning with the adulthoood of Leonardo da Vinci, and concluding, approximately, at the beginning of the 1814–15 Congress of Vienna. That "chest" of keyboard and orchestral instruments, which emerged as a standard over the period from J.S. Bach's work at Leipzig up until the Congress of Vienna, is taken as our standard of reference for defining matters posed in respect to the strictly Classical anti-Romantic tradition associated factionally with such names as J.S. Bach, Haydn, Mozart, Beethoven, Schubert, Chopin, and Brahms.

These instruments, designed for a well-tempered scale pivoted upon C=256, were developed in imitation of those characteristics of the chest of *bel canto* voice-species which we have identified above. Thus, to the degree both composer and performer grasp, more or less successfully, the practical implications of these connections, everything (bearing on principles) which is to be said of the intent and characteristics of instrumental performance, is subsumed by *natural* voice principles.

Kepler and Music

Through the eyes of the mathematical physicist, what we have noted, as the *natural* characteristics of "musical space-time," presents us an extremely significant challenge. In brief, the laws of a universe in which these *natural characteristics* might exist could not be the universe of Descartes, Newton, Kelvin, Helmholtz, Maxwell, or Boltzmann-Wiener. However, it could be a different kind of physical universe, that of Cardinal Nicolaus of Cusa, Cusa's follower Leonardo da Vinci, Cusa and Leonardo's professed follower Johannes Kepler, Kepler's professed follower Gottfried Leibniz, France's Gaspard Monge, or such followers of Leibniz and Carl Gauss as Bernhard Riemann, Georg Cantor, and Eugenio Beltrami. The case of Kepler's founding of the first comprehensive mathematical physics, is a very relevant illustration of the point.[1]

Take Kepler's *World Harmony*[2] as a point of reference. First, for the information of the person who has Alexander Pope's "a little learning" concerning physical-science matters, we emphasize that Isaac Newton did not "discover universal gravitation." Newton's famous Gm_1m_2/r^2 is merely an algebraic manipulation of the algebraic formulas representing Kepler's famous, universal three laws of motion.[3] Newton discovered nothing; rather, by the algebraic oversimplification in Newton's parody of Kepler's laws of motion, Newton introduces an apparently insoluble mathematical paradox into physics, the so-called "three-body problem."

In Newton's schema, for example, the orbits of the planets and their moons can be situated at any distance from the Sun one might choose for situating a planet. One merely has to choose a mass and orbital velocity whose associated centrifugal force neatly balances the centripetal force, the gravitational "pull."

In Kepler's universe, this is not permitted. The number of possible orbits and orbital velocities is precisely determined. No orbits between any two of these determined orbits is permitted. Kepler's method permits

[1] See Carol White, "Johannes Kepler: Voyager in Space," *21st Century Science & Technology,* March-April 1988; Lyndon LaRouche, "Designing cities in the age of Mars colonization," *21st Century Science & Technology,* November-December 1988; and *Will This Man Become President?* by the Editors of *Executive Intelligence Review,* 1983, pp. 161ff.

[2] Johannes Kepler, *Harmonici Mundi (The Harmonies of the Spheres)* (1619); see also *Mysterium Cosmographicum (The Secret of the Universe)* (1596), *Commentaries on Mars* (1609), *On the Six-Cornered Snowflake* (1619), and *Epitome of Astronomy* (1620).

[3] Kepler's laws can be summarily stated as follows: 1. The planets move around the Sun in ellipses, at one focus of which the Sun is situated. 2. As each planet moves around the Sun, the vector extending from the planet to the Sun sweeps out equal areas in equal times. 3. The ratio of the square of the planet's year to the cube of the planet's mean distance from the Sun is the same for all planets.

the existence of no planetary orbit between those of Mercury and Venus, Venus and Earth, Earth and Mars, Jupiter and Saturn, and so forth. Kepler requires one orbit between Mars and Jupiter, which Kepler assigns to "an exploded planet," i.e., the asteroid belt. Similarly, Kepler's universal laws of motion predetermine the relative orbital velocities of the planets in those determined orbits.

Although Kepler's calculations require refinement, his conception of the ordering of the Solar System is the one which agrees with the evidence; whereas the physics of Descartes, Newton, Kelvin, *et al.,* does not fit the evidence—most emphatically, the evidence of the uniqueness of the orbital positions, and of *the relative harmonic values of the orbital velocities*.

It is crucial, that the organization of the musical scale follows conceptually the arrangement shown by Kepler, in Kepler's treatment of the musical harmonies of the solar orbits and their associated harmonic ratio-values of their orbital velocities. This means that the *necessary and sufficient* (i.e., scientific) determination of the musical scale is consistent with the physical universe of Cusa, Kepler, Leibniz, *et al.,* but not with the schema of mathematical imagination adopted by Descartes, Newton, Kelvin, *et al.*

The same argument applies to *vocal polyphony* in general, as also to vocally determined, *natural registration,* and exactly determined, *natural* singing-voice-species register-shift.

In the universe of Cusa, Leonardo, Kepler, Leibniz, *et al.,* the laws of the universe are coherent with a *musical quality of harmonic ordering*. We can show this more readily than otherwise, by studies of the existence of "register shifts" within the extended span of the complete electromagnetic-frequency scale, for a scale starting below the frequency of human-brain "alpha waves," up through very energetic "gamma waves."

We must go further, as physics, including biophysics, demands this. We must surpass a simply linear notion of continuous increase of frequency (from "2," onwards), to the realm of "non-linear spectroscopy." This latter, "non-linear spectroscopy," assumes overwhelming importance as we focus upon the biophysical domain.

Obviously the production and hearing of music by the human species involves living biophysical processes in what proves to be the "non-linear spectroscopic" domain of generating and absorbing, discriminating efficiently musical tone-sequences. Thus, we locate the *biophysics* to be considered respecting a *science of music*.

Since the three cited, principal, natural features of vocal polyphony—*well-tempered scale, registration of singing-voice species,* and determined *register shift*—require a Keplerian universe, excluding the Newtonian, the kind of physics to which a science of music must refer, must be along the Keplerian track leading through Leibniz and Riemann.

Kepler and Life

Another way of presenting what is ultimately the same point just made, is to say that Kepler's mathematical physics was based explicitly, "axiomatically," upon the evidence, that our universe is characterized as one in which life is the highest form of existence, and man is *lawfully* the highest form of life known.

To attempt to quell riotous protests of indignation from among some holders of doctoral degrees in physical science, we must interpolate here an identification of the following unpleasant truth respecting modern university (and secondary school) education. Only after we have cleared the air so, can Kepler be discussed rationally.

The twentieth-century trend in U.S. education has been away from the rigorous standards of Classical and scientific education preferred by nineteenth-century Harvard University, for example, toward a rote education of the poor quality which German speakers associate with the conventional word of contempt, *Brotgelehrten*. More and more, scientific education has aimed pragmatically, away from rigorous attention to scientific fundamentals, toward, and below the editorial standard of, say, *Popular Science* magazine.

In brief, even most contemporary university products with four-plus averages and terminal degrees, are primitively uneducated in a field which happens to be this writer's specialty: *a Socratic method of approach to axiomatics*. This latter method is the most characteristic feature of the leading work contributed by the greatest scientific minds of the past 600 years, such as Cusa, Leonardo, Kepler, Leibniz, *et al.*

What the *Brotgelehrten* among science students and graduates know, is virtually no geometry, but merely a variety of arithmetic-algebra based upon, and limited to a formalist deductive method. Such is the passively

accepted classroom mathematics, at all levels of the pecking-order, today. What only a handful of such professionals do know, is that the scientific competence of a deductive mathematics is very much in doubt experimentally. The popular defense of the *Brotgelehrten* is to put out of sight and mind, any physical evidence, no matter how devastatingly true, which calls the "generally accepted," deductive form of mathematics into question.

The evidence which proves Kepler's mathematical physics competent and Newton's opposing mathematics as crucially incompetent by comparison, is the kind of crucial evidence showing the outer limits of physical application of a merely deductive mathematical schema.

That brings us to our concluding points on the science of music, in this foreword. There are three points to be made.

Despite the progress in interpretative performance of Classical musical works by some postwar-period musicians, the principles of Classical musical composition themselves have been virtually lost. The chief obvious reason for this general decay of musical education's quality is the attempt of established musicologists to superimpose the Hegelian metaphysical schema, in which the Romantic school is portrayed as the logical successor of the Classical, and the twelve-tone modernist rubbish the logical successor of the Romantic. The effort to adduce for the teaching of music a "principle" which coheres with such Hegelian mystical irrationalism, is the core of the musical-theoretical problem of today.

Continuing with the first of our three points here, there is a second aspect of the same problem to be noted here. The popularization of anti-scientific rubbish of Helmholtz's *Sensations of Tone* and the popularized hoaxes of Helmholtz's devotee Ellis, if believed, destroy utterly the ability of the music student to understand rationally the three *natural characteristics of music* we have identified above.

Summing up the first of our three concluding points, the nineteenth-century rise of the quasi-dionysiac dogma of Romanticism, decreed through the mouth of proto-fascist positivist Professor Friedrich Karl von Savigny, that an absolute separatism must be enforced, between natural sciences (*Naturwissenschaft*) and the arts (*Geisteswissenschaft*). Thus, did establishment support for Savigny's doctrine of separatism lead both to the rise of Adolf Hitler and to the triumph of the irrationalist sundry dogmas of "art for art's sake," in music, poetry, and so forth.

Hence, the proper unification of science and art, as embodying, as an integral wholeness, these pervasively coherent qualities of individual mind setting man apart from, and superior to the beasts, is indispensable for the vigorous revival of music in our time. To this purpose, the current of scientific view of music exemplifed by Kepler and his successors, is indispensable.

The second of our three concluding points coheres with the first. Although musical history has proven conclusively, empirically, the three cited *natural characteristics of vocal polyphony,* questions of practical significance arise which music demands be examined from the standpoint of biophysics. We shall turn to that after identifying the third of our three concluding points.

Our third, cohering point is this. It is not sufficient, that musicological questions be settled from the vantage point of biophysics' nonlinear spectroscopy, or from what might be termed a "simply musical" standpoint. The irrationalist myths of "absolute music" must not be left unchallenged. The human function of music, must be ultimately the basis on which musical activity is to be judged.

We subsume the three topics, as ultimately one, under the rubric *Kepler and life*.

The Sovereignty of the Creative Processes of the Individual Human Mind

Every genuinely new conception, as knowledge, which you, or any other person acquires, comes into existence in the individual human mind, in a way which can in no way be described by deductive methods, but rather in an entirely different way, in a way which solves the central paradox of Plato's *Parmenides* dialogue. This is the true key to understanding, first, the human purpose of Classical forms of music: This understanding shows us how the *biophysics of vocal polyphony* play their part in defining how music should be performed and composed.

The generation of a new idea, as a unified, *indivisible* conception, in the mind of an individual person, presents this following echo of the *Parmenides* paradox.

Many pieces, each individual, indivisible ideas, enter the mind, and are transformed from a *many* into a new, valid, combined but single and

non-divisible new conception. There is nothing of the new idea in any part of those many ideas which appear to have stimulated its generation. They are the *Many*; the new conception is *the indivisible One*. There is no deductive pathway leading from any or all of the Many, to this One. The transformation of the Many into this new One, is the work of *the creative processes of the individual human mind.*

By *creative processes,* we mean the same kind of mental processes which generate, transmit, and assimilate new, valid discoveries of fundamental principle in physical science. This occurs as a *Many*-into-*One* transformation, typifying so the required solution to the *Parmenides* paradox. Since this process is unique and indivisible, every individual mind engaged in generating concepts which are valid, and new to it, to this effect, is an *axiomatically sovereign* quality of *individuality.*

The case of physical science, the uplifting of man's existence through scientific and technological progress, shows that the self-development of individual mental creative processes, to produce valid changes for the better in man's comprehension of universal physical laws, puts such individual mental-creative processes in a special kind of direct, correspondence with the Will of the Creator.

Thus, in valid scientific progress, the primary relationship to knowledge of the individual's creative-mental processes, is to the *Mind (Will) of the Creator,* and only by derivation to objects in the universe.

Classical music, is the use of the natural characteristics of vocal polyphony, to replicate in music what the developed creative-mental powers of the individual human mind accomplishes otherwise in the "synthesis" of a valid discovery of improved, fundamental scientific principle.

This signifies, that the process of generating a *Many* (mathematical-physics *manifold*) from a starting-point, and then developing the manifold to generate a *One,* establishes a single conception—the One—as the identity of the composition, rather than as a divisible aggregation of parts. This requires what may be described fairly as a "problem-solving" dynamic to the process of composition; this implies, in turn, that the *problem* and its *solution* are defined as *problem* and *solution,* respectively, by some notion of lawfulness.

Hence, the *arbitrariness, irrationality* intrinsic to the principle of artistic romanticism, shows Romanticism to be on principle a *dionysiac* defiance against reason, and the twelve-tone system more radically so.

Notably, *the principle of musical composition cannot be deductive (e.g., Aristotelian, neo-Aristotelian) in form.*[4] It cannot fit within a "universe" (a mathematical physics) according to Descartes, Newton, Kelvin, *et al.* This brings us to relevant work by Leonardo da Vinci and Kepler, successively.

The central feature of the work of Kepler was his elaboration of a principle central to the scientific accomplishments of Leonardo da Vinci. Leonardo *et al.* had shown that all living processes were characterized as to form, and form of functional motion, by harmonic orderings congruent with the Golden Section. This work of Leonardo *et al.,* had the following significances for the later work of Kepler, and for our topic here today.

First, as to constructive geometry (e.g., mathematics). The Golden Section is the characteristic feature of generation (*determination*) of those five "Platonic" regular solids (polyhedra) which are the limit of such constructability within visible physical space-time.

Second, as the convergence of Fibonacci's series upon Golden Section harmonics illustrates, these latter harmonic orderings are not only characteristic of all living processes, but express a characteristic of negentropic processes.

Third, Kepler's choice of this geometrical mathematics for his construction of an astrophysics (and of universal laws of motion) defines his universe (as an integral whole) as negentropic (e.g., directly opposite to the universe of Newton, Kelvin, *et al.*). Subsequent evidence (e.g., Gauss's work on asteroid orbits) proved Kepler to have been right in his choice of a universal *negentropic* principle, and Newton's physics, based mathematically and ontologically upon axiomatically entropic assumptions, to have been flatly in error.

Modern crucial-experimental evidence shows: 1) that all living processes are harmoniously ordered negentropically as indicated above; 2) that Kepler's negentropically ordered physical space-time was proven as to astrophysics by Gauss's work on asteroid orbits; 3) that in the very small, the quantum-domain of Schrödinger and de Broglie functions, physical space-time is negentropically "Keplerian."

For reasons supplied in such published locations as *In Defense of Common Sense,* creative-mental processes are implicitly *nonlinear*

[4] Lyndon H. LaRouche, Jr., "In Defense of Common Sense," and "Project A," in: *The Science of Christian Economy and Other Prison Writings,* Washington, D.C.: Schiller Institute, 1991.

negentropic processes. Consider the argument for each, summarized very briefly.

Any consistent system of deductive argument, such as present-day conventional classroom mathematics, can be represented as an extensible form of deductive theorem-lattices. Such a lattice is generated from the starting-point of a set of unproven, arbitrary theorems, called *axioms* and postulates. All theorems are derived from that starting basis; no consistent theorem so derived contains any claim not originally implied by the original set of axioms and postulates.

A creative discovery in physical science is of the following type; at least, this is so, as long as we examine the matter from the standpoint of deductive method in general.

First, represent an existing physics (for example) by a choice of deductive mathematics, thus depicting that physics, in more or less close approximation, as a deductive theorem-lattice. Now, consider a single crucial experiment whose evidence refutes a consistent and necessary theorem of that theorem-lattice. All other practical considerations assumed taken into account, this single experiment demands a revolutionary overturn of that entire physics.

A fallacy in a single, consistent, and necessary theorem of a deductive system refutes fatally one or more features of the set of axioms and postulates underlying the entire lattice. The required correction of that proven margin of error in the deductive-axiomatic basis, requires a new axiomatic basis, to such effect that no theorem of the old theorem-lattice, e.g., *A,* is consistent with any theorem of the revised theorem-lattice *B,* and vice versa.

Thus, from the standpoint of deductive, or linear method (all deductive systems are linear, and vice versa), the two successive theorem-lattices are absolutely separated by a deductively unbridgeable logical gulf of *formal (logical) inconsistency*. Another name for this is *mathematical discontinuity*.

Nonetheless, the creative processes of the individual mind, in effecting the leap from *A* to *B,* bridge the discontinuity. Thus, we have as a representation of a creative-mental action (informing practice), a function linking successive theorem-lattices *A, B, C, D . . . ,* which is a function of successive, *nonlinear* discontinuities in one and all possible deductive domains. That is a true *nonlinear* function, of a higher Cantorian order. Thus, we have emphasized *nonlinear*.

The fact that the error-correcting aspect inherent in scientific progress directs revolutionary scientific practice (*progress*) of a society toward ever-higher per capita and per hectare reproductive processes, defines this creative function as a *negentropic* function, in the same sense, respecting our illustration, a Fibonacci series converges upon a harmonic ordering congruent with the Golden Section.

This is not merely the case for such creative thinking in physical science; it is the characteristic feature of creative activity in the medium of Classical art. We can illustrate this principle in Classical musical composition in many ways. We can consider, for example, the famous Goethe's misguided preferences for Reichardt, over settings of the same poems by Ludwig van Beethoven and Franz Schubert. Goethe failed to grasp the essential principle of musical creativity, even in so elementary a medium as the simple strophic song.

One of the most obvious illustrations of the point, is the treatment of J.S. Bach's *A Musical Offering* by Wolfgang Mozart, Beethoven, Schubert, and others. Here is an excellent showing of what ought to be understood as the seamless union of scientific methods of musical composition and beauty. A proposition is presented, yet once again, for a yet-more-ingenious solution. The solution is bounded by strict Classical rigor; the rigor pertains to the way in which a creative modification of the rules is permitted, on behalf of a solution.

There are three most essential things which a Classical musical composition must satisfy.

1) The medium must never depart from the domain of *natural beauty*. Beauty is life; ugliness is death. Life is rooted in those negentropic harmonic orderings which are congruent with the Golden Section. This has not changed since Plato.

2) Nothing can be art which is merely arbitrary whim, or which departs from the strict confines of natural beauty. Yet, the mere imitation of natural beauty is not art. Art is that which employs, and never departs from the medium of natural beauty, but which uses that uncorrupted medium as the domain of the same kind of strictly rigorous and valid creative-mental activity, applied to the medium of (in this case) vocal polyphony, which we associate otherwise with valid fundamental discoveries of principle in physical science.

3) The work of art, after meeting in a general way these first two requirements, must also master the challenge outlined in Plato's *Parmenides* dialogue: The *Many* in the composition must be transformed into the continuous substance of the indivisible *One*.

Hark back to Nicolaus of Cusa's work: the *microcosm* (Minimum) and the *macrocosm* (Maximum). We, through efficient development of that *divine spark* which is our individual potential for creative-mental acts, show ourselves, in working for the *isochronically* universal good, to be truly in the living image of our Creator. We participate so, in that which is greater than we are.

It is this quality of doing which marks us out, more than in any other way, as truly, perfectly sovereign individual reflections of our perfectly sovereign Creator. A true work of art brings *Many* into the perfect indivisibility of *a sovereign Oneness,* which latter is the indivisible Oneness of that work of art taken as a whole. Such a work of art thus reflects upon the direct form of relationship between the sovereign individuality of the creative intellect and that in whose likeness that sovereignty is cast. Unless a work of art achieves that specific sort of *sovereignty* itself, and the other conditions also fulfilled, it is no true work of Classical art.

The last quartets of Beethoven, beginning with the Opus 127, epitomize the opening into a new dimension of Classical musical composition. Since then, the Opus 135, the best Classical composers through Brahms, enriched the use of Beethoven's heritage; but they budged music as a whole not an inch further ahead, to this day.

Once, by the aid of insights contributed to young musical masters by a science of music, there will be a more adequate assimilation of what the late quartets represent. Once the first truly *sovereign* musical composition reflecting the principle of those quartets has been heard, we shall know by that sign that the lesson has been mastered, and then music shall, at last, move ahead once more.

—Lyndon H. LaRouche, Jr.

PREFACE

The Classical Idea: Natural and Artistic Beauty

BY LYNDON H. LAROUCHE, JR.

This manual on the elements of Classical tuning was developed to fill the needs of both the teachers and students participating in the projects of an informally organized program of activities engaging some hundreds of professionals and amateurs in a number of nations of the Americas, Western Europe, and Asia. Since important elements of the material included here are not presently available in any other published source, it was decided to present the book in its present form to the interested, or merely curious portions of the general public.

The material covered in this handbook is limited to what our own experience has shown to be the most common needs among students respecting the elementary aspects of well-tempered tuning and voice-registrations of singers and instruments.

It is designed to provide the music student with a ready reference manual, listing the most elementary of these values. The scope of the text is limited to the requirements associated with the reading of the Classical repertoire. By the nature of things, much of this is merely a restatement of well-known data; other values supplied here are products of new researches. This manual has the function of bringing both together in a single reference guide.

The second task adopted by this handbook, is making the reasons for the existence of these elementary values intelligible to the student.

For example, the fact that the values of the well-tempered and equal-tempered scales seem to be close approximations of one another, has misled many students to believe that the purposes of well-tempering and equal-tempering must be identical. Similarly, many students are misled by Hermann Helmholtz's *Sensations of Tone*, to believe that the well-tempered scale is a convenient deviation from a "natural musical scale." Similarly, the reasons why the Classical well-tempered scale was pivoted on middle C set at 256 cycles, are generally unknown. The relationship of Classical *bel canto* vocal registration to the well-tempered scale, is also generally unknown or misunderstood.

Confusion on such matters suggests to the student that the precise values are more or less arbitrary products of custom. When the reasons for the values are not made intelligible, music itself becomes unintelligible to that degree. It is as important that the student be informed why certain values are the correct ones, as that he or she know the correct values.

In compiling the values listed, the following approach has been taken. Our researches have proceeded from the point of reference of values known within the domain of modern musical practice since approximately the work of the circle of collaborators associated with Luca Pacioli and Leonardo da Vinci.

These values have been examined from two vantage-points. The method of constructing a well-tempered system and its values has been examined from the vantage-point of modern physics; a critical assessment of the work of Johannes Kepler from the standpoint of Carl Gauss and Bernhard Riemann's work on the complex domain, has predominated here. The second standpoint has been biology and the physiology of the vocal and hearing apparatus. Riemann's validated hypothesis on the organization of human hearing has been an included topic. The standpoint in biology employed has been that of optical biophysics, with emphasis on the approach of nonlinear electromagnetic spectroscopy of living processes. By correlating these two approaches, precise values for well-tempered tuning are demonstrated, and the relationship of vocal registration to that tuning also made intelligible.

In net effect, some of the values we supply here we have presented

with the confidence of scientific certainty. In other instances, we have supplied the best choice of customary value, and have indicated the nature of our uncertainty by appropriate footnotes. We believe that in each of the latter instances, the reason for our tentative choice, or our reservations will be clear.

The third, correlated feature of the text, is a summary of what is termed most conveniently the Classical Idea. We reference the Classical Idea as it applies with equal force to all branches of fine art, including architecture, but only to the extent this is needed to render intelligible the purpose and practical significance of the Classical Idea within the history of composition and performance of music as such.

For reasons which are made obvious in the body of the text, we have divided our treatment of the Classical Idea into two sections. A general statement of the history of the Classical Idea and its practical significance for music, is the subject of the remainder of this Preface. The more challenging issues posed, the intelligible character of the creative aspects of the artistic process, are the subject of a chapter included among the appendices.

The number of professional musicians, researchers, physicists, biologists, and medical professionals who have either participated directly in the project, or whose work has been a significant contribution, are too numerous to be listed conveniently.

Among the many public and private archives consulted over the span of eight years' work on tuning, special mention is made of the Leibniz archive in Hanover, where we obtained access to what had been the presumably lost manuscripts bearing upon Leibniz's direct influence on the adoption of what became Bach's well-tempered system. It should be noted that, bearing on our account of the adversaries of the well-tempered system and bel canto vocal registration, we have consulted the relevant archives, in Italy and elsewhere, of those who directed the efforts to eliminate Classical values. There is no speculation in what we report here on the nature of that opposition.

The Classical Idea

The strict usage of the term "classic" within the modern Western European tradition arises from former policies of education which placed the emphasis upon the Greek and Latin classics. "Classic" values signified reference to the idea of beauty associated with ancient, "Classical" Athens. The models of the "Classical" notion of beauty were centered around the image of the design of the Athens Acropolis and the expositions on the interrelatedness of the Good and the Beautiful found as central features of the dialogues of Plato (428–348 B.C.).[1]

The strict Classical Idea was established in the Western European tradition through the influence of the writings of St. Augustine (354–430), including his *De Musica*. The relationship between Platonic notions of the Good and the Beautiful and Augustinian Christian standards, was defined by St. Augustine in a famous letter citing the coincidence and differences between his outlook and that of Plato.[2] The application of Augustinian principles of harmonic beauty by the twelfth to thirteenth century cathedral-building school of Chartres in France, is an outstanding example of the pre-Renaissance notion of application of the Classical Idea.

Provided we take those ancient Greek and medieval aspects of the matter into historical reference, the modern form of the Western European Classical Idea is associated with the Renaissance, including the influential work of Dante Alighieri (1265–1321) and such followers as Francesco Petrarca (1304–1374), but otherwise emphasizing the fifteenth-century and early sixteenth-century work of the Golden Renaissance, as typified by the influence of Cardinal Nicolaus of Cusa (1401–1464), Luca Pacioli (c. 1445–c. 1517), Leonardo da Vinci (1452–1519), Erasmus of Rotterdam (1469–1536), and Raphael (1483–1520).

In Western Europe, to the present day, the Renaissance expression of the Classical Idea was also generally known by the name of "humanism." Unfortunately, in the English usages of this century, the term "humanism" has been stolen by the Ethical Union and its co-thinkers; their "secular humanism" signifies an outgrowth of modern liberalism which is directly opposite to classical humanism in every sense. So, today, we are obliged to say "classical humanism," or "Christian humanism," to show that we mean something directly

[1] Unless specifically indicated as B.C., dates given in this are A.D.

[2] One of St. Augustine's most extensive elaborations of the differences between the Christian and Platonic world outlooks can be found in his *City of God,* books 8, 9, 10, and 12 (New York: Random House, 1950).

opposite to what popular opinion today knows as "secular humanism."

Renaissance humanism, as typified by its principal authority, Nicolaus of Cusa, signified, among other things, that there is nothing in the universe of human experience which is not potentially intelligible to an individual human mind, nothing which is not potentially susceptible of intelligible representation in the strictest sense of intelligible scientific representation.

On that point, Nicolaus of Cusa and Plato agreed. For classical Athens, beauty was not a mere matter of differing tastes; the quality of being beautiful, or ugly, is a decision subject to rigorous scientific verification. The Golden Renaissance, especially through the Milan collaboration between Luca Pacioli and Leonardo, reconstructed rigorous geometrical proof of this classical Greek principle. From the spread of the influence of this proof, there developed what we rightly identify as the modern Classical forms of music, painting, architecture, drama, and poetry.

The Classical Composers

By Classical music, we signify the work of a series of eighteenth- and nineteenth-century composers, beginning with Johann Sebastian Bach's (1685–1750) establishment of the well-tempered system of polyphony, and continuing through paragons, such as Wolfgang Mozart (1756–1791), Ludwig van Beethoven (1770–1827), Franz Schubert (1797–1828), Felix Mendelssohn-Bartholdy (1809–1847), Frederic Chopin (1810–1849), Robert Schumann (1810–1856), and Johannes Brahms (1833–1897), through the 1890s.

We should also include those predecessors of Bach, including his immediate musical ancestors of the seventeenth century, who, from the time of Leonardo da Vinci, fought to establish a Classical music based on perfection of an effort aimed at producing a well-tempered system. We must also include the known history of what we call today the "bel canto" method of voice-training and singing.

Stone sculptures of singers from the fifteenth century (see *Figure A*) demonstrate conclusively that the bel canto system was fully developed at that time.

We must distinguish between the musicians in this Classical tradition, and those composers among their contemporaries who fought to eliminate the Classical tradition. Claudio Monteverdi (1567–1643) was such an anti-Classical composer, whose approach to composition and choice of musical themes prefigures the nineteenth-century Romanticism of Franz Liszt (1811–1886) and Richard Wagner (1813–1883). The nineteenth-century Romantic composers lived and worked during the same time as the Classical tradition was practiced by such exponents of the Classical tradition as Mendelssohn, Chopin, Schumann, Giuseppe Verdi (1813–1901), and Brahms.

Nora Hamerman

Figure A. Panel from Luca della Robbia's sculpture for the choir stall of the Cathedral of Florence.

During the period of Bach's last years at Leipzig (Bach served as cantor of St. Thomas's school and music director in Leipzig from 1723–1750), the House of Hanover and other elements of a faction then known as "the Venetian Party"[3] sought to obliterate Bach's music and

[3] On the usage of "Venetian Party" during the early eighteenth century, see H. Graham Lowry, *How the Nation Was Won: America's Untold Story, 1630–1754*, Washington, D.C.: Executive Intelligence Review, 1988. Under the reign of England's Queen Anne, all of Western Europe and English-speaking North America was divided between the allies of Gottfried Leibniz and Jonathan Swift, on the one side, and what was termed the "Venetian Party." The latter included the Duke of Marlborough's Liberal Party in England, and the corrupted Georg Ludwig of Hanover, later Britain's George I.

influence from the memory of mankind, to the effect that Bach's compositions were not permitted to be performed in European concert halls until Mendelssohn broke the ban, by performing Bach's *St. Matthew Passion* at Berlin, in 1829. Against Bach, the Hanoverian faction held up as a model the trivial figure of Jean-Philippe Rameau (1683–1764).

Despite the ban against the performance of Bach's compositions during the period from approximately 1750 until Mendelssohn's famous 1829 concert, Bach shaped the development of the Classical field. Beethoven virtually teethed upon Bach's *Well-Tempered Clavier,* under the instruction of one of Bach's leading students, Christian Gottlob Neefe (1748–1798).

Wolfgang Mozart underwent a revolution in the profundity and power of his composing after 1782 studies of Bach's work. Although the powerful Venetian faction had banned Bach's music from the concert stage, Mozart and Beethoven defined Classical composition on the basis of their own studies and use of Bach's discoveries.

The influence of Marxist and kindred social theories of art among musicologists, and others, has produced the popularization of a doctrine to the effect, that modern composers belong to successive periods of musical mannerisms and tastes, such as the Baroque, Rococo, Classical, Romantic, and Modernist. The spread of this social theory has been perhaps the chief reason the majority of modern professional musicians no longer grasp some among the most rudimentary features of principles of Classical musical composition.

It is usually assumed that the "Romantic Period" erupted on the European continent during the period of the 1815 Treaty of Vienna and the anti-Classical Carlsbad Decrees. For that reason, all leading composers after 1827–1828 are not only classed as representatives of the Romantic Period; in most instances of what passes for standards of performance of the musical repertoire today, the works of strictly "Bachian" composers such as Schubert, Mendelssohn, Chopin, Schumann, and Brahms are interpreted in a way more or less appropriate for Hector Berlioz (1803–1869), Liszt, Wagner, and Hugo Wolf (1860–1903).

The cleanliness, meticulous shaping of tone, "long-line" phrasing, and contrapuntal voice transparency, essential for the classical composition, are more or less abandoned, and the performance inundated with thick blobs of sentiment and Romantic mannerism instead.

So, the historical fact is, that during the entire period from the time of Leonardo da Vinci through the death of Brahms, composers, performers, and musicologists committed to the Classical Idea in music constituted a more or less widespread and powerful faction within music. During this span of time, there were no distinct periods of such a nature that some ruling Hegelian sort of musical spirit of the age—an Hegelian *Weltgeist* or Savigny *Zeitgeist*—was a characteristic feature of the work of the musicians generally.

To the degree there might seem to be any justification at all in use of terms such as a Baroque, Classical, Romantic, or Modernist "Period," this merely signifies that one of the contending political factions within music enjoyed the upper hand in terms of backing by powerful patrons. The hegemony of the "Bachians," such as Mozart and Beethoven, during the 1763–1815 period of the rising influence of the American Revolution upon Europe, represented the Classical faction in music at the relative peak of its political power. The Romantic movement in music derived its power from the anti-American forces at the center of the Holy Alliance.

The same is true of other aspects of the fine arts, including painting, architecture, drama, and poetry. The increasing patronage of Romanticism and, later, Modernism is associated with a rise of irrationalism in political movements as well as in artistic fields. As the political power of wealthy patrons of these irrationalist movements in art was increased, and as irrationalist radicalism was spread more and more throughout the populations, the representation of the Classical musical composer on the concert stage, and in the teaching institutions, was diminished. Although works from the Classical repertoire continued to be performed, the standard interpretation of those works was shifted in a way more or less satisfactory to the sentimental, anti-polyphonic irrationalism of, initially, the Romantics, and, more recently, the Modernists.

The means by which Classical music was so undermined were purely political ones, such as the shift from the well-tempered C=256 to the Russian bandmasters' A=440, decreed, as a purely political decision during the 1815 Congress of Vienna. At the same time that the Romanticism of Liszt and Wagner was promoted against Beethoven's influence, there were also direct efforts to obliterate those strict standards of tuning and vocal registration the which lie at the center of the methods of Classical composition and performance.

In the effort to destroy the tradition of Classical music from within, three chief lines of attack were chosen. The first, was a direct attack on

well-tempered harmonics, by aid of introduction of "elevated pitch," beginning with the political decrees demanding that C=256 be replaced by A=440. The second was the imposition of new standards for construction of the musical instruments. The third, was a manifold attack upon principles of bel canto singing. That threefold attack has become more or less successful, at least to the extent that the Classical standards and principles in these matters are the knowledge of but a tiny minority among professional musicians and music curricula today.

Natural and Artistic Beauty

Classical Aesthetics is centered around strict definitions of what ought to be intended by use of the terms "natural beauty" and "artistic beauty."

By *natural beauty*, we mean the principles of beautiful forms as they occur in nature. In music, this includes the well-tempered system of polyphony, which has been discovered by man, but which was created entirely by nature, not the artificial whims of musicians. We include as *natural beauty* the potentialities of the bel canto singing voice.

By *artistic beauty*, we mean an artistic composition which never violates the principles of *natural* beauty, but which adds a new dimension of beauty, produced by the creative mental powers of the individual mind of man.

In Classical Aesthetics, we insist that the quality of beauty—both *natural* and *artistic*—is not a matter of taste. The statement, "Well, in my opinion, it is beautiful, and my opinion is just as right for me as someone else's taste is for them," is not tolerated. There must be an absolute, scientific proof, that one principle of artistic composition is consistent with the quality of beauty, and that a contrary view is scientifically wrong.

The best exponents, and examples of classical Athenian culture, already demonstrate a clear understanding of this point. They recognized that there is an absolute standard of beauty, by which we are permitted, and implicitly obliged, to say that one thing is beautiful, and a contrary thing called art, ugly. They struck upon the right approach to discovering that standard, a standard which can be demonstrated with scientific certainty, to the effect that we can show not only whether one person's idea of beauty is right, or not, but that a contrary opinion is wrong.

The classical Athenians already understood, with fair accuracy, that this scientific proof is based on a certain kind of use of a special kind of geometric construction, a form of mathematical practice sometimes identified as "synthetic geometry." In other words, the proof of the quality of beauty is a measurable proof, provided we first understand the special principles of measurement required.

Those principles of measurement are the foundation for the proof of the strict standards of the well-tempered system, and are also the basis for showing the necessary connection between the well-tempered system, as a harmonic ordering of tuning, and the precise values of bel canto singing-voice registration.

For that reason it is most important for the training of music students, that the nature of the proof for the Classical Idea of natural and artistic beauty be presented. This obliges the teacher to show, that the methods of construction used to prove that only certain values of tuning for registration are the right ones. It may be beyond the teacher's qualifications in science to elaborate the full proof, but, at the least, the nature of the proof should be identified for the student as clearly as possible.

One of the clearest examples of the force of the Classical Idea within ancient Athens, is the design of the Acropolis (see *Figure B*).

The geometric exposition of this principle of beauty of form is included within the dialogues of Plato. The modern exposition, and further development of the principle is traced to the work of Pacioli, Leonardo, and their collaborators, a project based directly upon the discoveries of Nicolaus of Cusa in the field of what is called "synthetic geometry" and in the stipulation of the principles of modern physical science.

The Classical Greeks already understood that the quality of beauty is located in that which represents the essential distinction between healthy forms of living processes and non-living objects.

This is based on the simple observation, a fact verified in every case, that all living processes have a characteristic harmonic ordering in their morphology of form, and that non-living processes have a different characteristic ordering. This is the most elementary of the measurable differences between living and dead processes. In mathematical phys-

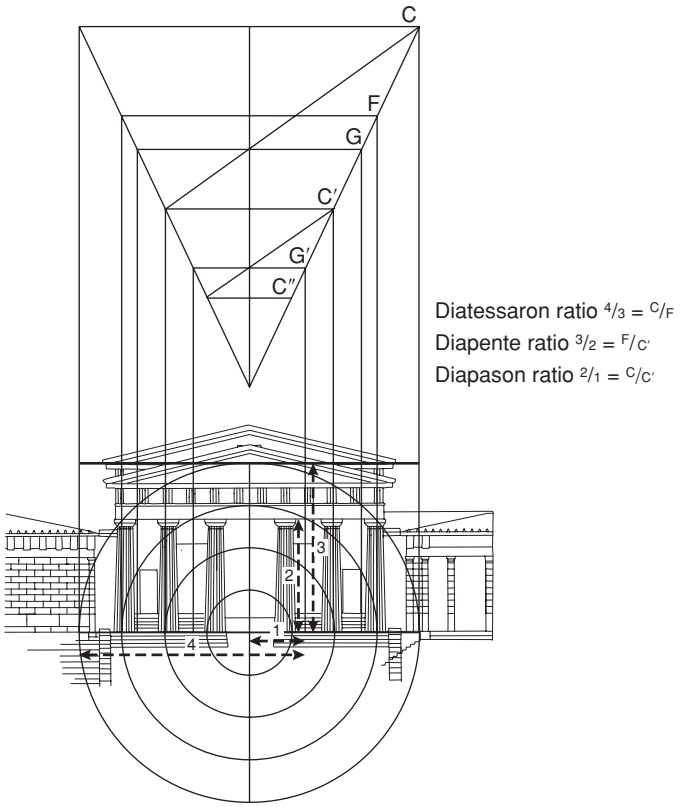


Figure B. The works of Iktinos and Mnesikles, the two leading architects of Athens during the fifth century B.C., *show mastery of a method of constructive geometry based on a conical projection of a Golden Section ratio and self-similar spiral action. This constructive method formed the basis for the design of the Propylaia, the Parthenon, and the Erechtheion on Mount Acropolis. For example, the west elevation of the Propylaia is a composition of mixing the ratios of 2:1 (the octave), 3:2 (the fifth), 4:3 (the fourth), and the Golden Section.*

ics, we say that the former orderings are characteristic of *negentropic* processes, and the latter of *entropic* ones.

Essentially, life is beautiful, and the quality of deadness in human existence is ugliness. The Athenians recognized that beauty of form is associated with certain harmonically ordered constructions based upon the sectioning of circular motion. In Plato's dialogues, it is emphasized that all beauty of form, including that of music, is congruent with harmonic orderings cohering with the Golden Section of circular motion.

Pacioli, Leonardo, and their collaborators demonstrated, that all healthy living processes have these distinctions. The morphology of growth of healthy living processes is congruent with a harmonic ordering consistent with the Golden Section; the bodily functions of motion are also congruent with the same harmonic ordering. Work over the centuries since Pacioli's famous *De Divina Proportione* (1508), has strengthened the evidence in support of this proof.

These principles, taken together with the methods of scientific thinking earlier elaborated by Cusa, were the basis for Leonardo da Vinci's encompassing genius in the physical sciences and as a scientific pioneer in painting, sculpture, architecture, and music. One of the principal outgrowths of this accomplishment was the school of Raphael.

Between the period of Plato's Athens and the fifteenth-century Renaissance, the well-tempered musical system of Athens was carried a step further, by the famous Islamic philosopher al-Farabi (c. 872–950). Al-Farabi elaborated an equal-tempered approximation of the values of a well-tempered octave scale. It was al-Farabi's work, carried into Western Europe, which contributed a leading part in establishing the octave form of well-tempered scale.

After the work of the circles of Pacioli and Leonardo, the most important next step of progress in the perfection of this aspect of the Classical Idea was the contributions of Johannes Kepler (1571–1630), the founder of astrophysics, and, in fact, the founder of modern mathematical physics as a whole. As Kepler writes, his work in music, in the creation of the root-conceptions of modern topology, and his astrophysics, were premised chiefly on the preceding work of Cusa, Pacioli, and Leonardo, as supplemented by some very important work by Albrecht Dürer.[4]

In examining Kepler's work on the well-tempered system, we must separate the particular values which Kepler supplies for the principal harmonic intervals of the well-tempered scale from the method of hypothesis he employed to produce these results. As Kepler himself

[4] Johannes Kepler, *The Secret of the Universe* (1596), *Commentaries on Mars* (1609), *On the Six-Cornered Snowflake* (1619), *Harmonies of the Spheres* (1619), and *Epitome of Astronomy* (1620).

specified, to define more correct values, both for astrophysics and music, certain specific advances in mathematical physics must be developed to perfect his own hypothesis.

Kepler specified the requirements of a differential calculus, a task undertaken by Blaise Pascal (1623–1662) and completed by Gottfried Leibniz (1646–1716). Kepler also specified the need for an adequate method of geometric determination of the values of what are called elliptic functions. The problem of defining elliptic functions was solved in principle, at Germany's Göttingen University by the beginning of the 1860s, chiefly by the successive work of Carl Gauss (1777–1855) and Bernhard Riemann (1826–1866).

By employing today the advantages of the work of such leading nineteenth-century mathematical physicists as Gauss, Lejeune Dirichlet (1805–1859), Karl Weierstrass (1815–1897), and Riemann, we are able to derive the correct values for the well-tempered system in the most rigorous and conclusive way.

The harmonic orderings of the well-tempered system, centered upon well-tempered values for the minor third, major third, fourth, arithmetic-geometric mean, geometric mean, and fifth, are identical to the correct values for astronomy, and are congruent with the Golden Section. Kepler was correct as far as he had progressed in detail; the modern Gauss-Riemann physics of the complex domain permits us to provide the corrections in method and values in a rigorous and conclusive way. (See *Figure C*.)

In the well-tempered system, we begin with the harmonic intervals of the minor third, major third, fourth, fifth, and the Golden Mean (F-sharp), and with the derived distinctions between major- and minor-key harmonic progressions constructed in this way. We are able to construct twenty-four major and minor keys, and their appearance as scale-inversions, in this way.[5]

To construct the system in first-approximation, it is sufficient to take the tone of the key of C major or C minor which lies on the minor third, major third, fourth, Golden Mean, and fifth, as the tonic tone of a new major or minor key, and to construct the minor and major thirds, fourth, Golden Mean, and fifth for that key-signature, as we construct such harmonic progressions for C major and C minor.

[5] Arithmetic-geometric mean, geometric mean, and Golden Mean (or Golden Section) are each distinct values for F-sharp, depending on the construction of the scale.

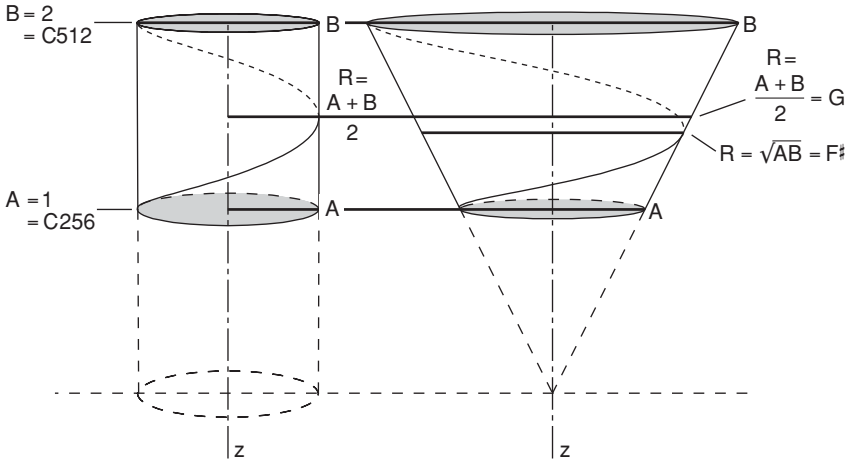


*Figure C. Simple spiral action in the complex domain (left) is cylindrical in form; at one-half rotation (*R*), the distance moved along the axis* z *is one-half of the distance moved along* z *by a full "octave" rotation from* A *to* B. *One-half rotation therefore corresponds to the arithmetic mean* (A+B)/2, *or G. In self-similar spiral action (right), which characterizes the Gauss-Riemann complex domain, the distance moved by one-half rotation is the distinct geometric mean* ($\sqrt{AB}$) *of the total distance, corresponding to the movement from C to F-sharp.*

Our first construction of the harmonic system, begins from middle C=256. We refine this construction, by going to C above middle C, C′=512. We repeat the first approximation, in determining the intervals of a minor and major third, fourth, geometric mean, and fifth, reading downward, from C′ to C. We repeat this for each of the key-signatures whose harmonic intervals we have defined by the first approximation.

By these combined efforts we have mapped completely each of the thirteen half-tones, from C through C′ in the well-tempered system of twenty-four major and minor keys. The values so determined are those congruent with harmonic orderings based upon the Golden Section. Hence, this is the only musical arrangement which is coherent with the principle of life, and thus the only musical arrangement in which natural beauty is possible.

All of these values are natural values, not artificial ones. The Gauss-Riemann correction of Kepler's construction shows that these values were the absolute musical values of our universe before the first

human being existed. Man did not create the well-tempered system, any more than man created gravitation; man discovered both, correcting his error of not recognizing these natural laws earlier.

The basic values of bel canto vocal registration have the same quality of natural beauty. What we call bel canto voice-training is not some arbitrary system of singing; it is man's discovery of the natural qualities of the human voice's potential for singing.

The simplest example of this is the way in which the soprano voice naturally sings in a different quality of voice, in singing the F of the well-tempered system (at C=256), as opposed to singing the next half-tone, the F-sharp. This register shift of the soprano on the well-tempered F-sharp is determined by the physiology of the human soprano voice; singing differently will lead to damaging the singing voice. Thus, bel canto represents another case of man's discovery of natural laws, rather than some artificial custom.

In response to the later prevalence of an elevated equal-tempered scale, at A=440, ten cycles higher than the natural well-tempered scale, bel canto training adopted the custom of training the soprano voices to pass register on the F, rather than the F-sharp. Indeed, if the soprano attempted to pass on the F-sharp, rather than the F, in such elevated tuning, the tendency would be either to produce a "wolf-tone" quality on the F, or to mask that by straining the voice, with long-term destructive effects on the voice itself.

However, the actual absolute pitch at which the soprano register-shift naturally occurs, is the same in both cases. In the well-tempered system at C=256, the discontinuity between the registers occurs not on either the F or F-sharp, but in the no-man's land in-between. Thus, in elevating the pitch, from A=430 to A=440, the issue is not that we have shifted the scale less than a half-tone of the equal-tempered scale. The issue is, that the elevated pitch places the F, which is below the discontinuity between registers, in C=256, above that discontinuity.

If we set the Sun of the solar system at C, according to scalar values based upon the distances of the planets from the Sun, or at F according to scalar values based upon the angular velocities of the planets, in both cases, the asteroid belt lies between the values of F and F-sharp. This doubly-connected conical musical function, according to Kepler, is the reason that, although the solar system requires the existence of a planetary orbit in this location, the planet in that orbit must have been destroyed. Kepler supplied the correct orbital harmonic values for this missing planet, which Gauss proved to be the true orbital values for the asteroids Ceres and Pallas first observed at the turn of the nineteenth century, nearly two hundred years after Kepler had insisted on a destroyed planet with those orbital values. (See *Table A*.)

In astrophysics, the region so defined as lying between F and F-sharp is a zone of harmonic discontinuity, separating the dense inner planets of the solar system from the gaseous outer planets of the second series. In Kepler's astrophysics, the existence of a necessary planet within such a region of discontinuity ensures the destruction of that planet.

The values for the various register shifts of the tenor have zones of agreement and disagreement with the soprano, but the principles of all voice-register shifts are the same, despite the differences in the tonal values at which they occur. The various species of voices, soprano, tenor, mezzosoprano, baritone, contralto, and bass, form a tonal series, a series which is the basis for natural vocal polyphony. (See *Figure D*.)

The hoaxster Helmholtz, who wrote his *Sensations of Tone* as a ponderous assault on both the well-tempered system and bel canto singing, makes much of the highly varied tuning of organs existing during the eighteenth century. However, Bach himself resorted to the obvious expedient of adjusting the organs with which he worked, and transposing the quoted keyboard key to coincide with the well-tempered tuning at the C=256 which had been standardized in France and Germany at that time. The construction of the best string instruments and woodwinds, during the seventeenth and eighteenth centuries, and the parallel standards of construction of the best stringed keyboard instruments, is a fact which Helmholtz slyly evades. Typically, these instruments were designed to be resonant at values of C congruent with C=256.

During the nineteenth century, as constructions of musical instruments were altered to accommodate A=440, and keyboard instruments redesigned to suppress polyphonic characteristics of the Classical ones, there was an attack upon C=256 standards as being purely arbitrary. It was argued, in effect, "You have chosen C=256 merely because it was a simple power of the number two. There is no reason any other tuning which pleases us is not as valid, or even more valid than C=256."

In rebuttal of that objection to C=256, the physiology of singing shows why C=256, or a very close approximation of that value, is the

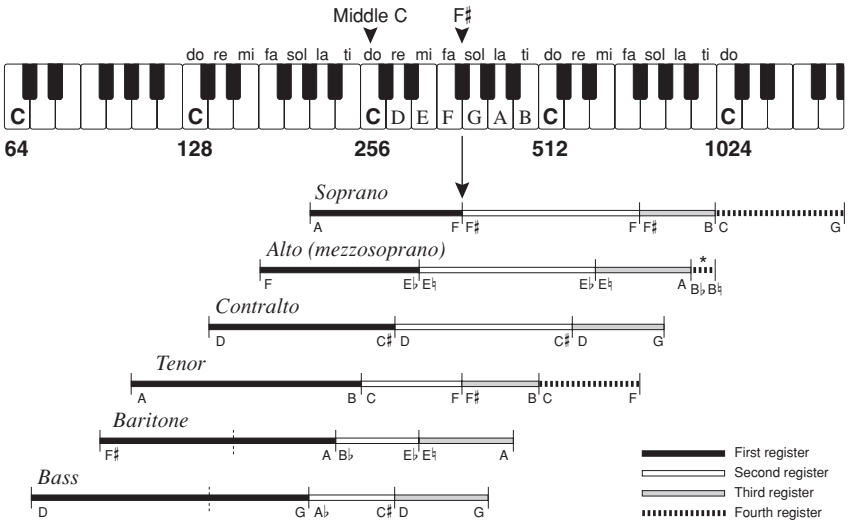
Table A. Kepler's Harmonies of the Planets

Planet	Apparent angular velocity	Interval (period/aphelion)
Mercury		
perihelion	384′00″	12:5 =
aphelion	164′00″	octave + minor third
Venus		
perihelion	97′37″	25:24 =
aphelion	94′50″	diesis*
Earth		
perihelion	61′18″	16:15 =
aphelion	57′03″	semitone†
Mars		
perihelion	38′01″	3:2 =
aphelion	26′14″	fifth
Ceres (asteroid)		
perihelion	15′06″	1:0.7111 =
aphelion	11′00″	"devil's interval"‡
Jupiter		
perihelion	5′30″	6:5 =
aphelion	4′30″	minor third
Saturn		
perihelion	2′15″	5:4 =
aphelion	1′46″	major third
Uranus		
perihelion	0′46″	6:5 =
aphelion	0′39″	minor third
Neptune		
perihelion	0′22″	25:24 =
aphelion	0′21″	diesis*
Pluto		
perihelion	0′24″	octave +
aphelion	0′08.7″	"devil's interval"‡

* Kepler's diesis = 0.96 = the half-step between E and E-flat.
† Semitone = 0.9375 = the half-step from B to C.
‡ Kepler's "devil's interval" = 1:0.7111
Modern Ceres data = 1:0.7278
Modern Pluto data = 1:0.7250 (+ octave)

Sources: For Mercury through Saturn: Johannes Kepler, *Harmonici mundi*. For Ceres through Pluto: modern astronomical data.

only correct one. Some of this scientific proof was already established by Leonardo da Vinci's methods; a stronger proof, incorporating Leonardo's method, lies in the domain of modern physics and biology.



* Mezzosoprano "Verdiana" is not strictly a fourth register; see Chapter 4.

Figure D. The Six Species of the Human Singing Voice. The main register shifts are absolutely determined; lower and upper extremes of range are given according to a survey of the ranges used in Classical bel canto vocal compositions.

However, there is another reason for choosing C=256, whose proof lies entirely within the understanding of the well-tempered system as such.

Singing is based on the activity of children's choruses, and hence children's voices, in which the child's soprano predominates. The female soprano does not undergo a significant voice-change during adolescence; the male voices, most emphatically, do. Despite the changes in, especially, the male voices, the principles of registration remain the same throughout the changes in values of register-shift. For this and related reasons, the benchmark for tuning is the registral qualities of the soprano voice, and the differences in registration of other voices serve, combined with the different registrations within each species of singing voice, as the basis for vocal polyphony.

Thus, the central problem of composition within the Classical repertoire, is the way in which soprano register-passage coincides with the pitch of the well-tempered system. If the soprano register-shift occurs on the F required by A=440, a disharmony is introduced to the Classical repertoire. The principles of counterpoint require that the F lie within

the relatively lower soprano register, and the F-sharp be located in the relatively higher register.

For example, in the vocal repertoire of Mozart and Beethoven, the soprano's F must lie in the relatively lower register, and the F-sharp in the relatively higher one. This is required for two principal reasons. The most obvious reason, is the well-tempered system, which requires the same *natural* division of the octave scale, in terms of quality of registration, as Kepler's planetary harmonics. The second is peculiar to the prosodic aspects of the songs of those two composers, in particular. If the register shift is on the F, the soprano will naturally sing the song wrongly from a poetical standpoint.

Throughout the classical vocal repertoire, through such examples as Brahms's *Four Serious Songs*, the composer has written the composition for a specific species of voice in a key chosen for this purpose—in this example, the bass. If one attempts to transpose this song to a different key, for the purpose of employing a different species of voice, the relations within the domain of the vocal-instrumental counterpoint of the keyboard part fall apart to a significant degree. A Classical composer approaches the construction of a song in more or less the following manner. The Classical poem has a natural prosody, to such effect that if we take the various settings of such poems by various composers of the Classical period, and compare these with a setting by the Romantic Hugo Wolf, we observe certain similarities which all of these composers have recognized as intrinsic to the prosody of the poetry itself. These considerations include both the relative tonal values of the vowels, and the inflections of the vowels by consonants. They include also the requirement of combining ascending harmonic sequences and inversions, in defining a musical statement corresponding to a line of the poem. They include that fact, that in the recitation of Classical poetry in better than a sing-song sort of tedious monotony, the use of speaking-voice registration is required to emphasize the posited and apposite conception of which the line-statement is formed.

These considerations define, for the Classical composer, both a certain notion of harmonic progressions of tones, and the location of divisions of musical statements of the line to such effect that one or more portions of the statement may lie in registers below, or above, or both below and above, the principal register of central reference.

To satisfy these combined requirements of the poem's musical setting, once the composer has chosen a certain species of voice for this song, and has chosen between a minor and major harmonic sequence of utterance, the composer is obliged to choose a definite key-signature, which divides the registration of the sung line as required. This is the most important consideration in choosing a key-signature for a vocal composition.

Thus, as we have already noted the significance of the soprano and tenor voices as the pivotal point of reference for well-tempered composition, it is of the greatest importance to the composer, that the soprano register-shift occur on the F-sharp.

Hence, the elevation of the well-tempered scale which places the soprano register-shift so, is the only *natural* tuning for the composer. Hence, Mozart required tuning of A between 427 and 430. A value of 430.5 is the calculable upper limit for A; A=427 defines the lower limit of a comfortable soprano register-passage on the F-sharp. If the composer estimated in terms of equal-tempering, he would tend to choose the point of discontinuity between the two registers at a quarter-tone distance between F and F-sharp. A well-tempered keyboard tuning scaled to C=256, or A between 427–430, would fit the requirements for all species of singing voices comfortably.[6]

The grounding of the musical education is in the development of the singing voice. Pre-school-age children learning to sing with their minds set at a habituated "perfect pitch," based on C=256, is the normal foundation for a musical population from which all composers and performers, amateur and professional, and audiences, are best drawn. It is such early foundation in singing which establishes music as a native language of the population.

The development of the Classical musical instruments, especially since Leonardo's work on this, has been governed by construction of instruments which imitate the natural qualities of the properly trained singing voice. One attempts to cause the strings and woodwinds to sing bel canto, and approaches the shaping of keyboard instrument's enunciation of tones and phrasing of tones to the same effect. And, so on. (See *Figure E*.)

The instrumental ensemble is a product of vocal polyphony. The significance of this is rather readily demonstrated by music students. In writing of simple canonical exercises, choose specific species of singing

[6] A tuning of A=432 (C≈256.9)—the tuning demanded by Giuseppe Verdi—can be considered the extreme upper practical limit for singing with proper registration.

Philip Ulanowsky

Figure E. The fortepiano's frame is built almost entirely of wood, as opposed to the metal frame of the modern pianoforte. This, combined with a greater distinction between registers, gives the fortepiano a bel canto singing quality which is extremely difficult to replicate on its modern descendant. The instrument pictured above was constructed in Vienna by a student of Conrad Graf in 1836, and is currently in the possession of the Schiller Institute in Leesburg, Virginia.

voices, with regard to their natural register-shifts. The differences in progressions, with respect to register-shifts, among the voices, define the way in which the various species of voices might be placed with respect to one another, and the difference in results effected by substituting different species of voices for each assigned part. By creating musical instruments which imitate such species of voices, by virtue of their constructions, or by string instruments which can simulate the registral distinctions among differing species of voices (as Bach's works for unaccompanied strings illustrate this most forcibly), the principles of vocal polyphony are elaborated in a greatly expanded domain.

The connection is usefully illustrated by comparing the vocal and instrumental compositions of Mozart and Beethoven, separately, and in parallel. The same principles of use of singing-voice registration, which confront us immediately in the composition of the vocal part, govern the composition of the instrumental work. For this reason, the placement of the soprano register-shift in the vocal part, is also an imperative of registration and tuning in instrumental works.

This approach to counterpoint has been savagely impaired by the modern teaching of chordal progressions. It is important for musical literacy, that no performer or audience ever hear a chord as a chord, but rather as polyphony. Each tone of the intoned chord is recognized as a tone in some species of singing voice, as a mere momentary cross-sectional slice of an ongoing piece of polyphonic utterance.

All the topics we have referenced thus far, pertain only to the domain of *natural* beauty. Mankind's work in all the features we have treated thus far is only the work of recognizing *natural* laws of music, independent of the rightful powers of choice of the musician. Granted, the mastery of these *natural* qualities of musical beauty, is the imperative foundation of musical artistry, and something which must never be violated in the composition of music or its performance. In other words, these are either simply the *natural* laws of musical science, or principles directly derived from nothing but the application of those *natural laws* to the empirics of the musical apparatus.

All that is beautiful in music, which is not simply the faithful service of *natural beauty*, is the product of *artistic* beauty.

Artistic Beauty As Such

Artistic beauty is the essence of that which sets mankind apart from, and above the beasts. This quality of mankind has two interdependent aspects. The first of these two aspects we may conveniently identify as the formal one; the second, inseparable aspect we may identify as the spiritual one. We treat the formal aspect of the matter first, and situate the spiritual aspect in that frame of reference.

What distinguishes human society, and the human individual, from

the "society" of the beasts? Empirically, the distinction may be made as follows.

The ethnologists have postulated that the most primitive condition of mankind is what they name a "hunting and gathering society." Whether such a form of society ever existed, or not, there is no doubt that the early primitive condition of mankind must have been confronted with the problems which the ethnologists postulate. Certain general features of such a postulated form of society can be estimated with relatively great precision.

Under such conditions of wilderness life, an average of about ten square kilometers of the Earth's land-area would be required to sustain an average individual. This signifies a ceiling upon the size of the living human population, of approximately 10 million individuals for this planet as a whole. The level of subsistence and life-expectancies of such a population would be very poor, and an average age of death of the individuals significantly below 20 years. The cultural life of mankind in such a state would be more or less comparable to that of troops of baboons.

Today, the human population is in excess of 5 billion. Admittedly, most of that 5 billion live in deprived and precarious conditions, conditions which have become progressively worse, on the whole, during the recent 20 years. However, had we deployed adequately the levels of technology already existing, we could sustain more than 10 billion at levels of existence and life-expectancies characteristic of the industrialized nations during the late 1960s and early 1970s. At present, the frontiers of science and technology have placed within the reach of the next two generations, the highest potential rate of increase of the per-capita productivity of labor in history.

The rise of population can be traced with reasonable, if somewhat diminishing accuracy, backwards for more than 6,000 years. We are able to correlate the rates of increase of potential population-densities with precise changes in applied technologies. In effect, we are able to construct a mathematical function which correlates advances in science and technology with increases of mankind's potential population-density, subject to the requirement of increasing per capita standards of consumption and life-expectancies.

Thus, relative to the ethnologist's postulated "hunting and gathering" society, mankind's absolute population-density has been increased by three orders of magnitude (e.g., approximately 1,000 times). In terms of the energy content of per capita consumption, we must add additional orders of magnitude of improvement. In addition to this, there is an approximate fourfold improvement in life-expectancy. In contrast, no animal species is capable of improving its conditions by even a small fraction of an order of magnitude, except through human intervention as animal husbandry.

Thus, that aspect of the nature of the human individual, by means of which mankind generates and efficiently assimilates scientific and technological progress, is the aspect of individual human behavior which sets mankind apart from, and above the beasts. It is the application of that same distinctively human quality of behavior to *natural beauty*, which is the root of *artistic beauty*.

This locates the source of artistic beauty in those same potential creative powers of the individual mind which account for mankind's ability to generate and to assimilate efficiently valid fundamental discoveries in physical science. We limit the discussion of the formal aspect here to a few bare essentials of the sort more readily observed by inspection of the matter.

Among the most commonplace examples of the creative potential of the individual is an event which often occurs among happy, very young children occupied in constructive play with building-blocks. At some point, the child may effect what is for that child an original discovery, expressed as the ability to build something which the child had been unable to build before, and to adduce from this success a principle which the child discovers can be repeated in that and other ways. In that moment, witnessing the child's sudden illumination with a special quality of joyfulness, the adults observing may be brought to the verge of "tears of joy."

In that experience, we witness the germ of the principle of artistic beauty: the delight in the exercise of our individual creative powers of discovery which we associate with the notion of "tears of joy."

In music, we experience this in a good performance of Mozart's *Requiem* or the simpler *Ave verum*. If the conductor does not evoke a sense of the specific quality of emotion associated with "tears of joy," the conductor is informed that either he is seized by a bad state of musical mind, or that the performance lacks the quality of "rightness."

We can more or less readily observe, by thoughtful inspection of the matter, that we are capable of two general qualities of emotional state. On the one side, there is the nobler condition typified by "tears of joy."

Opposite, is the erotic emotion, which we associate with hedonistic lusts such as greed and rage. The Classical Idea is associated with the first, and the Romantic and Modernist approach to music with the second.

In Plato, the first quality of higher emotional state is associated with the notion of the Good and the Beautiful—*Agathos,* as in the woman's name, *Agatha.* In the original Greek of the New Testa-ment, a related notion is identified by the verb-related term *Agapē*, as directly opposite to the lower quality of emotional state, *Eros*. In Western European Christian culture, *Agapē* is rendered as *Caritas* in the Latin, and the *charity* of the King James Authorized Version of the New Testament. It signifies, for Western European culture, the quality of love of God, love of mankind, love of truth, and love of beauty, and the controlling emotional state with which we approach life's challenges.

We observe that this quality of *Agapē* occurs in a special way in connection with valid forms of creative mental activity. It occurs as the prize secured when we effect a valid discovery. Yet, without this same emotional quality as a driving force, we are unable to sustain the qualities of concentration needed to effect such discoveries.

In the effort to find a solution to an inherently soluble problem, we observe a student or craftsman hammering away in a state of more or less thinly disguised rage, and perhaps smashing his tools when he or she fails to obtain success in that way. In contrast, we observe the happier, relatively calm state of mind, blended with great concentration and energy, quietly proceeding to attack the problem on a flank, working stubbornly, confidently toward a solution.

In musical performance, we observe the master, mobilized in the appropriate, approximately *agapic* state of mind, sustaining successively a very long line of phrasing over a passage, a sequence of passages, an entire section of a movement of a work, an entire movement, an entire work. The beauty of some of the *adagio cantabile* movements of Mozart and Beethoven instrumental compositions, are excellent illustrations of this.

If we compare such a performance of these works, with the erotic quality of sentimentalism of other performances by celebrated artists, the difference glares out at us. It was said of Wagner's "Liebestod," from his *Tristan und Isolde*, that the performers' objective was to leave "not a dry seat in the house." Such is the distinction between the *agapic* quality of the Classical Idea in music, and the erotic approach, bordering upon the dionysiac or irrationally mystical, of the Romantic approach.

Some performers have recognized the fact of the distinction, but have understood it wrongly. They accept the fact that Classical instruments were tuned to C=256, and accept the prohibition against imposed arbitrary sentimentality upon the performance of the score according to the original text. However, the result is dullness. There is no *intensity* in the execution, no compelling sort of distinctive "long phrasing" of the performance. The almost metronomic absence of any governing emotion at all, has been substituted for the abominations of the Romanticist's erotic sentimentality, and the Modernist's dionysiac vacillations between the dionysiac and the intoxication with the nothingness of the mystically obscene.

Among the best ways of bringing out such crippling emotional states among literate musicians, is to lure them into reciting a short composition in Classical poetry. Each of the more fundamental among the interpretive problems of their musical performance will tend to be shown in that terrible recitation of poetry. Another device which is usually more or less infallible to the same effect, is to lure them into discussing the interpretation of a musical composition from their repertoire. The response is usually either pedantic discussion of mere technical aspects of the composition, or sentimental driveling along the same general lines as the usual run of newspaper musical critic's reviews and dust-jacket program notes.

The notion that the composer has elaborated a composition as a musical idea referenced to the potential for developing such an idea in chosen musical subject-matter, is something of which the lured musician appears to be ignorant.

There is perhaps no one mode in which accomplished musicians do communicate the notion of *agapic* qualities of musical ideas. Our modern musical culture does not accustom us to communicating on such subjects; most musicians leave such matters to the domain of musical expression as such, rather than words. Sometimes, a verbalization of musical ideas occurs as overtones of musical rehearsals and kindred occasions. The kinds of tests we have suggested will usually bring out the failed musician's problems, but are not infallible ways of adducing the desired quality of expositions from the good musician; the latter usually resort to demonstrations made with aid of their instruments, showing the problems of the wrong way, in contrast with the

proper approach. In such ways, they attempt to make the differences heard. In the final analysis, no other approach is a fully adequate one.

Nonetheless, what we have stated here so far indicates the general idea to be conveyed. In practice, perhaps no musician is fully satisfied that any performance he or she has given, or heard, is yet an adequate one. The drive to discover flawed or inadequate treatments, and to discover ways to better serve the purpose, is the life's blood of musical activity, as every true scientist is impassioned by the determination to supersede the inadequacies in his most recent, most valued discoveries. That is the *agapic* way of such professions at their best.

Yet, we may add something of general applicability, which is helpful in making the point a bit clearer. What we aim for in the Classical Idea of music, is polyphonic and *agapic* "transparency" of the composition as a unified process of elaboration—development—of a musical idea.

Now, the dividing-line between *natural* and *artistic* beauties becomes blurred.

In 1747, J.S. Bach entered into a famous collaboration with the Prussian monarch and amateur musician Frederick the Great. The result was Bach's *A Musical Offering*. It is both a beautiful musical composition and a series of studies defining the rudiments of the discovery of a new dimension of approach to the methods of Classical musical composition.

After Mozart undertook his intensive studies of Bach, about 1782, Bach's *A Musical Offering* contributed a major influence to his work. The results are most directly represented in a series of three compositions. The first is the C minor keyboard sonata, K. 457. The second is the so-called "Dissonant" quartet, K. 458. The third is a keyboard fantasy, written as a prologue to the K. 457 sonata, K. 475. The same musical idea is elaborated in application to other locations, but these three, taken together, represent a formal statement of Mozart's assimilation and further development of the discovery which Bach presented in his *A Musical Offering*.

The same musical idea is the principal subject of several works of Beethoven. In the keyboard repertoire, these include his "Pathétique" sonata, Opus 13, and his last keyboard sonata, Opus 111. Schubert also makes the same musical idea the principal subject of several compositions, including, most famously, his posthumous C minor keyboard sonata and the *Kriegers Ahnung* of the collection published as his *Schwanengesang*. Chopin, demonstrably predominantly influenced by Bach more than Beethoven, nonetheless includes among his most famous references to Beethoven's work an explicit treatment of Beethoven's Opus 111, as his own Opus 4.

In effect, the discoveries situated at the center of Bach's *A Musical Offering* were thus rendered a virtual law of classical compositional method. This is exemplary of a general principle of the Classical Idea, not only in music. As in valid scientific work, the initial discovery of a principle has the implications of a work of great artistic beauty. Once established, that same principle becomes a part of the repertoire of natural beauty.

This is not the exception to the rule, of the distinction between natural and artistic beauty; rather, it is the apparent exception which proves the rule.

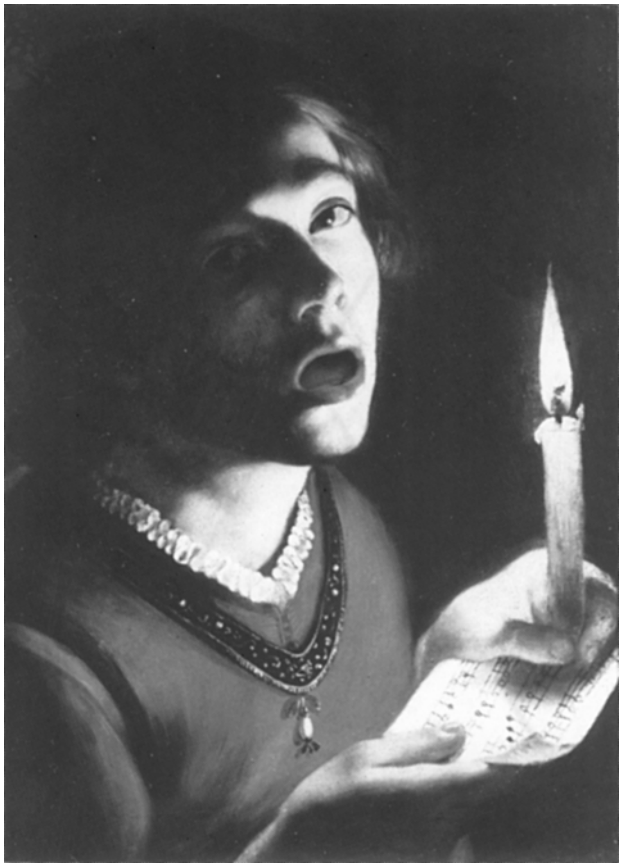
All Classical art, as a whole, and in each of plastic and non-plastic aspects of art as a whole, has a directed character. The direction, is the perfection of man's use of natural beauty. The result of progress is, that the greater perfection so achieved becomes a higher standard for natural beauty's expression as art. The discoveries which have established this higher standard persist as artistic beauty for generations to come; the enjoyment of such works is the act of reliving the process of discovery, and is thus of the character of durable artistic beauty on that account. At the same time, what is proven to have been a valid discovery in the production of artistic beauty, becomes a principle of natural beauty thereafter.

The essential distinction between natural and artistic beauty, is that *natural beauty* is that which is decreed for art from the beginning, by God. *Artistic beauty* is that use of lawful natural beauty shaped by valid use of those creative powers with which God has endowed the human individual. The situation is broadly the same as in the progress of physical scientific knowledge and practice. The difference is, that the *Agapē* which enables the scientist to produce valid fundamental discoveries, and to guide society in the use of those discoveries for the advantage of mankind, is the end in itself of the creation and re-creation of artistic beauty.

The purpose of art is to celebrate and strengthen the noblest state of mind which the individual person can achieve, and to aid thus in making

us better people. It is a contribution best and most naturally celebrated in the manner *Agape* prescribes, by an intensification of that anti-erotic quality of emotion we associate with child-like tears of joy.

The most precious gift we may receive, is the means to bring forth the force of *Agape* to rule our minds, and guide our actions, at will. Artistic beauty is a lever by means of which we are enabled to do just that. That is the purpose of art in general, and music in particular, according to the Classical Idea.



Rome, Doria Pamphiliji/Photography by Araldo De Luca

Figure F. This oil painting of a "Young Singer With a Candle" (Rome, Galleria Doria Pamphilij) was made most likely in Rome during the early decades of the seventeenth century by a French or Dutch artist, and strongly suggests that the quintessential Bel Canto experiment was well known at this time. In this era the first surviving treatises on the vocal art were also written, although the essential knowledge embedded in them goes back at least a century, to the era of Leonardo da Vinci. The youthful singer is shown with a wide-open, rounded mouth, inches away from a candle whose flame does not waver—indicating the "laser"-like properties of the properly produced voice. The anonymous artist is only known as the Maestro della Candela, the Candle Master.

It was during the early seventeenth century that it first became common, in Italy and then all over northern Europe, for artists to portray single musicians, often of the lower social strata, playing instruments. These included lutes, guitars, viols, and various wind instruments, but most often they highlight the recently invented violin with its amazing properties of imitating the trained soprano voice. The paintings are a great source of knowledge about the way these instruments were being played at this time.

Although there are quite a few paintings from the international "tenebrist" school which show picaresque singers performing at night by candlelight, this one may be unique in its emphatic evocation of the physical superiority of the Italian School of Singing.

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I

THE WELL-TEMPERED SCALE

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CHAPTER 1

The Foundations of Scientific Tuning

This chapter will demonstrate why, from a scientific standpoint, no musical tuning is acceptable which is not based on a pitch value for middle C of 256 Hz (cycles per second), corresponding to A no higher than 432 Hz. In view of present scientific knowledge, all other tunings including A=440 must be rejected as invalid and arbitrary.

Those in favor of constantly raising the pitch typically argue, "What difference does it make what basic pitch we choose, as long as the other notes are properly tuned *relative* to that pitch? After all, musical tones are just frequencies, they are all essentially alike. So, why choose one pitch rather than another?" To these people, musical tones are like paper money, whose value can be inflated or deflated at the whim of whoever happens to be in power.

This liberal philosophy of "free-floating pitch" owes its present power and influence in large part to the acoustical theories of Hermann Helmholtz, the nineteenth-century physicist and physiologist whose 1863 book, *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik* (*The Theory of the Sensations of Tone as a Foundation for Music Theory*) became the standard reference work on the scientific bases of music, up to this very day. Unfortunately, every essential assertion in Helmholtz's book has been proven to be false.

Helmholtz's basic fallacy—still taught in most music conservatories and universities today—was to claim that the scientific basis of music is to be found in the properties of vibrating, inert bodies, such as strings, tuning forks, pipes, and membranes. Helmholtz defined musical tones merely as periodic vibrations of the air. The fundamental musical tones, he claimed, are sine waves of various frequencies. Every other tone is merely a superposition of added-up sine waves, called "overtones" or "harmonics." The consonant musical intervals are determined by properties of the "overtone series" to be simple whole-number ratios of frequencies. Arguing from this standpoint, Helmholtz demanded that musicians give up well-tempering and return to a "natural tuning" of whole-number ratios; he even attacked the music of J.S. Bach and Beethoven for being "unnatural" on account of their frequent modulations.

Helmholtz based his theory of human hearing on the same fallacious assumptions. He claimed that the ear works as a passive resonator, analyzing each tone into its overtones by means of a system of tiny resonant bodies. Moreover, he insisted that the musical tonalities are all essentially identical, and that it makes no difference what fundamental pitch is chosen, except as an arbitrary convention or habit.

Helmholtz's entire theory amounts to what we today call in physics a "scalar," "linear," or at best, "quasi-linear" theory. Thus, Helmholtz assumed that all physical magnitudes, including musical tones, can at least implicitly be measured and represented in the same way as lengths along a straight line. But, we *know* that every important aspect of music, of the human voice, the human mind, and our universe as a whole, is characteristically *nonlinear*. Every physical or aesthetic theory based on the assumption of only linear or scalar magnitudes, is bound to be false.

A simple illustration should help clarify this point. Compare the measurement of lengths on a straight line with that of arcs on the circumference of a circle. A straight line has no intrinsic measure; before we can measure length, we must first choose some unit, some interval with which to compare any given segment. The choice of the unit of measurement, however, is purely arbitrary.

The circle, on the contrary, possesses by its very nature an intrinsic, *absolute* measure, namely one complete cycle of rotation. Each arc has an absolute value as an *angle,* and the regular self-divisions of the circle define certain specific angles and arcs in a lawful fashion (e.g., a right angle or the 120-degree angle subtended by the side of an equilateral triangle inscribed in the circle).

Just as the process of rotation, which creates the circle, imposes an absolute metric upon the circle, so also the process of creation of our universe determines an absolute value for every existence in the universe, including musical tones. Helmholtz refused to recognize the fact that our universe possesses a special kind of curvature, such that all magnitudes have absolute, geometrically determined values. This is why Helmholtz's theories are systematically wrong, not merely wrong by accident or through isolated errors. Straight-line measures are intrinsically fallacious in our universe.

For example, sound is not a vibration of the air. A sound wave, we know today, is an electromagnetic process involving the rapid assembly and disassembly of geometrical configurations of molecules. In modern physics, this kind of self-organizing process is known as a "soliton." Although much more detailed experimental work needs to be done, we know in principle that different frequencies of coherent solitons correspond to distinct geometries on the microscopic or quantum level of

organization of the process. This was already indicated by the work of Helmholtz's contemporary, Bernhard Riemann, who refuted most of the acoustic doctrines of Helmholtz in his 1859 paper on acoustical shock waves.[1]

Helmholtz's theory of hearing also turned out to be fallacious. The tiny resonators he postulated do not exist. The human ear is intrinsically nonlinear in its function, generating singularities at specific angles on the spiral chamber, corresponding to the perceived tone. This is an active process, akin to laser amplification, not just passive resonance. In fact, we know that the ear itself *generates* tones.

Moreover, as every competent musician knows, the simple sinusoidal signals produced by electronic circuits (such as the Hammond electronic organ) *do not* constitute musical tones. Prior to Helmholtz, it was generally understood that the *human singing voice,* and more specifically, the properly trained bel canto voice, is the standard of all musical tone. Historically, all musical instruments were designed and developed to imitate the human voice as closely as possible in its nonlinear characteristics.

The bel canto human voice is for sound what a laser is for light: The voice is an *acoustical laser,* generating the maximum density of electromagnetic singularities per unit action. It is this property which gives the bel canto voice its special penetrating characteristic, but also determines it as uniquely beautiful and uniquely musical. By contrast, electronic instruments typically produce Helmholtzian sine-wave tones, which are ugly, "dead," and unmusical exactly to the extent that they are incoherent and inefficient as electromagnetic processes.

The human voice defines the basis for musical tuning and, indeed, for all music. This was clearly understood long before Helmholtz, by the scientific current associated with Plato and St. Augustine, and including Nicolaus of Cusa, Leonardo da Vinci and his teacher Luca Pacioli, and Johannes Kepler. In fact, Helmholtz's book was a direct attack on the method of Leonardo da Vinci.

If Helmholtz's theories are wrong, and those of Plato through Kepler and Riemann have been proven correct—at least as far as these

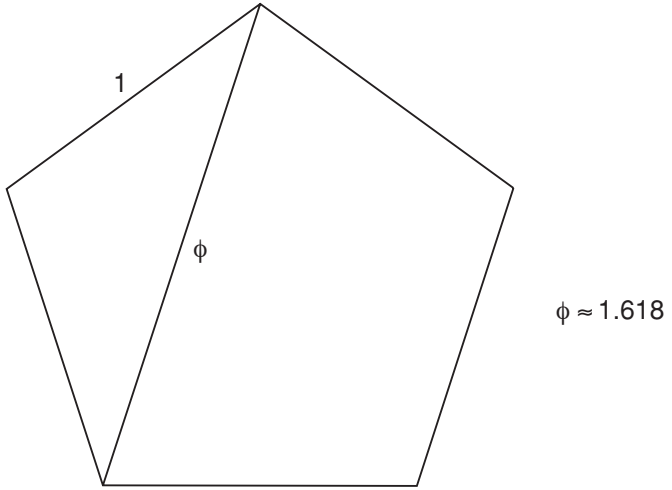

Figure 1.1 The Golden Section arises as the ratio between the side and the diagonal of a regular pentagon.

went—then what conclusions follow for the determination of musical pitch today? Let us briefly outline the compelling reasons for C=256 Hz as the only acceptable scientific tuning, which have emerged from a review of the classical work of Kepler *et al.* as well as modern scientific research.

The human voice, the basic instrument in music, is also a living process. Leonardo and Luca Pacioli demonstrated that all living processes are characterized by a very specific internal geometry, whose most direct visible manifestation is the morphological proportion of the Golden Section. In elementary geometry, the Golden Section arises as the ratio between the side and the diagonal of a regular pentagon (*Figure 1.1*). The Golden Section naturally forms what we call a self-similar geometric series—a growth process in which each stage forms a Golden Section ratio with the preceding one. Already before Leonardo da Vinci, Leonardo Pisano (also called Fibonacci) demonstrated that the growth of populations of living organisms always follows a series derived from the Golden Section. In extensive morphological studies, Leonardo da Vinci showed that the Golden Section is the essential characteristic of construction of *all* living forms. *Figure 1.2* illustrates the simplest Golden Section proportions of the human body. Since music is the

[1] Bernhard Riemann, "Über die Fortpflanzung flacher Luftschwingungen von endlicher Weite," in *Gesammelte mathematische Werke*, ed. H. Weber (Leipzig, 1876), pp. 145–164. English translation: "On the Propagation of Plane Air Waves of Finite Amplitude," *International Journal of Fusion Energy* (1980), Vol. 2, No. 3.

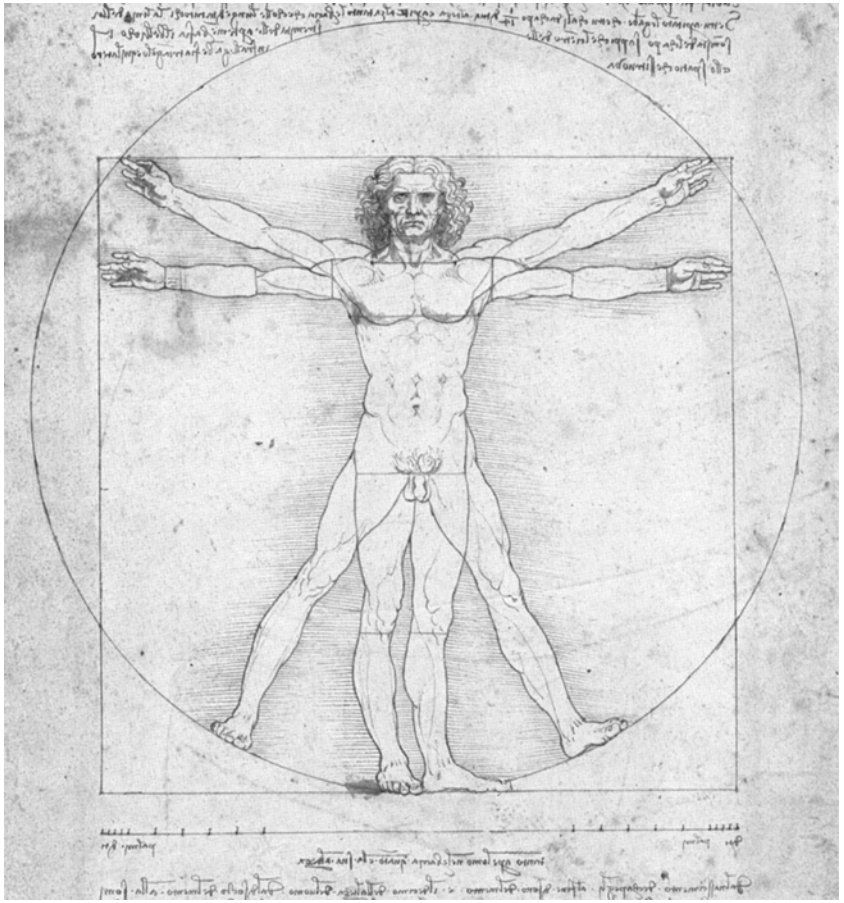

Figure 1.2 The famous Leonardo da Vinci drawing of the human body inscribed in a circle shows Golden Section proportions.

product of the human voice and human mind—i.e., of living processes—therefore, everything in music must be coherent with the Golden Section. This was emphatically the case for the development of Western music from the Italian Renaissance up through Bach, Mozart, and Beethoven.

The Classical well-tempered system is itself based on the Golden Section. This is very clearly illustrated with the following two series of tones, whose musical significance should be evident to any musician:

Figure 1.3 The differences in frequency-value between these these two basic series of musical intervals, are ordered according to the Golden Section.

C–E-flat–G–C, and C–E–F-sharp–G. In the first series, the differences of the frequencies between the successive tones form a self-similar series in the proportion of the Golden Section. The frequency differences of the second series decrease according to the Golden Section ratio (see *Figure 1.3*).

To understand the well-tempered system better, we must first examine the reason why certain specific proportions, especially the

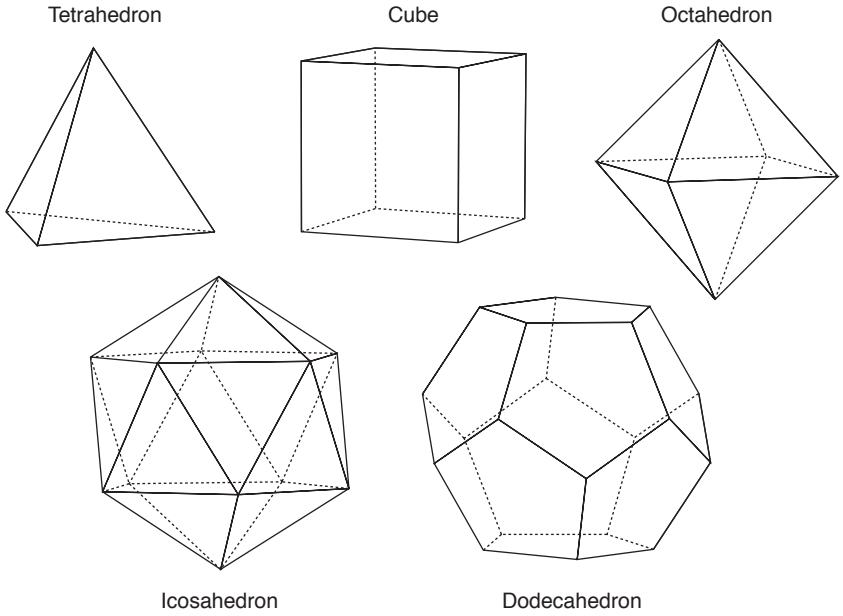

Figure 1.4 The five Platonic solids.

Golden Section, predominate in our universe, whereas others do not.

There is nothing mysterious or mystical about the appearance of the Golden Section as an "absolute value" for living processes. Space itself—that is, the visual space in which we perceive things—has a specific "shape" coherent with the Golden Section. For, space does not exist as an abstract entity independent of the physical universe, but is itself *created*. The geometry of space reflects the characteristic curvature underlying the process of generation of the universe as a whole. We know that space has a specific shape, because only five types of regular solids can be constructed in space: the tetrahedron, cube, octahedron, dodecahedron, and icosahedron (*Figure 1.4*). These five solids are uniquely determined characteristics of space. They are absolute values for all of physics, biology, and music. Indeed, Luca Pacioli emphasized that all the solids are derived from a single one, the dodecahedron, and that the latter is uniquely based upon the Golden Section. Hence, the Golden Section is the principal visual characteristic of the process of creation of the universe.

In his *Mysterium Cosmographicum,* Kepler provided further, decisive proof for Leonardo and Pacioli's method. He demonstrated that the morphology of the Solar System, including the proportions of the planetary orbits, is derived from the five regular solids and the Golden Section. *Figure 1.5* shows Kepler's famous construction of the planetary orbits through a nested series of concentric spheres whose spacing is determined by inscribed regular solids. Therefore, the Solar System has the same morphological characteristics as living organisms.

Kepler located the underlying reason for these morphological characteristics in the generating process of the universe itself, and this he attempted to identify with the help of what is called the *isoperimetric theorem*. This theorem states that among all closed curves having a given parameter, the circle is the unique curve which encloses the greatest area. Circular action is the maximally efficient form of action in visible space, and therefore coheres uniquely with the bel canto musical tone and the beam generated by a laser. Kepler reasoned that if circular action reflects uniquely the creative process of the universe, then the form of everything which exists—of atoms and molecules, of the Solar System, and the musical system—must be constructible using nothing but circular action.

By this procedure, called "synthetic geometry," we generate from the circle, by folding it upon itself (i.e., circular action applied to itself),

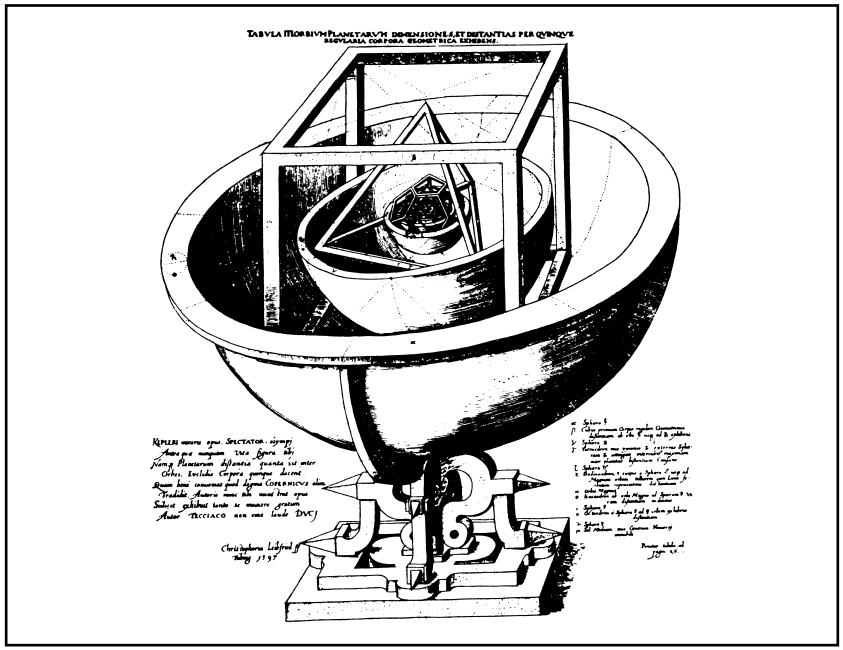

Figure 1.5 Kepler's construction of the planetary orbits by nesting the Platonic solids in spheres.

a straight line, the diameter. By folding again, we obtain a point, the center of the circle, as the intersection of two diameters, as in *Figure 1.6*. This alone creates for us the basic "elements" of plane geometry. Also, by rotating a circle we obtain the sphere (*Figure 1.7*).

Further constructions, using circular action alone, generate the regular polygons—the equilateral triangle, square, and pentagon—which form the faces of the five regular solids. From these uniquely determined polygons, Kepler derived the fundamental musical intervals of the fifth, fourth, and major third, *without any reference to overtones*. These polygons embody the principle of self-division of circular action by 3, 4, and 5. The octave, or division by 2, we already obtained as the very first result of folding the circle against itself. From division by 2, 3, 4, and 5 we obtain, following Kepler, the following values for the basic musical intervals: octave 1:2, fifth 2:3, fourth 3:4, major third 4:5.

Division by seven is invalid, Kepler argued, because the heptagon is not constructible from circular action alone, nor does it occur in any

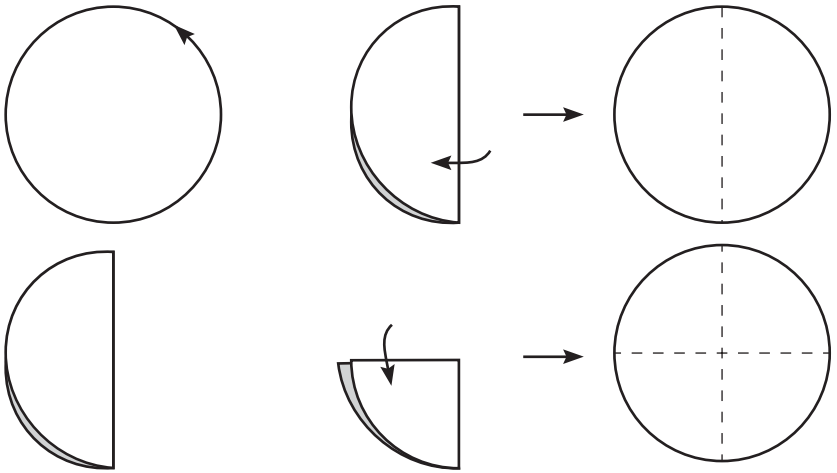

Figure 1.6 By the process called "synthetic geometry," we generate from the circle, by folding it upon itself, a straight line (the circle's diameter). Folding again, we generate a point, located at the center of the circle.

regular solid. Since Kepler's musical ratios are uniquely coherent with the regular solids, they are uniquely coherent with the Golden Section underlying those solids.

Kepler went on to demonstrate that the angular velocities of the planets as they move in their elliptical orbits around the Sun, are themselves proportioned according to the same ratios as the fundamental musical intervals (see *Table A* on p. xxiii). Since Kepler's time, similar relations have been demonstrated in the system of moons of various planets, and provisionally also even in the motion of spiral galaxies.

C=256 has a uniquely defined astronomical value, as a Keplerian interval in the Solar System. The period of one cycle of C=256 (1/256 of a second) can be constructed as follows. Take the period of one rotation of the Earth. Divide this period by 24 (= 2 × 3 × 4), to get one hour. Divide this by 60 (= 3 × 4 × 5) to get a minute, and again by 60 to obtain one second. Finally, divide that second by 256 (= 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2). These divisions are all Keplerian divisions derived by circular action alone. It is easy to verify, by following through the indicated series of divisions, that the rotation of the Earth is a "G," 24 octaves lower than C=256. Similarly, C=256 has a determinate value in terms of the complete system of planetary motions.

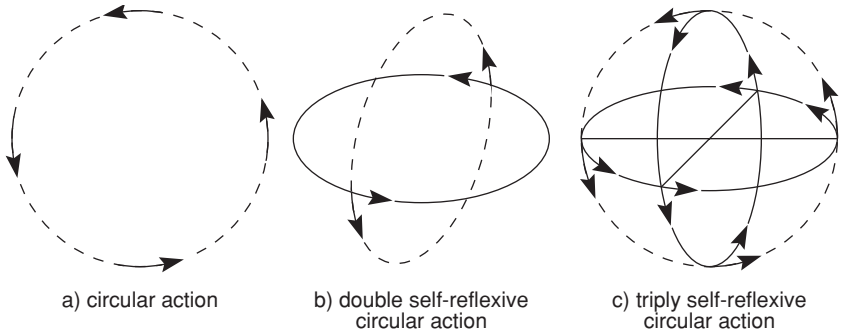

Figure 1.7 The generation of the sphere as the result of triply-connected circular action.

By contrast, A=440 is a purely arbitrary value, having no physical-geometrical justification. A=440 is an insane tuning in the rigorous sense that it bears no coherent relationship with the universe, with reality.

Today, we can add some essential points to this. Kepler's solution was absolutely rigorous, as far as it went; however, circular action is only an incomplete representation of creative action in the universe. The next great step was taken by Carl Friedrich Gauss at the beginning of the nineteenth century. Gauss introduced *conical spiral action,* instead of mere circular action, as the basis for synthetic geometry. Spiral action combines the isoperimetric principle of the circle with the principle of growth expressed by the Golden Section.

Let us demonstrate conical spiral action in the bel canto voice. Have a soprano sing a scale upward, starting at middle C (=256). As the frequency increases, so does the intensity of the sound produced. The more precise term for this intensity is "energy flux density." But this increase is not merely linear extension, not merely increase in scalar magnitude. As our singer sings upward, two important events occur. First, she must make a register shift, at F-sharp, in order to maintain the "isoperimetric," least-action form of bel canto tone. We shall return to the register shift in a moment. The second event occurs upon arrival at the octave, C=512. We hear very clearly, that *one cycle of action* has been completed, like a 360-degree rotation. This proves that there is a *rotational* component of action to increase the frequency or energy flux density. Again, Helmholtzian straight-line action does not exist.

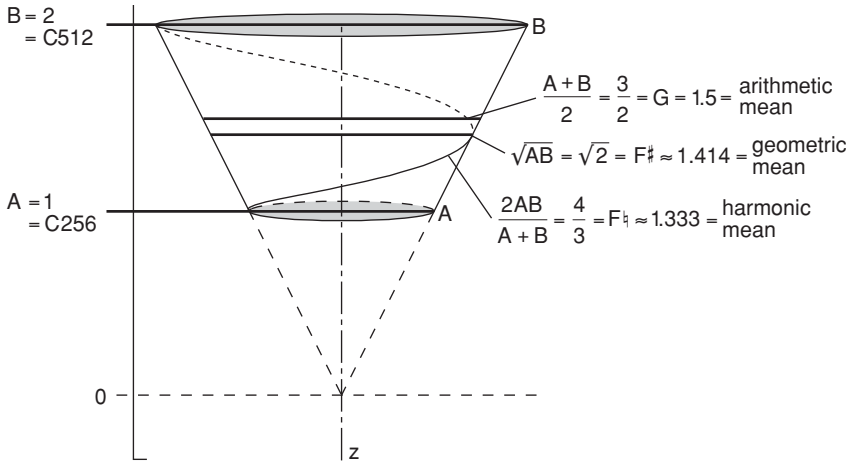

Figure 1.8 The octave corresponds to one full revolution of spiral action, while the fifth, diminished fifth, and fourth are respectively the arithmetic, geometric, and harmonic means.

The true geometry of the singer's action is therefore most simply represented by *spiral action upward on a cone*. In *Figure 1.8,* the cone's axis represents frequency. Each circular cross-section of the cone represents a bel canto musical tone. The spiral makes one complete rotation in passing from C=256 to C=512, and one more cycle would bring it from C=512 to the next higher octave, C=1024. Thus, the interval of an octave corresponds to one complete 360-degree cycle of conical spiral action.

Not only the octave, but all musical intervals correspond to specific angles on conical-spiral action. This is most clearly seen if we project our conical spiral onto a plane perpendicular to the axis (*Figure 1.9*). If we divide a full 360-degree rotation into 12 equal angles, then each such (30-degree) displacement corresponds to a semitone interval in frequency. The radial lengths defined by the spiral at the indicated 12 angles are exactly proportional to the frequencies of the equal-tempered musical scale. The interval of a fifth corresponds to rotation through 7/12 of the circle, or 210 degrees. The interval of a minor third corresponds to a right angle, and so forth.

(The equal-tempered system is only an approximation of a rigorous well-tempered system whose details have yet to be fully elaborated. Nevertheless, the indicated construction identifies the frequency regions

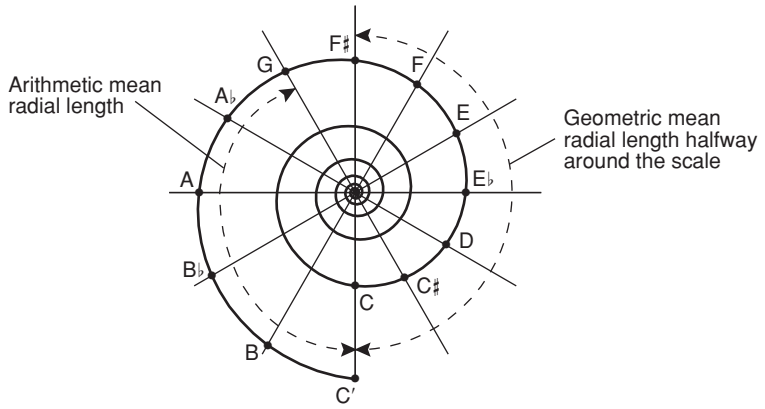

Figure 1.9 The self-similar conical spiral projected onto a plane, showing the intervals of the equal-tempered scale.

and angular displacements within which the well-tempered values are to be defined.)

Most important, the halfway point of the full cycle starting at C, is F-sharp, the diminished fifth from C, or the interval once known as the "devil's interval." In terms of geometrical proportion, this F-sharp is located as the *geometric mean* of C=256 and its octave, C=512.

If we carry out synthetic geometry constructions with conical spiral action, just as Kepler did with circular action, we discover wonderful things. For example, construct the characteristic of the conical volume bounded by the circles at C=256 and C=512, by slicing the cone diagonally across those two circles. The result is an ellipse. Project this ellipse onto the plane. The principal parameters of the resulting plane ellipse define exactly the frequency ratios for the most important division-points of the octave (*Figure 1.10*):

C=256 corresponds to the perihelion of the ellipse
C=512 corresponds to the aphelion
F corresponds to the semi-latus rectum
F-sharp corresponds to the semi-minor axis
G corresponds to the semi-major axis

At the same time, F, F-sharp, and G correspond to the harmonic,

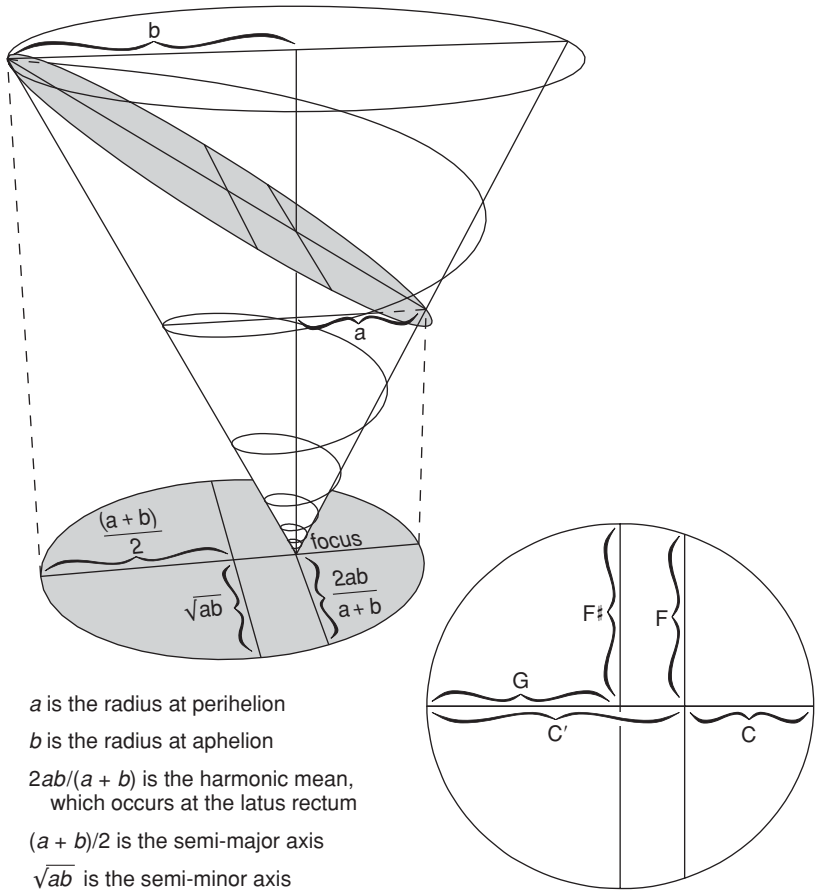

Figure 1.10 Projection of the ellipse formed by the circular cuts of the octave onto a plane, and the important division points of the ellipse.

geometric, and arithmetic means, respectively, of the octave. These three means formed the basis of classical Greek theories of architecture, perspective, and music. The same notes F, F-sharp, and G mark the principal division of the basic C-major scale. This scale consists of two congruent tetrachords: C–D–E–F and G–A–B–C. The dividing-tone is F-sharp.

Let us now return to our soprano. She makes the first register shift, from first to second register, exactly at this point of division. The first tetrachord, C–D–E–F, is sung in the first register, while G–A–B–C are sung in the second register. The register shift divides the scale exactly at the geometrical-mean or halfway point in the cycle of conical spiral action. The same process repeats in the next-higher octave, where the shift from second to third register of the soprano comes once again at F-sharp, the geometric mean.

The bel canto register shift is a physical event of fundamental importance, and not merely a technical question for the voice. In physical terms, the register shift constitutes a singularity, a nonlinear phase change comparable to the transformation from ice to water or water to steam. An even better comparison is to the biological process of cell division (mitosis). In every case, we see that in C=256 tuning, the region of this singularity coincides with the principal *geometrical division* of conical spiral action. (Here we take the soprano voice, for musical and developmental reasons, as the fundamental reference for the human voice in general.)

Our Solar System also makes a "register shift." It has long been noted that the inner planets (Mercury, Venus, Earth, and Mars) all share such common features as relatively small size, solid silico-metallic surface, few moons, and no rings. The outer planets (Jupiter, Saturn, Uranus, and Neptune) share a second, contrasting set of characteristics: large size, gaseous composition, many moons, and rings. The dividing-point between these two sharply contrasting "registers" is the asteroid belt, a ring-like system of tens of thousands of fragmentary bodies believed to have arisen from an exploded planet.

It is easy to verify that the Solar System register shift falls exactly in the same, geometric-mean position, as the shift of the soprano voice in the proper C=256 tuning. If we begin at the outer layer of the Sun, and construct a self-similar (logarithmic) spiral making exactly one rotation in passing from that layer to the orbit of the innermost planet, Mercury, then the continuation of that spiral will make exactly one full cycle in passing from Mercury to the region defined by the overlapping orbits of Neptune and Pluto (*Figure 1.11*). The halfway or geometric-mean point comes exactly at the outer boundary of the asteroid belt. More precisely, if we compare the planetary spiral with our simple spiral derivation of the equal-tempered system (Figure 1.9), letting the interval from Mercury to Neptune-Pluto correspond to the octave C–C, then the planetary orbits correspond exactly in angular displacements to the principal steps of the scale. The asteroid belt occupies exactly the angular position corresponding to the interval between F and F-sharp; this region

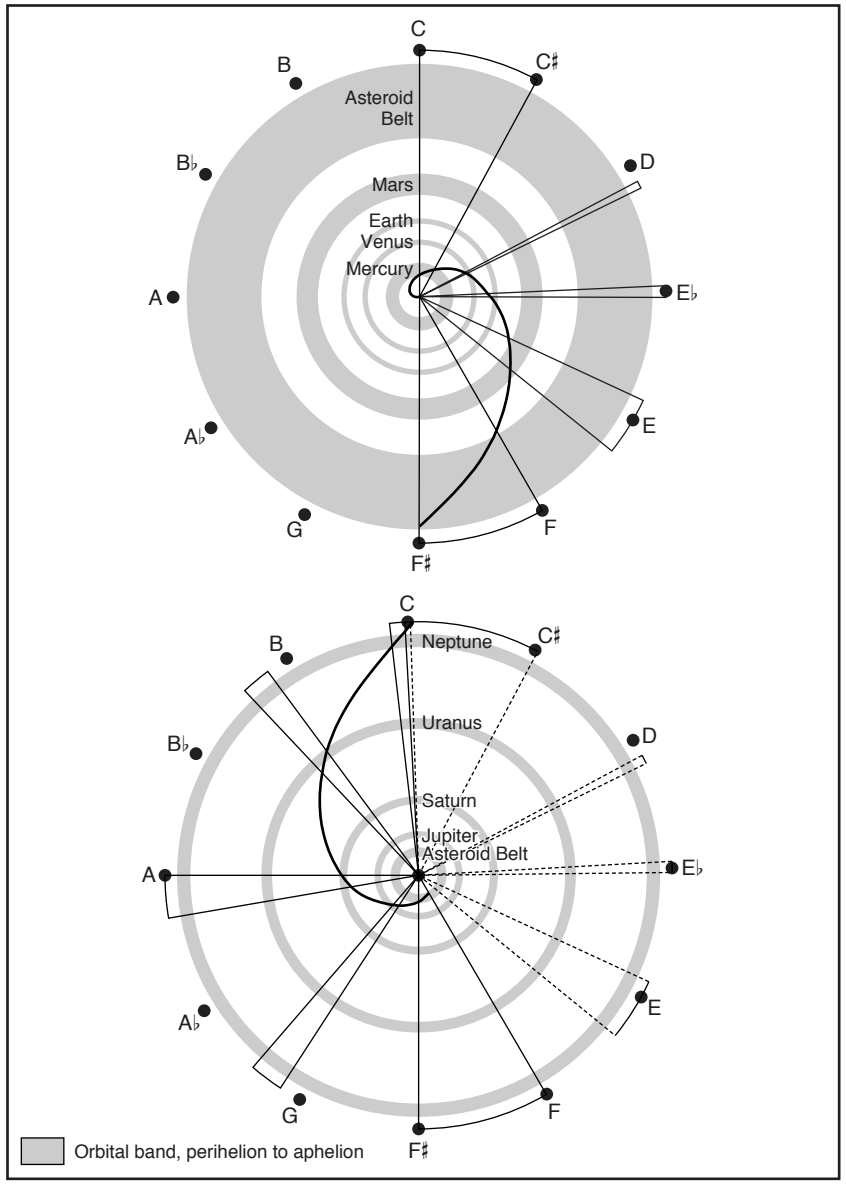

Figure 1.11 A self-similar spiral will make exactly one full cycle in passing from Mercury to the region defined by the overlapping orbits of Neptune and Pluto.

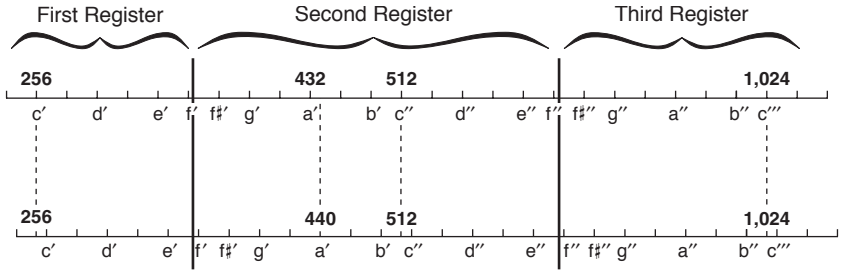

Figure 1.12 At A=432 or below (top scale), the register shift occurs between F and F-sharp; at A=440 or above (bottom scale), it is forced downward to between E and F.

is where the soprano makes the register-shift, in C=256 tuning. Thus, complete coherence obtains, with this tuning, between the human voice, the Solar System, the musical system, and the synthetic geometry of conical spiral action. (Recent work by the late Dr. Robert Moon and associates has extended this coherence to the "microcosm" of subatomic physics.)

Figure 1.12 illustrates what happens if the tuning is arbitrarily raised, from C=256 (corresponding to A between 427 and 432 Hz) to, for example, A=449. The soprano register shifts (at approximately 350 Hz and 700 Hz) lie, in the higher tuning, between E and F, rather than between F and F-sharp. This divides the octave in the wrong place, destroys the geometry of the musical system, destroys the agreement between music and the laws of the universe, and finally destroys the human voice itself.

If we arbitrarily changed the "tuning" of the Solar System in a similar way, it would explode and disintegrate! God does not make mistakes: Our Solar System functions very well with its proper tuning, which is uniquely coherent with C=256. This, therefore, is the only scientific tuning.

Music, Thought, and the Curvature of Space

Here we call attention to some additional important questions related to the problem of scientific tuning. But first let us restate the essence of the matter in fundamental terms.

Human knowledge concerning our universe divides itself generally into three domains. First, we have the domain of knowledge of what we call "inorganic" processes: the properties of electrons, atoms and molecules, light and gravity, and so forth. Second, we have the domain of knowledge of living processes, which includes medicine, biology, ecology, and so forth. And third, we have the domain of knowledge of the mental processes of human mind, and especially of those creative processes of thought which absolutely distinguish Man from the beasts. Music, of course, is a central feature of this third and highest domain.

If we examine the relationship of these three domains, the essential thing to realize is that *they all concern one and the same universe*. Thus, we *think* with this remarkable organ called the brain, which is a living process. Besides being living, the brain is also a physical process involving electrons, atoms, molecules, and electromagnetic radiation, organized in a special way. If you rightly reject "Cartesian dualism"—which is actually a form of paranoid schizophrenia—then you are obliged to consider the efficient, lawful connection which must exist between the three domains.

Not only is the human mind a physical process, but human thought processes have immediate, concrete effects upon the rest of the universe. As human society grows, as science and technology advances, the human mind becomes an ever more powerful *causal factor* in the physical universe. Indeed, the existence of the human mind is the single most important "experimental fact" in all of physics.

The professional physicist will tell you that there are certain basic parameters which underlie every process which occurs in the universe, no matter what it is. These include such things as the speed of light c, the Planck quantum of action h, the charge of the electron ε, the so-called fine structure constant α, and so forth. If any of these basic parameters were to change, then *everything* would change. For example, the propagation of sound involves interactions between air molecules which are complex quantum electromagnetic configurations, and thus involves all the fundamental parameters of physics.

However, this is a clumsy and somewhat misleading way to state it. In reality, the so-called fundamental parameters only reflect the fact that physical space-time has a certain *curvature*—an overall geometry—such that every process in the universe is shaped accordingly. The study of this question in mathematical physics goes back to Nicolaus of Cusa, and to the nineteenth-century work of Gauss, Riemann, and the Italian geometer Eugenio Beltrami, and has most recently been revived by Lyndon LaRouche and his scientific friends.

Of course, we do not see this curvature directly—that is the proper business of science to discover. But by way of a metaphor, think of drawing forms on the surface of a sphere: You can draw any form you want, but as long as it is drawn on the spherical surface, the form will be curved in a certain way, independent of its particular shape. It "inherits" the curvature of the sphere upon which it is drawn. The curvature of the universe is different from the static kind of curvature a sphere possesses, however, because the universe's curvature embraces space and time together. It shapes all *processes,* from those of human mind down through the domain of living organisms and the inorganic domain from astrophysics into the microscopic, subatomic level.

Since the creative powers of the human mind, as realized in scientific and technological progress, embody most directly the causal principle of the universe, it is the lawful characteristics of creative mentation which most clearly demonstrate the curvature of physical space-time.

An exciting implication of this, is that something congruent to creative mentation must pervade the whole universe, including the inorganic domain. This is called "negentropy."

This very sketchy discussion of curvature of physical space-time provides us with a most advantageous vantage-point for examining the problem of musical tuning. The fact that space-time is curved in a specific way imposes an absolute measure on all existences. We are not allowed to arbitrarily stretch the universe, as if it were made of chewing-gum.

Since music must embody and perfect the creative powers of the mind, while at the same time being organized as a physical process involving tones and propagation of sound, we must examine all three of the above-mentioned domains to adduce proof for tuning at C=256. It is only those invariant features which persist throughout the three

domains which can claim to cohere with the curvature of physical space-time.

This kind of unified approach is nothing new in and of itself. It is explicitly formulated, for example, in Plato's *Timaeus,* in St. Augustine's *De musica*, and later in the *World Harmony* of Johannes Kepler. It was also at the basis of the musical system of the High Sanskrit culture of India. The question of "tuning" implies how to organize human activity in accordance with the law—and we say now, space-time curvature—of the universe.

For example, Sanskrit culture considers the construction of the astronomically based calendar, the proper measurement of time, certain aspects of medicine, as well as the setting of proper vowel sounds and rhythms for the recitation of poetry, and the tuning of instruments, *all as a single problem.* The classical Indian astronomical treatise of *Aryabhata,* written around 500 A.D., defines the smaller units of time as *syllables and breaths* (*pranas*), and relates these units to the astronomical cycles of the year, the month and the day, as follows:

1 breath (*prana*) corresponds to 10 long syllables
1 *vinadika* = 6 breaths
1 *nadi* = 60 *vinadikas*
1 day = 60 *nadis*
1 month = 30 days
1 year = 12 months

If we calculate backwards, we find that the ancient Indian *prana* was 4 seconds in our time-scale. If we divide the Indian *prana* in half, ten successive times, we come to the period of oscillation corresponding to C=256. In other words, the frequency associated with breathing would be a C ten octaves lower than C=256.

A few historical remarks are in order here, on how C=256 was originally identified as the "scientific tuning."

The first explicit reference to the tuning of middle C at 256 oscillations per second was probably made by a contemporary of J.S. Bach. It was at that time that precise technical methods developed making it possible to determine the exact pitch of a given note in cycles per second. The first person said to have accomplished this was Joseph Sauveur (1653–1716), called the father of musical acoustics. He measured the pitches of organ pipes and vibrating strings, and defined the "ut" (nowadays known as "do") of the musical scale at 256 cycles per second. J.S. Bach, as is well known, was an expert in organ construction and master of acoustics, and was in constant contact with instrument builders, scientists, and musicians all over Europe. So we can safely assume that he was familiar with Sauveur's work. In the time of Beethoven the leading acoustician was Ernst Chladni (1756–1827), whose textbook on the theory of music explicitly defined C=256 as the scientific tuning.

From the seventeenth through nineteenth centuries, and in fact into the 1940s, all standard U.S. and European textbooks on physics, sound, and music, Helmholtz included, took as a given the "physical pitch" or "scientific pitch" of C=256. *Figures 1.13* and *1.14* show pages from two standard modern American textbooks, a 1931 standard phonetics text, and the official 1944 physics manual of the U.S. War Department, which begin with the standard definition of musical pitch as at C=256.

Regarding composers, all "early music" scholars agree that Mozart tuned at C=256, since his A was in the range of A=427–430. During the 1980s, directors of original-instrument orchestras such as Christopher Hogwood, Roger Norrington, and others established the practice of recording all Mozart works, as well as most of Beethoven's symphonies and piano concertos, at precisely A=430. Their reasoning for doing so was pragmatic: German instruments of the period 1780–1827, and even replicas of those instruments, can only be tuned at A=430.

Czar Alexander's introduction of high-pitched brass instruments into Austria at the 1815 Congress of Vienna, kicked off a demand from all the crowned heads of Europe, for the "brighter" sound produced by the higher pitch. While Classical musicians resisted, protagonists of the Romantic school, led by Franz Liszt and his son-in-law Richard Wagner, championed the higher pitch during the 1830s and 1840s. Wagner had the bassoon and many other instruments redesigned so as to be able to play only at A=440 and above. By 1850, chaos reigned, with major European theaters working at pitches varying from A=420, to A=460 and higher at Venice.

In the late 1850s, the French government, under the influence of a committee of composers led by bel canto proponent Gioacchino Rossini, called for the first standardization of the pitch in modern times. France consequently passed a law in 1859 establishing A at 435 Hz, the lowest of the ranges of pitches (from A=434 to A=456) then in common use in France. It was this French A to which Verdi later referred, in objecting to higher tunings then prevalent in Italy, under which circumstance "we call A in Rome, which is B-flat in Paris."

SPEECH AND VOICE

With X-Rays of
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BY

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DIRECTOR OF PHONETICS LABORATORIES
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NEW YORK
THE MACMILLAN COMPANY
1931

CHAPTER IV

EXPLANATION OF SOME TERMS

"We often disagree merely because we fail to understand each other's terms alike."

Standard of Pitch. In this book where other authors are quoted, the standard of musical pitch used by them is often retained. On the other hand, where a comparison of two authors is necessary the pitches cited by one are sometimes converted, so that the two may be made to talk in exactly the same terms. Thus D. C. Miller prefers the tempered scale or so-called "International Pitch" where A = 435 and Middle C = 258.65; but Sir Richard Paget, and other scientific investigators cited in this work, generally use the "Physical" or "Scientific" pitch where A = 430 and Middle C = 256. Where the two are compared, the figures of the one are reduced to the norm used by the other.

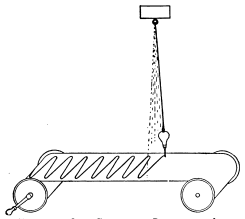

FIG. 3. — ONE COMPLETE SWING = 1 d.v.

Physical Pitch Used. In general, in this study itself, where nothing else is specified, "Physical Pitch" is used. For practical purposes, however, there is little difference between the two standards. Both were fixed on norms determined by Koenig, the Paris scientist and scientific instrument manufacturer who played such an important part in phonetic studies along about the middle of the last century.

Double Vibrations per Second = Pitch. Herein we usually use the term "d.v./sec." (double vibrations per second) in order to designate the frequency of a sound wave, or in other words, the pitch of a sound. We

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Figure 1.13 G. Oscar Russell's 1931 book on phonetics used as its point of reference the "physical pitch" of C=256, as opposed to the reigning pre-World War II "international pitch" of A=435.

PHYSICS

COURSE 2

HEAT, SOUND, AND LIGHT

Adapted from Modern Physics by
Charles E. Dull

TEXTBOOK

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VII

Sound — Music

19. WHAT ARE THE QUALITIES OF MUSIC?

What is standard pitch? Strike the note middle C on any average, well tuned piano and it gives 256 vibrations per second. Likewise the middle C tuning forks that are used in all physical laboratories are all tuned to 256 vibrations per second. This gives the note A 427 vibrations per second. (See Fig. 19–1.) The other notes of the scale vibrate according to a fixed ratio, like that shown in the diagram. In *concert* pitch, which is now little used, middle C has 271 vibrations per second. *International* pitch differs slightly from that used by physicists since A equals 435 vibrations per second on the International scale. With the pitch adopted by the American Federation of Musicians, A has 440 vibrations per second. Sopranos find it difficult to sing music written by Handel and his contemporaries when accompanied by instruments tuned to the pitch adopted by the American Federation of Musicians.

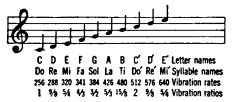

FIG. 19–1. The major diatonic scale. Key of C.

How do noise and music differ? Many siren discs, such as that shown in Fig. 17–2, have four rows of evenly spaced holes, and one row of holes that are irregularly spaced. If a blast of air is forced through any one of the regularly spaced holes, a *musical note* is produced. If air is forced through the irregularly spaced holes, a *jarring noise* is produced. In music, the pulses reach the ear in rather regular succession. Striking the desk with a stick,

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Figure 1.14 The 1944 Manual of the U.S. Army insists on C=256 as the standard pitch, and notes that "sopranos find it difficult to sing music written by Handel and his contemporaries when accompanied by instruments tuned to the [A=440] pitch adopted by the American Federation of Musicians."

Following Verdi's 1884 efforts to institutionalize A=432 in Italy, a British-dominated conference held in Vienna in 1885 ruled that no such pitch could be standardized. The French, the New York Metropolitan Opera, and many theaters in Europe and the United States continued to maintain their A at 432-435, until World War II.

The first effort to institutionalize A=440 was a conference organized in 1939 by Nazi Propaganda Minister Josef Goebbels, who had standardized A=440 as the official Nazi German pitch. Professor Robert Dussaut of the National Conservatory of Paris told the French press that, "by September 1938, the Acoustic Committee of Radio Berlin requested the British Standard Association to organize in London a congress to adopt internationally the German Radio tuning of 440 periods. The congress was held in London, a very short time before the War, in May–June 1939. No French composer was invited. The decision to raise the pitch was thus taken without consulting French musicians, and against their will." The outbreak of war between England and Germany soon thereafter voided the Anglo-German agreement, with the result that A=440 still did not stick as a standard pitch.

A second congress of the International Standardizing Organization convened in London in October 1953, to again attempt to impose A=440 internationally. This conference passed such a resolution; but again, no continental musicians who opposed the rise in pitch were invited, and the resolution was widely ignored. Professor Dussaut of the Paris Conservatory wrote that British instrument makers catering to the U.S. jazz trade, which played at A=440 and above, had demanded the higher pitch, "and it is shocking to me that our orchestra members and singers should thus be dependent upon jazz players." A referendum was held by Professor Dussaut in which 23,000 French musicians voted overwhelmingly for A=432.

As recently as 1971, the European Community passed a recommendation calling for the still non-existent international pitch standard, according to "The Pitch Game," in *Time Magazine,* August 9, 1971. The article reported that A=440, "this supposedly international standard, is widely ignored." Lower tuning is common, including in Moscow, *Time* reported, "where orchestras revel in a plushy, warm tone achieved by a larynx-relaxing A=435 cycles," and at a performance in London "a few years ago," British church organs were still tuned a half-tone lower, about A=425, than the visiting Vienna Philharmonic at A=450.

We find further confirmation of C=256 in the other domains of human knowledge referred to above. First, psychologists have long identified the frequency of 16 cycles per second (4 octaves above the "seconds pendulum," and 4 octaves below C=256) as a very important psychophysiological threshold, called the "flicker frequency." It is at this frequency that the mind begins to integrate a series of repeated stimuli (such as flashes of light or sound pulses) into a continuous *gestalt*. Most likely this "flicker frequency" is related to the characteristic frequency ranges of the brain waves (alpha: 8 Hz and higher; theta: 4–8 Hz).

Second, a recent study of the "tuning" of living cells[2] in the field of optical biophysics has revealed that living tissue emits and absorbs electromagnetic radiation at a series of specific frequencies or wavelengths. It turns out that the most important of these frequencies can be arranged in an ordering very similar to the musical scale, but 42 octaves higher (see *Figure 1.15*).

Perhaps the most important single frequency is that associated with the main absorption band of DNA, the key substance in all living processes. This band corresponds to wavelengths of between 263 and 269 nanometers (a nanometer is one-billionth of a meter). The center frequency of this band (corresponding to 265 nm) is 1.1283×10^{15} cycles per second, which is exactly 42 octaves above the frequency 256.54 cycles per second. Thus, the key biological molecule is tuned very precisely to C=256.

A further, most striking piece of evidence comes from nuclear physics. Already Gottfried Leibniz in the seventeenth century insisted that there is no such thing as passive, inert matter, but that all matter is merely a phenomenon associated with *action*. Much later, in the 1920s, Louis DeBroglie and other physicists completed the demonstration that the particles of matter such as electrons, protons, neutrons, and atomic nuclei are all associated with very high-frequency oscillations. In other words, we could say that these entities are constantly being maintained by processes "tuned" to particular frequencies. The DeBroglie frequency for the proton is 2.26876×10^{23} Hz, which corresponds nearly exactly to the "G" in the 69th octave above middle C=256 Hz. (The difference between the proton's "G" and the G defined by equal tempering in C=256 is less than the 28th part of a semitone.) The frequency of the neutron is very slightly higher, by the 40th part of a semitone. This means that the

[2] Warren J. Hamerman, "The Musicality of Living Processes," *21st Century Science & Technology,* Vol. 2, No. 2, March–April 1989.

Figure 1.15 The Musical Scale and the Biological Spectra

Mitogenic radiation	42 octaves + F-341 Hz (200 nanometers)
Pure protein alpha helix	42 octaves + E-326 Hz (208 nanometers)
DNA	*42 octaves + C-256 Hz* *(265 nanometers)*
Protein complex	42 octaves + B-243 Hz (280 nanometers)
Vision (lower bound)	42 octaves + G-188 Hz (360 nanometers)
Register shift between ultraviolet and visible F–F-sharp	
Chlorophyll-*a*	42 octaves + E-158 Hz (430 nanometers)
Carotene	42 octaves + D-141.5 Hz (481 nanometers)
Photosynthesis action spectra	42 octaves + C-128 Hz (536 nanometers)
Vision peak	42 octaves + B-122 Hz (560 nanometers)
Cytochrome	42 octaves + B-flat-114 Hz (595 nanometers)
Chlorophyll-*a*	42 octaves + A-flat-102.25 Hz (660 nanometers)
Bacteria photosynthesis center 1	42 octaves + G-94 Hz (720 nanometers)
Register shift between visible and infrared F–F-sharp	
Bacteria photosynthesis center 2	42 octaves + E-80 Hz (850 nanometers)
Bacteria photosynthesis center 3	42 octaves + E-flat-75.5 Hz (900 nanometers)
Biosphere maximum radiation	42 octaves + C-64 (1,072 nanometers)

Taking the main spectral absorption frequency of DNA as "biological middle C" lying 42 octaves above C=256, the key moments of biological processes range from F above "biological middle C," to two octaves below (40 octaves above C=256). All values are precise musical tones in cycles per second (Hz) plus 42 octaves. The initial experimental values in wavelengths are given in parentheses. Source: Warren J. Hamerman, "The Musicality of Living Processes," *21st Century Science & Technology*, March-April, 1989, p. 34. Reprinted by permission.

DeBroglie frequencies of the nuclei of the chemical elements are all very nearly integral multiples of the proton frequency (and the frequency of the hydrogen atom), which is tuned to G in the C=256 tuning.

The other crucial "elementary particle," the electron, corresponds nearly exactly to the "A" in the 58th octave above middle C (differing by less than the tenth part of a semitone from the equal-tempered value). The French physicist Joel Sternheimer has shown that the masses of the so-called elementary particles are organized closely in accordance with the musical scale. This holds, however, only in the tuning C=256, not in A=440. (The nominal difference between these two tunings is somewhat less than half a semitone, far bigger than either the differences between the DNA, proton, and electron frequencies and the equal-tempered values, or the differences between equal-tempered and the Keplerian scale values. The actual discrepancy between the A=440 and C=256 tunings, on the proper nonlinear metric as opposed to the nominal arithmetic one, is qualitatively larger; in demonstrations of the two tunings this difference is commonly heard as an entire semitone.)

Lest this appear to be mere "numerology," let us emphasize the following: Such basic parameters as the fundamental frequency of DNA and the DeBroglie frequencies of the proton, neutron, and electron on the one hand, and the astronomical cycles on the other, all reflect the curvature of physical space-time. Furthermore, if we examine the physics of generation and propagation of the bel canto musical tone, we find that (1) the singer as a living organism is "tuned" in accordance with the DNA in all of his or her cells, and (2) the DeBroglie frequencies are embedded everywhere in the singer and in the air through which sound propagates, as a central feature of the way in which physical action is organized through electrons, protons, and neutrons which constitute singularities of matter. To escape C=256, we would literally have to banish ourselves from the universe!

As noted above, it is the coincidence of this astronomically defined value of the C octave series with a register shift of the bel canto soprano voice where it should be—namely between F and F-sharp in that tuning—which is the main basis for regarding C=256 as the scientific tuning. The bel canto register shift is defined not by mere physiological requirements of the voice, but also by the criterion of *beauty* which derives from the creative faculties of the human mind.

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PART

II

THE HUMAN SINGING VOICE

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CHAPTER 2

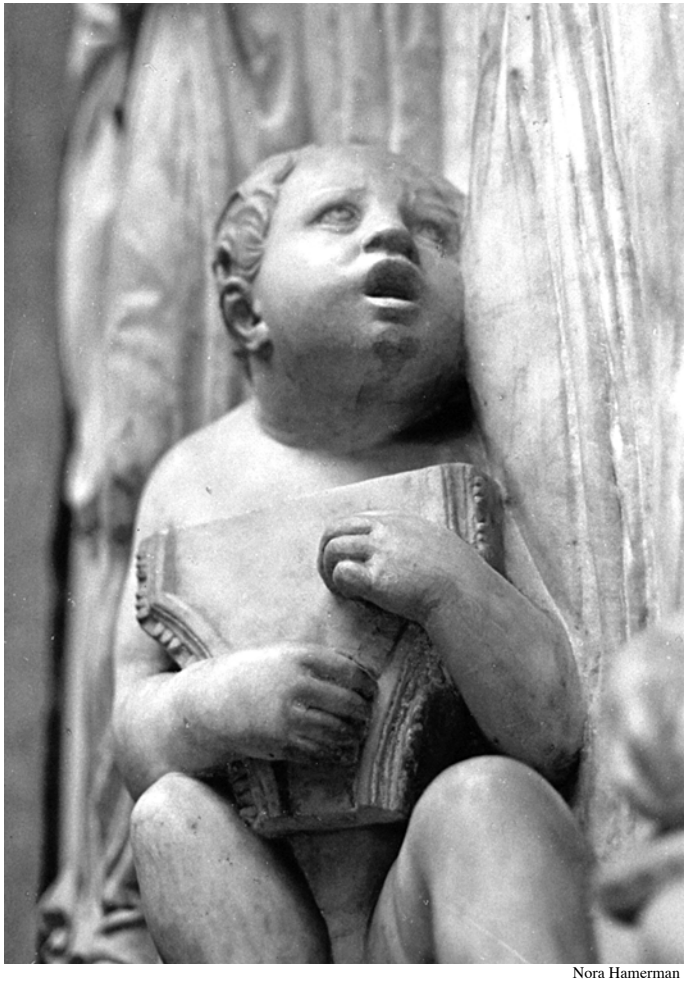
The Six Species of Singing Voice

This chapter catalogues known standards for the ranges and variety of internal qualities of each species of singing voice. In the properly trained adult singing voice, the range of each *species* of voice (soprano, tenor, and so forth) is divided into sub-ranges, or *registers,* each of a different quality than in the preceding and following register. A chart of the registers of each of the six voice species can be found on the inside front cover of this volume. The values shown in that chart reflect the natural ordering of the physical universe (and of the human singing mechanism as well), and therefore represent the registration to be followed in the classical bel canto training of singing voices (see Chapter 9). Other voice-training methods, especially those popularized since the early part of the twentieth century, shift the emphasis from a naturally determined registration, to a notion of "resonance," with imprecise register shifts.

All children, from the time they can speak, begin with a universal species of voice, the soprano voice. The large majority of children continue as sopranos until some time before puberty (see Chapter 3), at which point the voices of some children develop into mezzosopranos. The precise timing of these changes varies with the individual child. But regardless of the timing of these changes, the experience of being able to sing as a soprano is universal for young human beings during their earliest years, when learning to speak is, in the best of situations, combined spontaneously with learning to sing.

The fact that today, the child soprano may not appear to be the universal voice, is one of the unfortunate consequences of an electronic media culture which bombards even young children with vocal models of adult females who speak and sing in the lowest notes of their range, and adult males who speak and sing in a "falsetto" voice in the highest notes of their range—which turn out to be the same notes, roughly the two or three tones above and below middle C. The message imprints upon the modern child's ear an image of the very part of his own vocal range which is the *least natural* to his or her soprano voice.

FIGURE 2.1 Luca della Robbia, Toddler Playing Harp and Singing Bel Canto, Marble Relief



Nora Hamerman

This sculpture of a singing and harp-playing toddler, made for the Cathedral of Florence, demonstrates that Italian Renaissance music of the early 1400s took as its point of departure, the ideal of a universal standard of training children to sing (see Figure 2.3 and front cover). The 1436 completion of the dome of the Cathedral of Florence by the great architect Filippo Brunelleschi confirmed the hegemony of the Florentine

Renaissance world outlook. Brunelleschi had solved the staggering technical challenges of vaulting the huge space of the dome, by applying the principles of advanced geometry, in particular by adapting older Roman techniques appropriate to the construction of a spherical dome, to the much more difficult problem of raising a curved ellipsoidal dome over an octagonal base.

A similar principle of ellipsoidal action appears to have been discovered for singing. The Cantoria (choir loft) of the Cathedral portrays children between approximately the ages of two to 14, singing and playing the musical instruments described in Psalm 150. The sculptor of this relief, Luca della Robbia, was Brunelleschi's principal protégé after 1430, and his reliefs, now in the Cathedral Works Museum, were commissioned as part of the project to complete the Cathedral.

The evidence of the choir loft sculptures suggests the following program, at least as an ideal for that society: Singers were trained to sing *in childhood* for seven to ten years, starting from the age of two to five, and continuing to the age of 13 to 15 (onset of puberty). They were trained in church choral polyphony, and the mode of singing corresponded to what we now call bel canto. Although in an earlier era, adult men sang the upper polyphonic line ("soprano") against the "tenor," apparently by making use of a highly trained falsetto voice which was not usually required to sing any higher than a C or D above middle C, it was the introduction of boy sopranos that allowed for a far richer and more flexible development of the soprano line. To this day, vocal pedagogues at the world's few remaining bel canto children's choirs affirm that almost all children, at least until the age of 10–11, must be trained as sopranos for optimum lifetime vocal development.

Figure 2.2 Jan van Eyck, Singing Angels, Panel from the "Ghent Altarpiece," Ghent, 1426–32

Franco-Flemish master composers such as Dufay, Ockeghem, and later Josquin des Prez, were brought to Italy in the fifteenth century to help stimulate the development of polyphonic music in the peninsula.

These masters were the product of an educational system based the training children to sing at an early age; they were instructed to sing plainchant, and especially highly ornamented ("florid") polyphony in the cathedral schools, which were an an integral feature of the great Gothic cathedrals in northern France, the Low Countries (Flanders), and the Rhineland beginning in the twelfth century.

At the time when Della Robbia carved the Florentine choir loft, the leading northern composer, Guillaume Dufay, who had been trained in the Cathedral School of Cambrai, was in Florence attached the papal court. Dufay imported northern European choirboys to perform his compositions, such as *Nuper rosarum flores,* a motet specially composed for the dedication of Brunelleschi's dome. It is possible that Luca's choir loft actually depicts such celebrated French and Flemish youths, who were learning the newly developed Florentine vocal technique.[1]

This panel depicting an angel choir from the famous "Ghent Altarpiece" by Jan Van Eyck, completed in 1432, may be taken as a realistic depiction of the vocal technique applied in northern Europe in the same period as Luca's Cantoria. The angels' faces, which appear to correspond to adolescent choristers aged about 12–16, are portrayed by Van Eyck is if making an intense effort to "nasalize" the voice, i.e., to place it in the resonant cavities of the head, as seen in the slight frown which Van Eyck must have observed from living models. This method of placement, an absolute necessity for singing often unaccompanied music for sustained periods of time without becoming hoarse, was mentioned by Geoffrey Chaucer in connection with liturgical music, when in his *Canterbury Tales* he described the nun as "singing prettily in the nose." It is the efforts to "nasalize" upon which the singers focus, not the shape of the mouth. While two of the angels open their mouths in a way that approximates the Florentine "round sound" of Luca della Robbia, all of the rest show a tighter, more horizontal opening of the lips, such that the vowels being sung range from the Italian and Latin /e/ to /i/ (see Chapter 9).

[1] Major Flemish contrapuntalists participating in the Florentine Golden Renaissance included Guillaume Dufay (ca. 1400–74), Josquin des Prez (ca. 1440–1521), Johannes Ockeghem (ca. 1430–95), Heinrich Isaac (1450–1517), and Jacob Obrecht (1452–1500).

FIGURE 2.3 Luca della Robbia, Five-year-old Children Singing Bel Canto, Marble Relief

Nora Hamerman

Florentine humanists in the circles of Brunelleschi and their Flemish collaborators such as Dufay improved and expanded the pedagogy of bel canto. Della Robbia's reliefs are among the first in art history in which the singers portrayed are not angels, but human children.

It is in Florence, during the 1430s, that the concept of the "round sound," central to what later became called bel canto, is seen for the first time as the polemical focus of art. The numerous singing children in the ten Della Robbia reliefs all open their mouths in the relaxed, yet rounded open position characteristic of the Italian vowel /ɔ/, such that any note has a component of this round /ɔ/ regardless of the word being sung. It is evident that the boys portrayed here had been deliberately taught this egg-shaped or ellipsoidal form as the right way to sing, countering the "natural" tendency of children to shout, i.e., to sing on the neutral vowel /a/ as in "ma-ma," a tendency to which any experienced children's choir director will attest. The "O"-shaped opening of the lips in Della Robbia's young singers is particularly remarkable because, according to the Latin inscriptions from Psalm 150, which are placed above each panel to

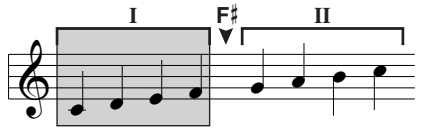
identify the music contained in it, they are actually singing "alleluia," a word which contains no /o/ vowels.

The significance of Della Robbia's mute treatise on vocal technique was underlined in the earliest full biography of Luca Della Robbia, written in Giorgio Vasari's *Lives of the Artists* in 1550. The Florentine art historian remarked on the extraordinary realism of the choirboys, and drew attention to Luca's skill in showing "how the throat swells in singing."[2]

Sculptures such as this of five-year-olds singing, or of the infant in Figure 2.1, cannot happen in a culture, unless the singing method depicted is well-developed, and being demonstrated to the viewing population. The Renaissance viewer was even able to determine which note was being sung, by the relative size of the mouth opening. The composers and other founders of the Renaissance such as Brunelleschi, his student della Robbia, and della Robbia's student Leonardo da Vinci, were deliberately creating a new culture in Florence, whose core was this new education system.[3]

If a child sings regularly, in a bel canto mode, during the pre-puberty period for seven to ten years, this will strengthen and develop the vocal apparatus of the child in a manner that is almost unimaginable today, and will lead to its realization not merely in the form of great performance, but in musical composition. The music of the period assumes an audience itself trained, or potentially trained, to sing such music. The standard of what the human voice will do, is based on that kind of background, which was typical not only of adult soloists, but of the educated population as a whole. The standard of what the human mind can hear is based on that kind of training, based on the assumption that the audience had ears trained to resonate such music.

Figure 2.4 The Child's Universal Division of the C Octave



Thus, in creating modern classical music, the Florentine masters set a standard for music upon a *universal*. Since every child has a voice, they based music upon that universal standard. *The basic scale upon "ut" or C was created to serve this reality*. An eight-note scale was eventually developed, which would be divided in precisely half, by the major *register shift* of the childhood soprano voice.

It was well known by the time of the Italian Renaissance that childrens' voices develop best if trained specifically to shift from the lowest or "first" register, to the following "second" register, at F-sharp, by means of making a "rounder" sound. The knowledge that the soprano's register shift divides the C–C octave precisely in half, is reflected most clearly in the compositions dating from that time forward (see Figures 3.3–3.7). This understanding shines forth in such works, despite the fact that it was not until two centuries later that the written system of hexachords or six-note scales, which dated back to the ninth century (see Figure 9.16), was formally supplanted by the eight-note scale spanning the entire octave.

[2] Vasari, Giorgio, *Le Vite degli Artisti* (1568) (Ed. Milanesi di Sansoni, 1906), the earliest art historian of the Renaissance.

[3] The standard claim that bel canto technique did not develop until 200 years later, in the seventeenth century, when it was developed by the *castrati* of Venice and Naples, is a self-serving concoction popularized by the unfortunate castrato authors of most seventeenth-century singing texts, such as *Practical Reflections on Figured Singing* (1776) by Giambattist Mancini (1716–1800). See Henry Pleasants, *The Great Singers,* New York: Simon and Schuster, 1966, pp. 37–51, especially pp. 39 and 48.

The practice of castrating young boys to form eunuch choirs was imported to the West from the Byzantine Empire, and did not begin until 1537, one hundred years after the Florentine Renaissance of the 1430s. It was nothing but an attempt to preserve forever, in a tragically unnatural way, the boy soprano voice. In Italy, castration was harsh proof that the beauty of the training and development of the childhood soprano voice to its maximum potential in the Florentine Renaissance was highly prized. But the claim by seventeenth-century castrato writers, that the castrato's vocal prowess was the product of the knife, and not of seven to ten years of intensive childhood training before the onset of puberty, is patently absurd. That claim is still raised today by Venetian and British authors, as a device to explain away the decline of bel canto as an "unavoidable by-product of progress" in the nineteenth century, when castration was abolished.

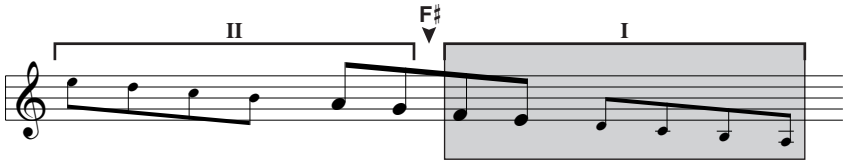
Castrato opposition to the Florentine tradition of using the round sound based upon the vowel /o/ was particularly intense, and castrato-authored texts frequently put forward the unsubstantiated claim that the unrounded vowel /a/ had always been the training vowel of choice in the Renaissance. E.g., Mancini (*op. cit.*) writes: "On the position of the mouth . . . others believe that they open the mouth correctly to give it a round form [/o/]. This monstrous position produces the monstrous effect. . . . [I]t makes the youth sing viciously in the nose. . . . Every singer should position his mouth as he positions it when he smiles naturally [/a/]."

Those compositions demonstrate conclusively that by at least the time of the Florentine Renaissance, an octave scale was fully developed to be divided in half, by the optimal F-sharp childhood register shift, and therefore based upon the pitch known today as C=256. The population learned the universal vocabulary of the scale as four notes in the lower register, and four notes shifted into the higher register.

There is no other explanation yet given for why C is known as "middle C," or why its scale is known as the basic key of Western music. The study of the human voice is thus a case study in human biology, ontology, and psychology, and demonstrates a major distinction of human beings from the animals.

Untrained childrens' voices may make first-to-second register shift over a wide area (see Chapter 3). Many, especially if unused to singing, do not shift spontaneously at F-sharp, any more than untrained children spontaneously read or write. Yet as a result of not making this shift, many children endeavoring to sing notes above F-sharp will experience very perplexing problems in intonation, or even in producing the voice at all. It was found that singers trained to shift from the lowest register to the center register as children, acquire voices with the most beauty, flexibility, and longevity.

FIGURE 2.5 Greek Tetrachord and Soprano Registers



Evidence from antiquity suggests long efforts to develop a scale around this basic human biological reality. The distinct human voice registers, and the desirabilty of basing the musical scale upon them, were already known during the Greek Classical period. Aristides Quintilianus (floruit ca. 330 B.C.), writer of one the only remaining fragments on Greek music, reported that in the Aeolian system, the most popular Greek musical scale, there was a central tetrachord A–G–F–E descending from the A above middle C, shown here in larger notes. The soprano F-sharp register shift divides this central tetrachord precisely in half.[4] Thus, the admittedly fragmentary evidence concerning Greek music indicates that it must have had the potential for the resolution of a musical idea from the second to the first register. The other notes of the Aeolian system were obtained by adding an equal number of tones above and below this central tetrachord, maintaining the F-sharp precisely in the center of the system.

The primacy of human vocal registers has been so well known for so long, that it is absurd to claim, as do many twentieth-century singing texts and schools, that voice registers do not exist, or that they exist only vaguely as a fault of the voice, to be homogenized in training. Aristides reports that there are "three regions" of the voice, each associated with a different *ethos,* or poetic mood. He speaks of "three styles" of musical compositions, "the lower, the middle, and the higher," which, he reports, are derived from these three natural "regions" of the voice. This association of the different registers of the voice with *distinct poetic voices* is critical to the greatest Classical composers' subsequent use of vocal registration to locate Truth and Beauty in the *poetic dialogue* within the mind of the sovereign individual. Aristides reports that the tragic style of composition is related to the lower notes, the Dithyrambic style of

[4] Aristides Quintilianus, fragment in H. Riemann, *Handbuch der Musikgeschichte,* Vol. I, Munich, 1919; and H. Macran, *The Harmonies of Aristoxenus,* Oxford, 1894.

composition to the middle notes, and the Nomic style to the higher notes.

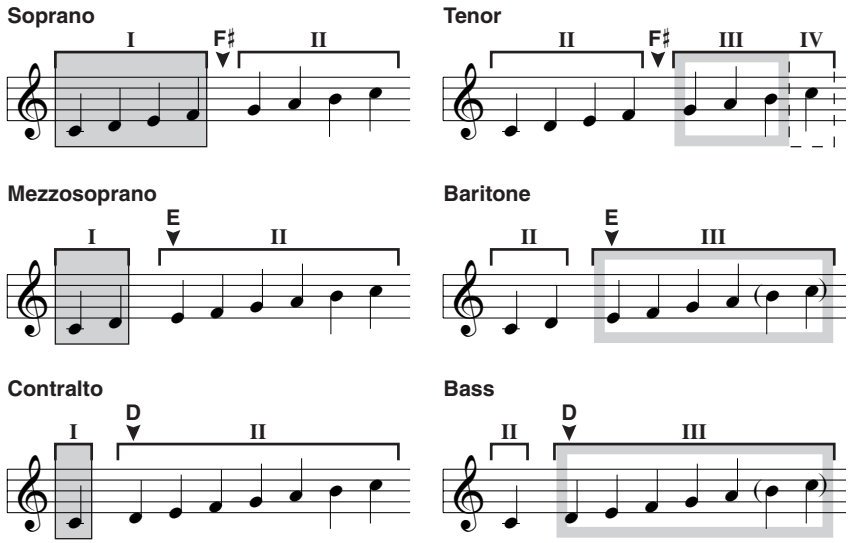
In Western Christian civilization, an early reference to the vocal registers of the child soprano voice comes from John of Garland (ca. 1193–1270) in the generation before Dante Alighieri. He writes of the three registers of the human voice, which he names *vox pectoris* (chest voice), *vox guttoris* (throat voice), and *vox capitis* (head voice). These correspond to bel canto terms, with the exception of the term "throat voice," which has been replaced by "center" of the voice, probably in order to avoid any imagery which might induce tension in the singer's throat. John of Garland writes: "It must be known that the human voice exists in three forms: it is a chest voice, throat voice, or a head voice. If it is a chest voice, then it is in the lower register; it ought to be placed in the lowest part of a piece. If it is a throat voice, it is in a middle position in relation to each. . . . And just as far down the chest voice is in the low register, so the head voice is high in the upper register. . . . Chest voices ought to be placed in the lower part; throat voices also ought to have the middle place in the upper sections."

Jerome of Moravia, a Dominican monk working in Paris in the thirteenth century, gives similar details, in a manner which assumes that the educated public was familiar with registers. In his *Discantus Positio Vulgaris* (ca. 1300) he writes: "Speaking popularly, not of their real nature, certain voices are of the throat, certain of the chest, and certain actually of the head itself. We call chest voices those that form the notes in the chest; throat voices, those that form the notes in the throat, and head voices, those that form them in the head."[5]

Since the shift from first to second register of the adult male tenor or bass is much less pronounced than in the soprano, these writers were doubtless speaking of the marked shift from the child soprano first-register chest voice, to the middle, second register.

[5] D.P. Duey, *Bel Canto in Its Golden Age,* New York: King's Crown Press, 1951.

Figure 2.6 Division of the C–C Octave by the Registers of the Six Voice Species



Human children develop into many different *species* of voice as they grow. Thus, the difference between "soprano" and "mezzosoprano" is a precise *different point of shift in registration,* not some vague notion of "tone color" difference. Still during childhood, some children's voices differentiate themselves away from the soprano species. A few years before puberty, some children develop into mezzosopranos. During puberty, male children become tenors, baritones, and basses. Each species, if the voice is trained properly, develops its own distinctive set of three or four distinct registers.

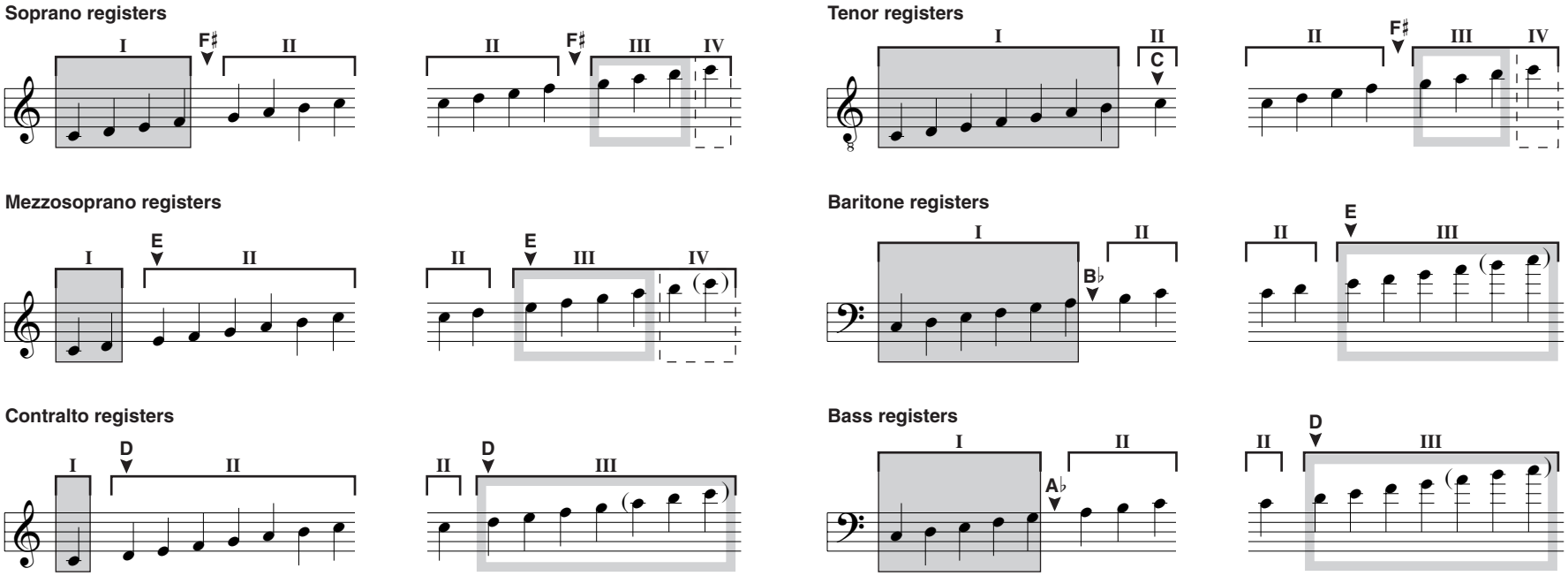
The chart shows, in first approximation, the ways in which the C major scale, beginning on middle C, is divided by the register shifts of each of the six species of singing voice. The soprano F-sharp register shift divides the eight-note scale in half, as already discussed above. Note that this register shift is retained by both adult sopranos and adult tenors, who make up 80 percent of any adult human population. The mezzo-soprano and the baritone develop a register shift at the E-natural above C=256, such that the number of notes in the C major scale which are sung in the lower register, is one-half the number sung in that register by the soprano or tenor. The contralto and bass voices exhibit a register shift

at the D above C=256, such that the number of notes sung in the lower register is halved again, to a single note. Further divisions with respect to the C major scale—i.e., further voice species—are not possible.

As will be seen in the following figure, divisions of the C major scale *above* F-sharp occur as characteristics of the male voices' first-to-second register shifts.

The reader is encouraged to examine this and the following register charts from the more profound standpoint already touched upon in the previous chapter. Namely, the C major scale is not some axiomatically pre-existent, Cartesian "empty space" which is subsequently "divided" through the imposition of the human register-shifts upon that "space." In fact no such "space" pre-exists. Rather, it is the *action of the human register shifts* in the musical domain which *uniquely determines* the universal quality of the C major scale, and which, by extension, determines all the keys of the 24-key well-tempered domain. A musical scale is therefore sufficiently defined not by what note it begins on, nor by its key signature, but by *how the scale is ordered according to the register-shifts of the six species of human singing voice*.

FIGURE 2.7 Division of Two-octave C Major Scales by the Registers of the Six Voice Species



The trained bel canto singing voice has a range of at least two octaves. In this figure, the C major scale is extended an additional octave upward for the female voices, and an additional octave downward for the adult male voices, in order to show how the extended scale is ordered by all registers of the six voice species. The trained soprano voice, even in small children, is capable of extension to a third and fourth register (labeled III and IV) in the octave above C=512. The shift between second and third register occurs between F and F-sharp, one octave above the first-to-second register shift. Thus the soprano registers divide the higher octave precisely in half, just as with the lower octave. Although the child's third register was scarcely utilized in Renaissance sacred music, vocal compositions dating from the lifetime of J.S. Bach demonstrate that children readily vocalize here, and in fact vocalize above high C=1024 shown here, to E or above, when the voice is elevated by training.

The mezzosoprano voice divides the higher octave with the same symmetry as it does the lower octave, shifting into the third register between E-flat and E-natural, exactly one octave higher than the first-to-second register shift. The mezzosoprano is the only other voice besides the child soprano, which may be said to be a "universal voice." It is the only other voice experienced by both boys and girls in childhood, for just a few years shortly before puberty (see Chapter 4). Next to the soprano voice, the mezzosoprano voice shows the most straightforward geometrical derivation (see Figure 2.8).

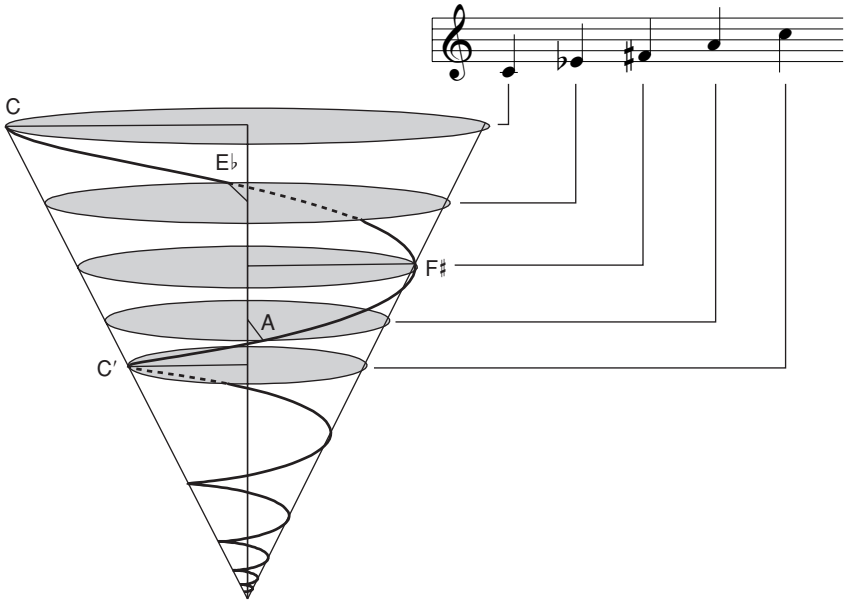
After puberty, the male voices lose their use of most of the octave above C=512, but gain a new, lower octave anchored on C=128 (see Figure 6.2). (Note that the convention used in this Manual for the tenor voice is a transposed G clef, with the subscripted "8" indicating that it is to be sung one octave lower than written.) The geometrical characteristics of the adult male voice registers, while distinct from those of the female voices, vary lawfully, according to derived geometrical principles.

The tenor retains the childhood soprano register shift between F and F-sharp above C=256; this shift becomes the entry-point into the tenor's

third register. In the newly developed lower octave, instead of developing a first-to-second register shift between F and F-sharp one octave below, as might be expected, the tenor's second register becomes foreshortened, such that the shift from first to second register is found between B and middle C. The distance separating the tenor's first-to-second register shift from his second-to-third shift, is a diminished fifth (augmented fourth), and is therefore geometrically congruent with the self-similar spiral action which determines the soprano's register shifts (see Figure 1.8). The shift from the tenor's third register into the super-high or fourth register, occurs between B and C=512, which is likewise congruent with the soprano's third-to-fourth register shift.

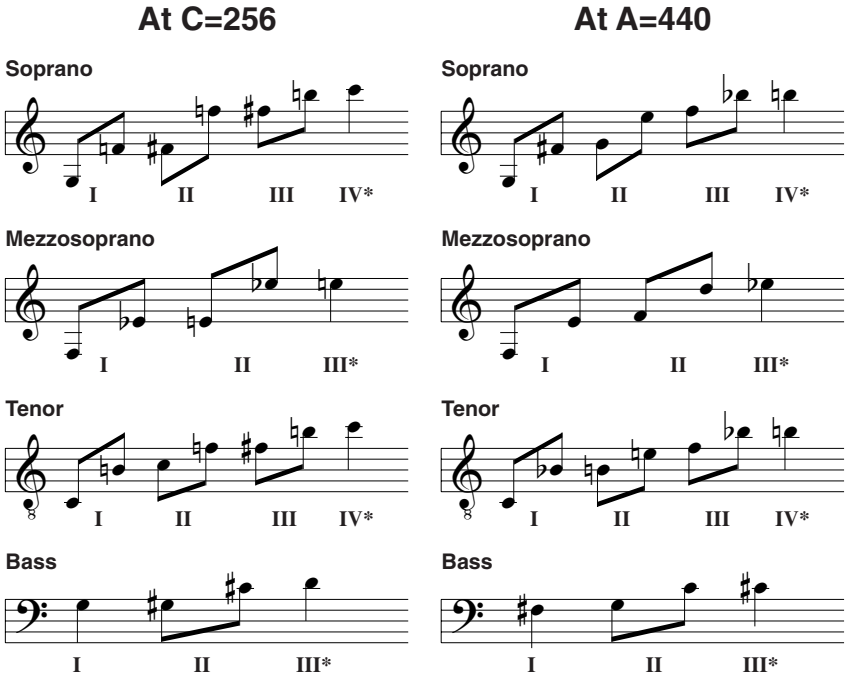
The lower male voices have the same congruence with their female counterparts. The mezzosoprano's first-to-second register shift between E-flat and E-natural, and the contralto's shift between C-sharp and D, become the baritone and bass's high shift into the third register at those same locations. As with the tenor, the second register is foreshortened, such that the first-to-second register shift is located a diminished fifth below the high shift. The baritone develops a lower shift between A and B-flat, while the bass develops his lower shift between G and A-flat. Again, the lower shifts are lawful, placed halfway around the rotation of the octave spiral implicitly defined by the shift between second and third registers.

Figure 2.8 Spiral-rotation Generation of Vocal Register Boundaries



The array of register shifts available in the mature human voices, is geometrically determined. The boundaries of several of these shifts are shown by the equal-tempered notes swept out by subdividing one full rotation of self-similar spiral action based on C=256. One-quarter of a full rotation around the spiral axis, a rotation of 90 degrees, produces E-flat, the lower boundary of the mezzosoprano first-to-second register shift from E-flat to E-natural. One-half rotation (180 degrees) produces the soprano F-sharp, the upper boundary of the soprano register shift. A three-quarters rotation (270 degrees) produces A, the lower boundary of the baritone first-to-second register shift; it is therefore analogous to the 90-degree mezzosoprano rotation. The original C=256 coincides with the upper boundary of the tenor first-to-second register shift, while C=512 at the 360-degree completion of the spiral, coincides with the tenor's first fourth-register note, the famous high C. Similar geometrical demonstrations are easily constructed for contralto and bass voices.

FIGURE 2.9 Vocal Registral Ranges at C=256 and at A=440



* Last register continues upward.

Modern elevated pitch, beginning with the promotion of the Russian bandmasters' A=440 during the 1815 Congress of Vienna, renders into gibberish all music composed on the basis of the bel canto registers. High-pitched tuning requires the bel canto-trained soprano voice, for example, to pass from the first to second register, or from the second to the third, on the F, a half-step below the F-sharp of the natural well-tempered tuning. The registrations of every other voice species are shifted downward by the same degree.

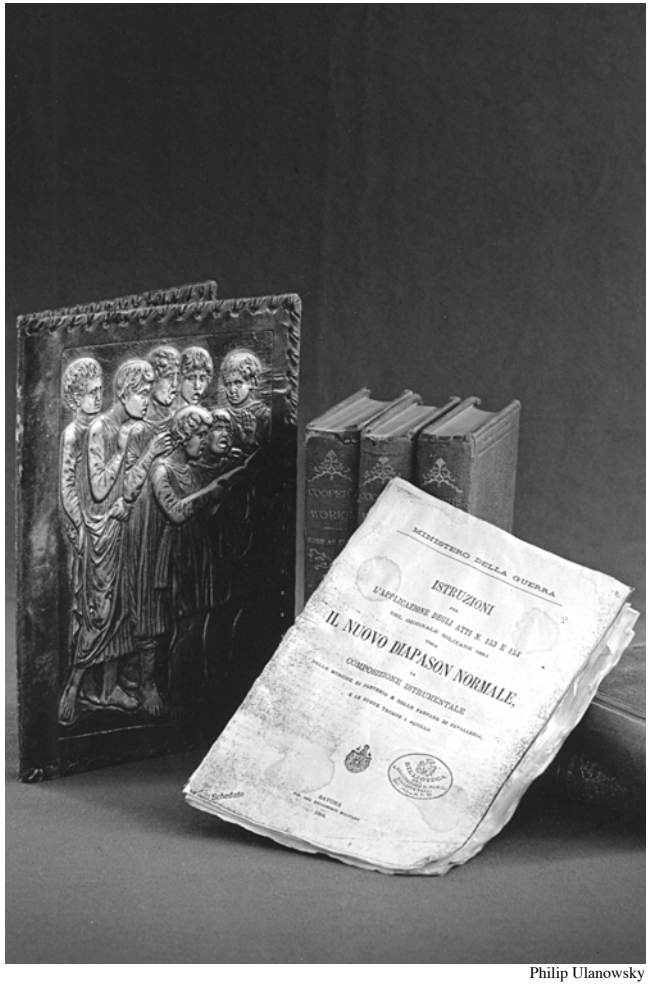
It should be kept in mind that the register *shifts* are located at specific frequency-ranges which properly lie *in between* the pitch values of the well-tempered scale. In the case of the F-sharp shift, it properly lies less than a quarter-step above the F. Therefore, even when the reference tuning pitch is raised by somewhat less than a half-step, this is enough to force the range of the shift downward, to a location slightly *below* the F. Thus, even small tuning-pitch adjustments will throw a Classical work "out of focus," much as a slight mis-focus of the eyes makes reading difficult or impossible (see also Figure 1.12).

Indeed, setting the tuning pitch to a value lying approximately half-way between C=256 (A=430.5) and A=440, makes the frequency-range of the soprano register shift *coincide* with the note F. A soprano singing an F at such a tuning is analogous to a violinist playing repeated notes on the instrument's "wolf tone"—a sure way to ruin the instrument. The A=435 "French standard pitch," officially adopted in France in 1859 and widely used during the latter half of the nineteenth century and the first decades of the twentieth, is, if anything, worse than the modern A=440. (See also Figure 1.12.)

Among the better twentieth-century singers, many can be heard to shift registers more or less according to the right-hand column of Figure 2.9, irrespective of their own personal views on how they sing. Although registers shifts do not "come naturally" in modern culture and must be taught, the well-trained elevation of the voice into the head, heard in the finest singers, disposes the voice to shift at its proper biological locations.

A vestige of the old bel canto tradition retained by better vocal coaches today, is the practice of adjusting to A=440 tuning by instructing especially tenors, and sometimes sopranos, to "cover" the voice at the high F-natural, if only to avoid a shouted sound. A good recorded example is Jussi Bjørling's 1950 Rome recording of the aria "Celeste Aïda" from Verdi's *Aïda* (RCA Victor LM-6122, conducted by Jonel Perlea, Chorus and orchestra of the Rome Opera House, with soprano Zinka Milanov and baritone Leonard Warren). As shown in Figure 6.10, Verdi constructed the aria at C=256 around the change of idea from the opening high F-naturals to the later high F-sharp at "mistico serto." Bjørling, recording at A=440, as shown in Figure 6.11, places all notes lying at F-natural and above in the third register, which is physically necessary to avoid shouting.

Figure 2.10 Title Page of 1884 Law Decreeing C=256 throughout Italy



Philip Ulanowsky

The composer and political leader Giuseppe Verdi complained of the damage to voices, denouncing the "shrieks [which] a too high tuning fork can give," as do thousands of singers today. Following a congress of musicians in Milan in 1881, Verdi took action. He wrote a proposal to create a "scientific standard pitch" at approximately C=256, using the Italian calculation of the upper limit for such a tuning, A=432. "Why should it be," Verdi wrote, "that a note which is called A in Paris, or Milan, should become a B-flat in Rome?" In 1884, Verdi's proposal was promulgated as a decree by the Italian War Ministry, institutionalizing A at 432 Hz throughout Italy.

The decree, preserved at the Giuseppe Verdi Conservatory in Milan, states *inter alia*: "The Ministry of War has now prescribed that all the orchestra instruments and those of military bands be tuned . . . from a normal A of 432 vibrations. . . . [M]usic is one thing the world over, and musical notes are as eternal and immutable as the physical laws upon which they depend! . . . Many masterpieces of yesteryear were written under the influence of a very moderate tuning fork. Therefore, with our too high forks today, they are no longer reproduceable, or are reproduced only at the cost of spoiling their sonority. . . . [T]he old pitches, judiciously measured against the natural range of the human voice, differed by almost a half-step from the higher pitches of today."

Unfortunately, the Italian government soon abandoned the effort, after a British-run conference held in Vienna the following year refused to adopt an international standard. The result has been that many orchestras, such as the late Herbert von Karajan's Berlin Philharmonic, have arbitrarily raised their concert pitch to A=450 and beyond.

In 1988, at an international conference at the Casa Verdi in Milan, the Schiller Institute began a petition drive to re-implement Verdi's legislation in Italy. Hundreds of the world's leading opera singers and instrumentalists joined that campaign.[6]

[6] *A Revolution in Musical Tuning Has Begun: The International Campaign to Set a Standard Scientific Pitch at A=432 (C=256),* pamphlet published by the Schiller Institute, Inc., Washington, D.C., 1989.

Development of the Vocal Choir

The history of progress in Western polyphony flows from the invention of new musical forms, new technologies which enabled composers to make ever more complex utilization of the registers of the human voice. The history of western Classical music, is the history of man's progress from the use of one or two voice species or types, to the ordered use of many different species of voices. The definition of classical polyphony is not merely "music with many voices," but music in which there is transparency of voices, such that the registration of each voice may be heard.

The earliest written Western music had principally *one species of voice*: tenor. A simple "cantus" (song) was presented, with variation above it, sung within a narrow range. The term "tenor" referred to the "holder" or singer of that "cantus" or melody; it derived from the Italian verb "tenere" ("to hold"). Medieval polyphony was the domain of monks. Of any male population, 80 percent have what we call today a tenor voice. The name "tenor" therefore came to be identified with the average male voice.

By the late fourteenth century leading up to the Florentine Renaissance, musicians desired greater degrees of musical freedom than what was afforded by simply adding to the number of polyphonic vocal lines. An effort was launched to broaden the range of available types of voices, and this led to the discovery of most of the distinct voice *species* as we know them today. The lowest voice, rather than just singing additional melodic variations of the tenor, was given the new function of "ground bass" or pedal point, serving as a reference-point for development of the composition as whole (see Chapter 12).

Composers of the period, such as Guillaume Dufay, thus created the modern vocal choir, by establishing the modern choral parts or sections: soprano, alto, tenor, and bass. They created a new "contra-tenor altus" (alto), which they set just above the tenor. A new "contra-tenor bassus" (bass) was set just below the tenor, and the "superius" (soprano) was set at the top. Soprano, alto, and bass at this time, signified nothing about the voice type, but only the location of the musical part, above or below the tenor. (This ambiguity between *choral part* and *voice species* has continued down to the present day, especially with respect to the choral bass line, which is usually sung by a combination of baritones and basses.)

By the time of the Council of Florence, *three species of voices* were in use, each with distinct registrations (see Figure 3.2). The boys' voices were known to have register shifts between F and F-sharp in both octaves. They became identified with the soprano part. The lower male voices were found to have register shifts at G–A-flat and C-sharp–D, and became became identified with the bass part. The tenor, which shifted at B–C=256 and F–F-sharp above C=256, was retained as a distinct species.

Although Renaissance polyphony represented a vast improvement over what had come before, it was limited to these three voices, because from 1400 into the late 1600s, only male voices were permitted to sing the "official" polyphonic music of the Catholic Church. The higher male voices had to sing both the tenor and the contra-tenor altus, or alto, part. The term "alto" originally, and throughout this time, simply referred to men who sang the part just above tenor. The tenor-altos and the standard tenors had identical register shifts.

A chart from Michael Praetorius's 1619 *Syntagma Musicum* (Figure 4.5) shows that even two hundred years after the high-point of the Florentine Renaissance, only the bass, the tenor (including the tenor alto) and the descant (superius) or soprano, were recognized. There was no recognition of the mezzosoprano, nor any kind of female voice.

In the 1520s, Josquin des Prez used the standard Renaissance church choral format of soprano, tenor-alto, tenor, and bass (Figure 4.6). The "alto" line lay almost exactly where the tenor line lay. The tenor clef often did double duty for the alto line (Figure 4.7).

During the seventeenth and early eighteenth centuries, Dietrich Buxtehude and his student J.S. Bach sought to further expand the available degrees of freedom, to four truly distinct vocal species. It was only during their lifetimes that composers began to write consistently for a fourth voice, the mezzosoprano, with register shifts between E and E-natural. Mozart expanded this principle to create the analogous male baritone voice (see Chapters 4 and 7).

Later, during the early nineteenth century, operatic composers began to explicitly identify an array of finer vocal types within each voice species. Each vocal type is distinguished by a different relative power with which the performer can sing in various parts of his or her vocal range, even though the register-shift remains at the same location in all

voices of the same species, regardless of type. Such distinctions became essential in opera beginning around the time of the American Revolution, because of the greater emphasis given to the development of the sovereign, creative individual. For example, differentiating the character of the servant Susanna from that of the Countess in Mozart's *Le Nozze di Figaro* is important, as can be heard, for example, in the duet "Sull'Aria" in Act II. Both singers, however, must sing with precisely *the same* register shifts, between F and F-sharp, in order for the musical and poetic tension between the two to be properly heard.

Some of the most commonly used voice types are listed below:

Soprano type	**Role**
leggero (light)	Susanna in *Le Nozze di Figaro*
lirico (lyric)	Countess in *Le Nozze di Figaro*
lirico spinto ("pushed" or heavy lyric)	Elisabetta in *Don Carlo*
drammatico (dramatic)	Leonora in *La Forza del Destino*

Tenor type	**Role**
leggero (light)	Ottavio in *Don Giovanni*
lirico (lyric)	Carlo in *Don Carlo*
drammatico (dramatic)	Florestan in *Fidelio*

Similar categories have come to be used for mezzosopranos, basses, and baritones.[7]

Voice Registers as the Medium of Socratic Dialogue

The practice of childhood training in bel canto voice registration during the 400 years from the Renaissance to the early nineteenth century yields a major clue to understanding the purpose of classical music. Why do great men write music?

The composer composes, not in order to impress, but rather to make the working of the creative mind intelligible, to demonstrate the *intelligibility of the creative process*. Classical musicians have long used the distinct vocal registers to represent the different voices in a poetic dialogue. This is because the human mind itself works as a "Socratic dialogue," a dialogue of multiple voices within the mind.

[7] The contralto voice seems to be an exception. Modern usage of the term "contralto" ought to be replaced by the designation "dramatic mezzosoprano." See Chapter 5.

Figure 2.11 Thomas Eakins, "Baby at Play"

The mind of a child, even before it learns to speak, develops in society; thought develops as a dialogue with that society. The child builds a construction with blocks. The parent urges, implicitly or explicitly: "That's beautiful; do it again." Creative acts are thus associated from their inception with mental dialogue. The child learns to think, to speak, in dialogue with parents and other adults, dialogue distinguishing good from destructive, right from wrong.

Thus, a major subject of Socratic dialogue is *lawful change,* the changing of the child's behavior through learning, or a *change* in an adult's thinking methods. The lawfulness of such change is illustrated by the allegory of the cave in Plato's *Republic*: A group of people is seated, facing the wall of a cave, with a fire behind them. They are chained, such that they cannot turn their heads away from the wall, upon which they see shadows projected against the cave wall by objects being moved about behind them. They imagine the shadows to be reality. One day their chains are broken, and they are forced to look out, toward the fire. They are blinded at first, unable to distinguish any objects at all.

Poetically, the cave dwellers' initial impressions constitute one voice in a mental dialogue. The change of thinking, the realization that there is another, higher reality, enters the mind as a *new voice* in the dialogue. The change is not arbitrary, but lawful, more truthful than the original assumption.

Plato's socratic dialogues are written in such a way as to train the mind to master this creative principle, to master the making of such lawful change—change in assumptions, and in the material universe. Plato often begins with a naive subject who accepts without question a set of underlying assumptions as deserving of axiomatic authority. Plato then introduces a change in voice—Socrates or his representative—with the Socratic proposition, that those unconscious assumptions themselves must be susceptible to a rigorous, intelligible sort of examination of their truthfulness or falsehood.

The Socratic method of questioning the naive assumptions then proceeds to drive the examination of the assumptions themselves to the extremes, so that the student realizes that the universe does not work according to the particulars of any set of assumptions. There are no particulars, no facts or any particular words to represent them, which cannot be questioned, and potentially dismissed. This method examines first the assumptions of any system such as Universe *A,* then the assumptions underlying those assumptions, and so on, to the boundary of all layers of successively underlying assumptions.

At this point, thought is focused directly upon the mind itself. Only the mind remains, which can still be seen to be functioning clearly, as the continuum "behind" all the assumptions. The mind at this point sees itself as the prototypical working of the universe, above and beyond any particular.

Plato's *Parmenides* dialogue, which concerns the transformation of the *Many* into the *One*, gives a full, rigorous proof of the scientific lawfulness of such Socratic dialogue, a proof only accomplished mathematically in the 1870s by Georg Cantor (see Chapter 9).

Socratic dialogue can be shown in any well-conceived poem.

O, my love is like a red, red rose — *First Voice*
That's newly sprung in June,
O, my love is like a *melody* — *Second Voice*
That's sweetly played in tune . . .

This Robert Burns poem would be meaningless if recited in a monotone. It has at least two necessary speaking voices, which proceed from the two distinct ideas. The two couplets are poetry, and not a mere

jingle or doggerel, because there is a lawful, Socratic *change,* a progression between the two voices in the dialogue. The beloved at first might be imagined as a rose, as a particular visual image. This is followed by a change to a more powerful level poetic metaphor; for, a lady cannot be imagined as a melody, in any specific sense.

Above all, the beloved is *neither* rose, *nor* melody, but the recipient of love. That love is the subject of the poem, the "unheard" sound which is "sweeter still," the principle of ironic transformation demonstrated but never named explicitly. This sort of change, effected through metaphor, is only beautiful because it conveys a transformation which proceeds according to adducible, lawful principles of the universe.

Repetition without transformation is not beautiful, but monotonous. Indeed, the word "monotonous" comes from the Greek expression for "one color," a voice with only one color or register, which must repeat an idea of the same type:

O, my love is like a red, red rose . . .
O, my love is like a blue tulip . . .

Arbitrary variation, on the other hand, is heard by the mind as gibberish:

O, my love is like a red, red rose . . .
—Is this the skull of a lawyer?

Since Classical song is Classical poetry elaborated as well-tempered polyphony, the most crucial quality of the voice is the distinction of color among both the distinct singing registers and the variable intonation of those registers. Often the choice of a *forte, piano,* or *mezzoforte* for a note or passage should have more to do, poetically, with the effect of a choice of dynamics upon the voice-register used, than upon so-called dramatic effects.

In contrast, the singing voice which is trained to blur the voice-registral distinctions tends to produce a boringly monotonous, unpoetical singing of the song. Color is introduced artificially by use of dramatic effects with dynamics.

In terms of voice-reproduction of thought-processes, we can not speak coherently, unless we employ at least two available voicings, to convey a different voice speaking one set of words or passage, than that voice used to speak another. Thus, in a Classical poem, the different voices speaking inside the mind, are to be made clearly different voices, by use of combinations of clear differences in voice-registrations and the difference in color of each voice-registration achieved through choosing a *pianissimo, piano, mezzoforte,* or *forte* dynamic.

Homogenizing the voice-registration and other coloration, to reliance only upon use of dynamics for dramatic effects, makes for a monotonous performance, in which the erotic-sensual effects achieved with dynamics blot out the poetry and music from the audience's minds.

The composition of Classical poetry flows from the way in which the creative processes of the mind operate. Thought begins in a preconscious way, just as memory proceeds from an initial state of preconscious awareness. This preconscious form of thought is "holographic." It is made conscious by the elaboration of the hologram into the form of a Socratic dialogue within the mind; this is reason, expressed in the form we are enabled to discuss it concretely among persons.

Poetry is the Socratic-dialogue form of elaboration of the holographic image of a creative discovery. Insofar as the poet is able to articulate that Socratic dialogue in a manner which is true to the holographic form of the creative mental act, poetry has an inherent power to move beyond any other form of expression.

In music, first in song, and then in the instrumental form of elaboration of the musical essence of vocal polyphony, we have the musical apotheosis of Classical poetry's principle. Here lies the inherent power of Classical musical composition.

All creative mental activity projects upon the conscious mind an intermingling of statements, each made in distinct voices, whose interplay is of the form of the socratic dialogue. Poetry is produced by reliving such a process of discovery. One has come to the last line of the initial dialogue; one knows the answer. Now, with knowledge of that answer to be reached, one retraces the successive arguments of the dialogue much as a qualified teacher prepares a lesson plan devoted to introducing some principle to the classroom.

The minds of fictive prototypes of various students, and the fictive leader of the discussion, are kept constantly in view. In one approach, the poem contains a single speaker narrating the dialogue, in which the acknowledgment of the actual or presumed response of other participants is accomplished by poetical apposition of lines and stanzas.

The characteristic of Classical poetry is that it is non-linear. Hence,

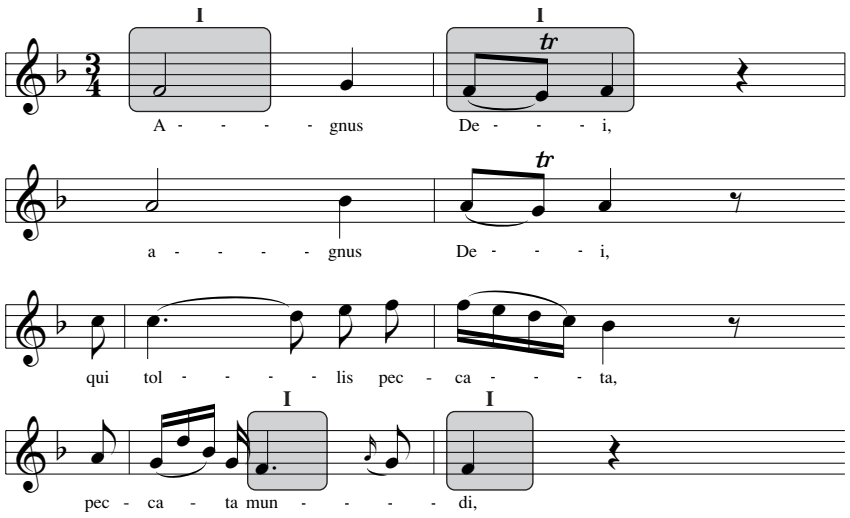
the requirement of ironical devices of simile, hyperbole, and metaphor. In banal poetry, the author introduces these elements of irony as mere, shallow rococo, to achieve the effect of exhibiting "style." In the work of the true Classical poet, such ironical devices never appear as mere embellishments; they always have a very distinct necessity.

The poem introduces at various points matters which seem linear enough. This leads into singularities, for which no literal expression exists within the bounds of the preceding, linear notion. What appears mimics something knowable within the linear framework, but is not that: hence, simile, hyperbole, and metaphor. Something beyond the periphery of linear vision has appeared in the range of vision, whose existence can not be denied, but whose nature lies outside the linear domain. We must use a word for this *unheimlich* occurrence, a word from the linear vocabulary; hence, simile, hyperbole, and metaphor.

In the end, what is identified ironically must be demonstrated to be real, efficient, changing the linear world in a concrete way. Goethe teased his audience in minor, short poems in which the "surprise ending" revealed the truth of what had preceded; the subjects are usually trivial, and biting wit, but useful to study as a simple demonstration of the same principle of composition in more serious classical compositions.

It is the interplay of voicings, which conveys the action of socratic dialogue in progress, leading to a Socratic resolution demonstrating ironical reality of what appeared metaphorical, which is the fundamental aspect of poetry.

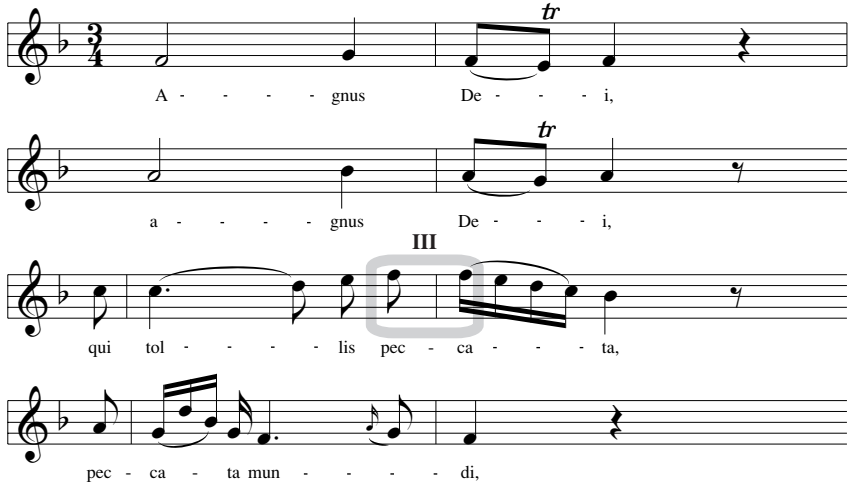
Figure 2.12 Mozart, "Agnus Dei" from *"Coronation" Mass,* K. 317, at C=256[8]



As discussed above, Classical composers used the registers of the human voice to create multiple musical voices. Vitiating this registration can, and usually does, radically alter the poetry and the meaning of many compositions.

In this "Agnus Dei" from Mozart's *"Coronation" Mass,* the composer presents the opening phrase twice, opening the first line in the soprano first register, and opening the second line in the soprano second register. Such a reading emphasizes the transformation in our understanding of Christ, the Agnus Dei (Lamb of God) over the two times that it is heard. This poetically expresses the meaning of the words, which are sung at the point in the mass where the consecrated bread is broken and is about to be given to the communicants. It could be said that Mozart was shaping a musical metaphor for the transubstantiation of the bread and wine into the body and blood of Christ.

Figure 2.13 Mozart, "Agnus Dei" from *"Coronation" Mass,* K. 317, at A=440



At A=440 this poetic reading is removed, and a different, arbitrary distinction is introduced. The opening phrase lies wholly in the second register; its repetition a major third higher effects no shift in register, and hence suggest no fundamental change in meaning. This is because at C=256, the lower F-natural brings the opening line into the first register, whereas at A=440 it is forced up into the second register. Furthermore, when sung at A=440 there is an emphasis, not intended by Mozart, on "peccata" ("sins"), because the high F-natural is forced up into the third register, which would tend to highlight the text here, as if it were some new subject or transformation. The high A=440 pitch therefore steers Mozart's intended poetic emphasis away from Christ the Lamb of God, and into undue stress on the "sin" as a noun, as opposed to Christ's absolution of sin.

[8] This example introduces the standard convention used throughout this manual to graphically represent the vocal registers. Notes which are to be sung in the first register are enclosed by a solid-shaded box (with the exception of the male voices, where an unshaded, outline box is used instead). Notes to be sung in the second register are left unmarked. Third-register notes are enclosed by an open box with a shaded outline, and the fourth register is denoted by an open box with a solid dotted outline. The register shifts of each of the six species of singing voice are presented in the chart on p. xxiii, which is also reproduced on the inside front cover. Throughout this volume, all register shifts are indicated, except in those cases where indicating them all would hinder the reader's comprehension of the working point.

Bel Canto Education

Human civilization is entering upon the threshold of the twenty-first century without a single great Classical poet or musical composer. This is due, in large part, to the fact that children are no longer trained to sing, to vocalize in the bel canto mode, with the early development of sensititively to distinctions between different registers. By contrast, great composers such as Mozart and Schubert, from the age of two or three (see Figure 2.1), learned the well-tempered system as a geometry of human vocal register-shifts.

Music is an expression of fluency in the language of music, which like any complex language, can only be learned fully when learned during the 12 years before puberty. The great composers learned the language of music in their heads; they could think in that language. Mozart, for example, composed not at the keyboard, but in his mind, and was able to do so because as a child he sang, and learned the basic irony, between the octave scale, and the human voice which splits the scale in half.

This is confirmed by Johannes Brahms, who insisted to his student Gustav Jenner[9] that the "old" way of developing real composers of music, was to train children from pre-school, as Mozart was trained, to write in musical notation at the time he learned to write German, "mastering that technical skill which enables the composer to freely shape his ideas and to set them down on paper," as Jenner cites Brahms. "Even Mozart had to first master the technical skill of writing; the fact that so early in his life he could have a never-failing technique, is in no small part attributable to his excellent father." Jenner reports that Brahms lamented not having had such an education, because by the 1830s and 1840s when Brahms went to school, that tradition of training children was falling into disuse. Brahms decried "the superficial, thoughtless, and fundamentally false educational method according to which our youth are usually taught, when a composer only becomes becomes so able, by first having to laboriously liberate himself from an instrument, which he had used up to then as an aid in his creative work; whereas with an education like that enjoyed by Mozart, for example, such a practice was ruled out from the very beginning."

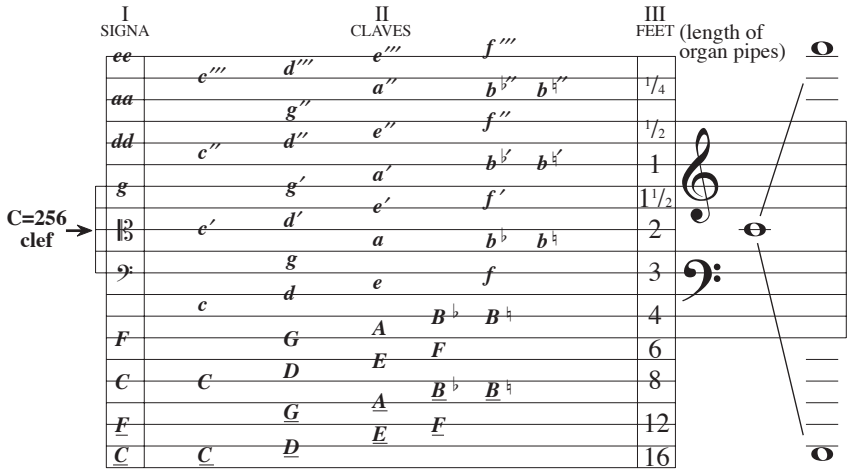
Jenner comments that "It is not rare that a composer who has already advanced beyond childhood without having been imparted this technique, is impeded by a kind of false ambition, which is basically just vanity, and which Brahms sought to combat in me with the following words: 'You must learn how to work. You must write a lot, day in, day out, and not believe that what you write always has to be something significant. The main point at first, is just to write.'"

[8] *Johannes Brahms als Mensch, Lehrer und Künstler: Studien und Erlebnisse,* Marburg an der Lahn: N.G. Elwert'sche Verlagsbuchhandlung, 1930. An English-language translation by the Schiller Institute is in preparation.

Instruments Constructed According to Bel Canto Principles

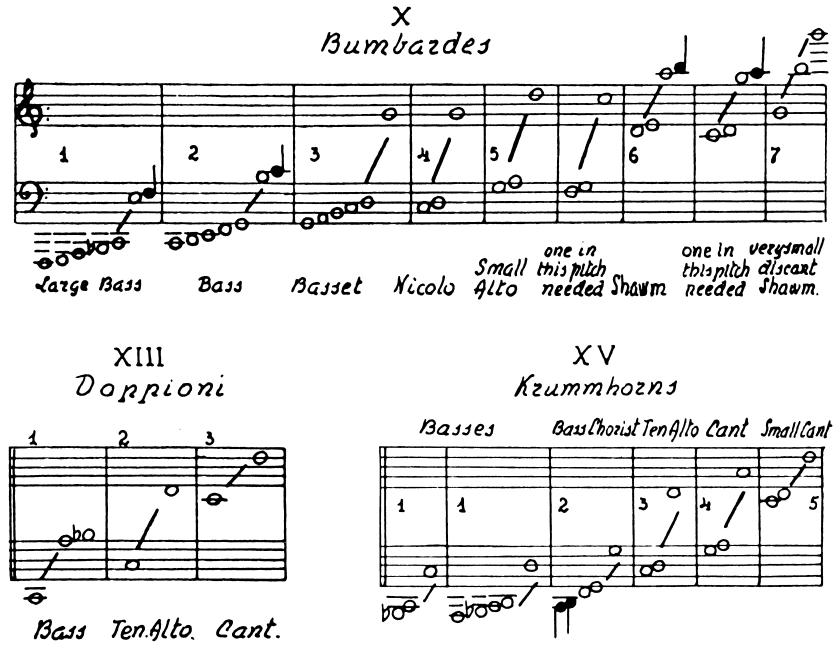
Dufay and his colleagues created not only the modern choral voices, but also the prototypes for most instrumental families in use today. The instruments were invented as machines, in the sense of Leonardo da Vinci's machines, as models and extensions of the power of the human singing voice. Woodwind and brass instruments were systematized into "chests of voices," that is, choirs, modeled precisely upon the Renaissance human voices, soprano, alto-tenor, tenor, and bass.

Figure 2.14 Praetorius, Clefs and Organ Pipes



Michael Praetorius (1571–1621), a colleague of Johannes Kepler and a chronicler of the Renaissance origins of music, wrote his two-volume history of humanist musical practices *Syntagma Musicum* (1620) in order to demonstrate that the science of music has always been based upon the human singing voice. Here Praetorius shows the genesis of all of the clefs of the musical system, as well as the pipes of the organ, from the C=256 of the singing voice. Praetorius's major writings coincide with those of Kepler on the planetary system. After Kepler's *Mysterium Cosmographicum* appeared in 1597, Praetorius published *Musica Sionæ*. Kepler's *Astronoma Nova* and *Harmonici Mundi* in 1619 were followed by Praetorius's *Syntagma*.

Figure 2.15 Praetorius, Chest of Instrumental Voices



These woodcuts from Praetorius's *Theatrum Instrumentorum* show that through the seventeenth century, instruments generally came in choirs, called "chests of voices" and modeled on the basic human singing voices of soprano ("cantus"), alto, tenor, and bass. The woodcut shows the families of woodwinds of the seventeenth century.

Figure 2.16 Set of Eight Seventeenth-century Italian Recorders

These seventeenth-century Italian recorders are preserved today in a museum in Venice precisely as they were delivered upon purchase at the time, never singly, but always in choirs.

Figure 2.17 The Master of the St. Lucy Legend, "Mary, Queen of Heaven"

During the Renaissance of the fifteenth and early sixteenth century—and indeed ever since St. Augustine wrote on music in the fourth century—it had never been doubted that the human singing voice was the

closest approximation to the divine order in music, and the basis of instrumental music. The artists of the Renaissance show this concept taking on increasingly sensuous form. The singing voice was considered the work of God, whereas musical instruments were the handiwork of man, acting in God's image.

In this picture, painted probably for a patron in Spain around 1480 in Bruges (Flanders), instruments were seen in a heirarchy, such that they were the more holy, the closer they came to imitation of singing voice. The artist portrays a concert played before the Trinity in Heaven, consisting of two choirs, one of small angels (like child sopranos) and the other of adolescents or young men—11 vocalists in all, who sing antiphonally from two choir books, and six accompanying instrumentalists playing instruments of the "soft" type used to accompany "house music" in that era—psalter, harp, lute, and recorders. The scene reflects actual musical practice, in which the instruments are intended to imitate and reflect, but never overpower the voice. Note, too, that the highest music, vocal polyphony, is to the right of the Trinity.

Contrasted with this is the larger musical ensemble which surrounds Mary in her transport toward heaven. The music portrayed here includes many "loud" as well as "soft" instruments, and only four singers—probably an indication that this was meant to convey the noisy pomp of a procession, a kind of music considered to be more "earthly."

Figure 2.18 Raphael, "The Ecstasy of St. Cecilia," 1514

In this allegory of the patron saint of music, the three levels of music are depicted for the first time as corresponding to three kinds of performance. At the bottom of the painting lie a six-string viol, strings broken off, along

with cymbals, triangles, and other "loud" instruments typical of the dance in that day. According to the legend of her life, St. Cecilia rejected this music during her wedding. In the center, St. Cecilia holds a "soft" portative organ, which because of its polyphonic character, common to all keyboard instruments, and the tradition of its use to accompany liturgical music, corresponds to hymn-singing and is closer to the divine ideal of music. Even this, however, is falling from her hands, as she alone hears the highest level of music, the heavenly voices of the choir of angels at the top of the painting. Raphael takes care to show the angels as reading different parts of a multi-voiced piece from different scores, thus indicating that the closest approximation of the divine in music was considered multi-voiced choral polyphony.

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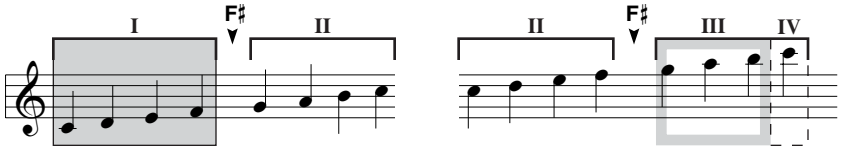
CHAPTER 3

The Soprano Voice

The Child Soprano Voice

FIGURE 3.1 The Soprano Division of the C=256 Major Scale



The soprano voice species is the universal voice of childhood, and the most common among adult women. All children, boys and girls, sing from ages 2–10 as sopranos; between age 10–11 and puberty, perhaps 20 percent of children develop into lower voices. As adults, similarly, some 80 percent of women are sopranos. The primary characteristic of the soprano voice species is the register shift at the F-sharp between the first and second, and between the second and third registers.

The most prominent register shift in the child is from the first register, popularly known as the "chest" register, to the second or "middle" register, at the F-sharp above middle C. The third register, beginning in the average child soprano at the F-sharp above C=512, is popularly known as the "head voice," because it is felt more clearly to be produced in the head.

In fact, the voice resonates with participation of the sinus cavities of the head in all bel canto registers; the first register has more of the lower overtones also resonating in the chest.

The ligaments and cartilage of children are extremely flexible, and children up to the age of ten can, if allowed to sing loudly, carry their first registers up to E above C=512. As the children grow, the "possible" shift more closely approximates the adult shift. As the age of children under instruction increases to 11 or 12, the first register can be extended without undue strain only to C=512. At age 13–14, the girls extend only to the B below that, and the boys, even before puberty, find they can only extend the low register only to the area G to A above middle C.

However, centuries of experience with children's voices has shown that when the child soprano is taught before age ten to shift at the F-sharp above middle C=256 (or near the F-natural at or above A=440), the voice undergoes the smoothest growth and matures into the strongest voice. This is done by encouraging the voice to be produced overall "in the head," and by singing softly in the area from the F-sharp register shift to approximately C=512.

Only once the voice is "in the head," can the child's register shift and tessitura be properly observed.

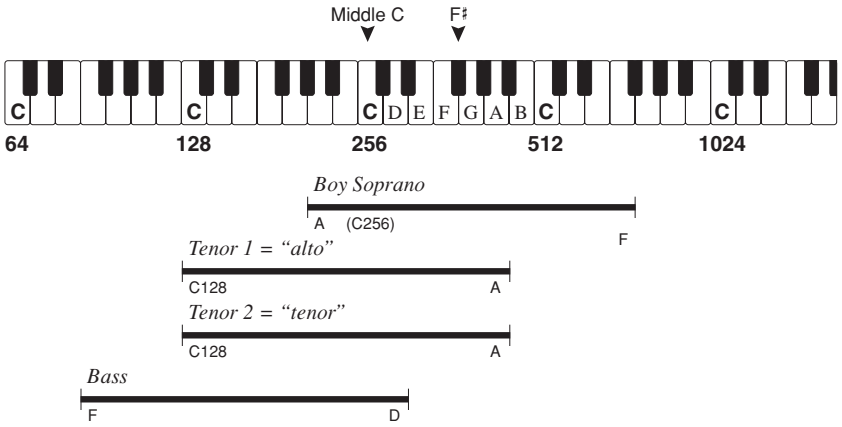
This seems confusing to adults today, because most adults were never trained to sing properly as children—a lack which is extremely difficult to make up for during adulthood.

In the untrained adult voice, with no placement in the head, true vocal characteristics cannot be properly observed at all. Only after some months of training, once the student's voice is placed, can register, tessitura, and range be identified.

Thus it often occurs that an untrained adult female, for example, may "feel comfortable singing low" and sing by mere habit in the alto section of an amateur choir. After some vocal training, this same individual, once the voice is placed in the head, may be discovered to be a high soprano. The untrained bass may turn out, when trained, to be a tenor, or the untrained habitual tenor may turn out to have been singing his higher notes incorrectly in "falsetto" or "false voice," and is found, upon training, to be a baritone or bass.

Certain bel canto exercises, properly taught, can place the voice so securely in the head, that the singer will automatically shift correctly—sopranos at F-sharp, mezzosopranos at E-natural, and so on—even when the singer is not explicitly instructed to make a shift or change and is unaware which note is being sung.

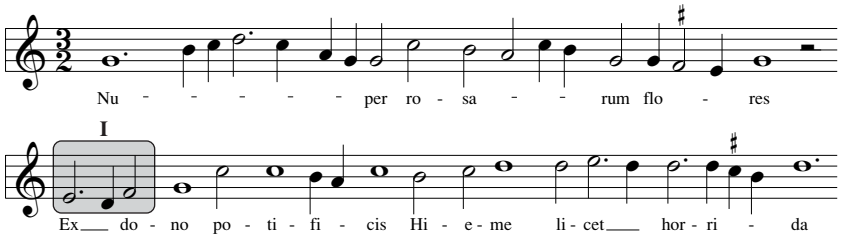
Figure 3.2 The Three Species of Renaissance Voice



The chart shows the three kinds of human voices used during the time of the 1439 Council of Florence, the high-point of the Italian Renaissance. It was during the Renaissance that the practice of composition by human voice registration was standardized, based on the child soprano voice.

Since women did not sing in church, the soprano line was entirely sustained by children, and all children were classified as sopranos. There were only three widely-used species of voice: soprano, tenor, and bass.

Figure 3.3 Dufay, *Nuper rosarum flores*

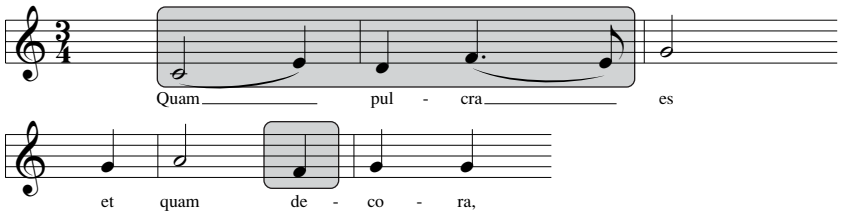


There is no end to examples demonstrating how all music in the classical polyphonic tradition, from the Renaissance onward, has been constructed around shifting from one registral voice to the next, just as the Classical poet does in his compositions, and, in an analogous way, the Classical dramatist.

Guillaume Dufay's polyphonic motet *Nuper rosarum flores,* composed in 1436 for the occasion of the consecration of the great cupola of the Cathedral of Florence, was based entirely around dialogue between the two registers of the boy soprano voice.

The first line of the theme sits in the child soprano's second register, and the second line of the couplet shifts downward into the first register.

FIGURE 3.4 Dunstable, *Quam pulcra es,* at C=256

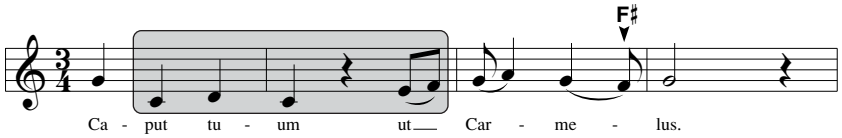


The same practice was also established by the Flemish and English by the early 1400s.

Compositions for boy soprano were constructed around the pivotal F-sharp register shift above middle C=256, with a new voice entering at the F-sharp or G above C=256.

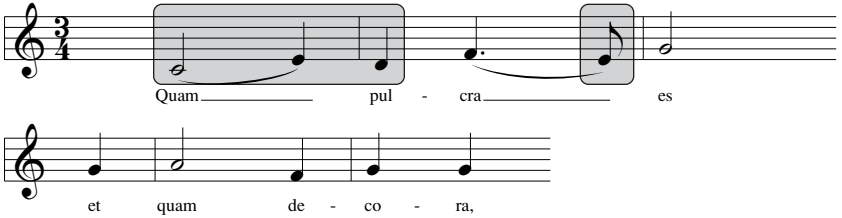
In the example above, the Englishman John Dunstable (d. 1453) placed his emphasis in the soprano line upon the verbal action "es" ("is") by making it the entrance of a new voice. The text, taken from the Song of Solomon, begins with describing the beloved in the first register, "Quam pulcra" ("How beautiful"), and then shifts to the new voice of the second register at "es." Thus it is particularly necessary that the F-naturals be in the first register, so as to distinguish the G following.

FIGURE 3.5 Dunstable, *Quam pulcra es,* at C=256



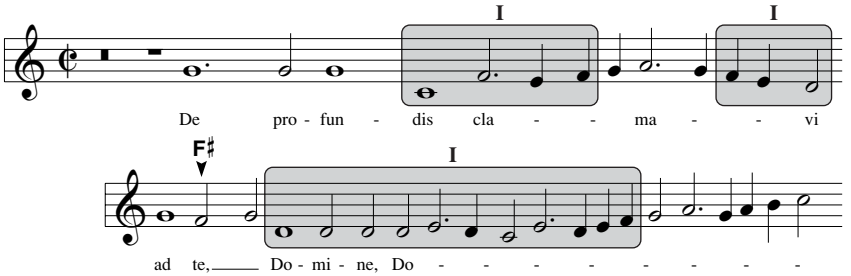
It is also necessary that the initial statement of the F-naturals be sung in the first register, so that the development of the piece at "Caput tuum" ("Thine head upon thee is like Carmel") can make a significant shift at the F-sharp which is known to have been sung at "Carmelus."

FIGURE 3.6 Dunstable, *Quam pulcra es,* at A=440



Higher tunings would move the F-naturals preceding the new voice up into the same register as the F-sharp and the G—so there can be no "new voice." Lower tunings would move the F-sharp, and perhaps even the G, down into the same register as the F-naturals—again, no "new voice."

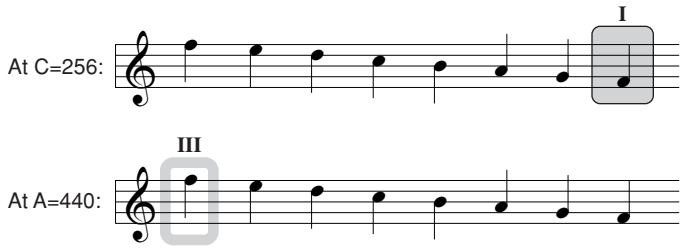
FIGURE 3.7 Josquin des Prez, *De profundis*



Leonardo's contemporary Josquin des Prez (1445–1521) similarly uses a new voice at the critical poetic idea "ad te, Domine" ("to Thee, Lord"), by introducing an F-sharp, again at the register shift into the second register. (Although the F-sharp is not written in the score, there can be little doubt that it was performed as such, according to the rules of *musica ficta,* in order to cadence on the G.)

This is the soprano line of the four-part motet. The words are from Psalm 130: "Out of the depths have I cried unto thee," with "ad te" ("unto thee") placed in the second register.

Figure 3.8 F Major Scale, at C=256 and A=440



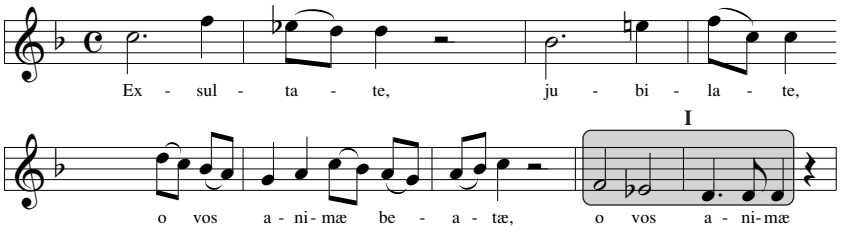
Composers also developed the practice of making a poetic statement in the second register, which resolved or affirmed itself at the end by falling into the first register, usually F-natural or the notes just below.

The configuration of the F major scale shows why the key of F major became a special favorite of Mozart and others for the soprano voice. At C=256, the uppermost note of the first register, F, is like a period at the end of a sentence. All the rest of the scale is in the central, second register.

At A=440, the F major scale is altered radically. The lowermost F is now jammed into the second register, creating a monotone effect at what at C=256 is the major singularity of the first register resolution at the end of the scale.

Also observe that the high F at the top of the scale has been likewise forced up into the third or "head" register, into which this scale is not supposed to enter at all.

Figure 3.9 Mozart, *Exsultate, jubilate,* K. 165



One of Mozart's most well-known concert arias for soprano, *Exsultate, jubilate* was composed in Milan in early 1773 when the composer was 16 years old, for the famous soprano castrato Venanzio Rauzzini.

The repugnant tradition of castration was created by the oligarchs of Venice as a by-product of the Counter-Reformation; but it does serve as a demonstration—albeit a negative one—of the high regard in which the "boy" soprano voice was held during the period 1400–1800. The alternative, practiced in Germany, was to train large numbers of new young boy sopranos each year, and to let newly pubescent youths graduate from sopranohood.

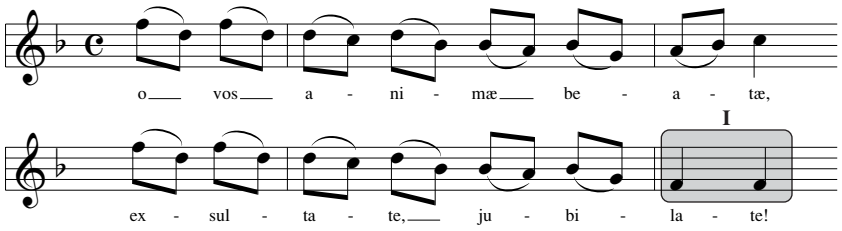
Works composed for the soprano castrato voice, while requiring more power and agility to perform than would normally be expected from a child soprano, nevertheless involve the same compositional considerations as with the child soprano voice.

This is the opening movement of the three-movement cantata. Here, the theme for the composition as a whole is given by the necessary shift on the second poetic phrase, down into the first register:

Exsultate, jubilate! (Exult, rejoice!)—second register
O vos animæ beatæ (O blessed voices)—first register

which is a fine example of Classical poetic statement and apposition.

Figure 3.10 Mozart, *Exsultate, jubilate,* K. 165, at C=256

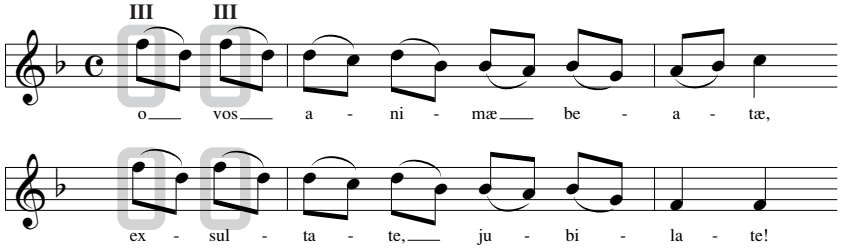


This verse of Movement I again depends for its conclusion on the critical low F in the first register at the end of the phrase:

> O vos animæ beatæ (O blessed voices)—second register
> Exsultate, jubilate! (Exult, rejoice)—first register

which is an example of poetic statement and resolution.

Figure 3.11 Mozart, *Exsultate, jubilate,* K. 165, at A=440



At A=440 the critical resolution at the end of this last couplet in Movement I is forced up entirely into the middle register, thereby reducing it to only one poetic voice.

The Soprano Third Register

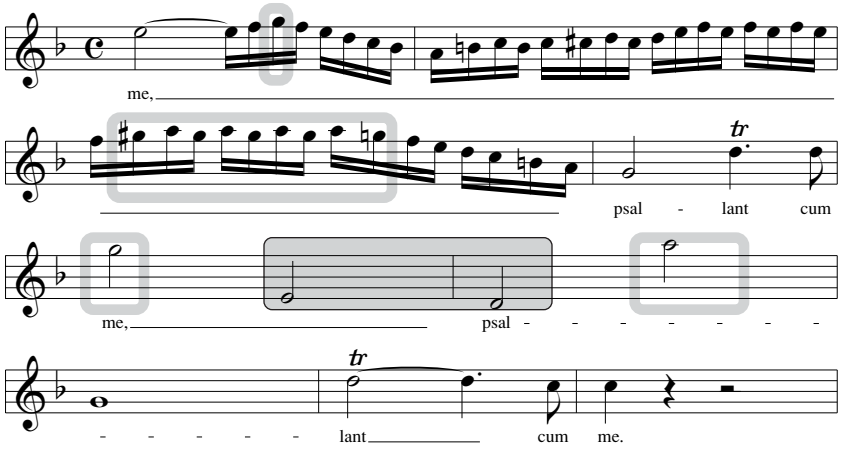
J.S. Bach and Mozart especially developed the use of the high third register in the child soprano voice.

Referring back to Figure 3.1, notice on the right-hand side, that when we add a second C scale ascending from C=512 to C=1024, there is an additional shift, again between C–D–E–F and G–A–B–C, this time at the high G at the top of the staff. This is called the third register in the soprano voice.

Observe that in order for this crucial symmetry to exist, the F at the top of the staff must remain down in the second register, with only the G shifting to the third register. In the F major scale, for example (see Figure 3.8), at C=256 this symmetry is preserved in all registers, whereas it is destroyed at A=440 when the high F is forced upward into the third register.

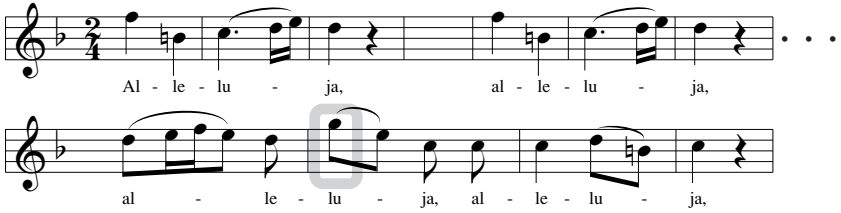
In Figure 3.11 above, for example, at A=440 the opening high F-naturals, which are meant to be passed through rapidly, are forced into the third register and stand out artificially, almost comically. In order to avoid this problem while still performing at A=440, most singers will simply strain the second register upwards and maintain the F in the second register; but ultimately they are defeated in their attempt to remain faithful to the composer's intention, because then the F's tend to take on an unpleasantly shrill quality.

Figure 3.12 Mozart, *Exsultate, jubilate,* K. 165



In this development passage later in the same movement of the composition, we see how powerfully these three distinct registers can act as distinct contrapuntal voices. Working at at C=256, Mozart used only the second and first registers for the opening of the piece (as in Figures 3.9 and 3.10). He reserved the special new emphasis of the third register for this later passage, in which the dramatic jump into that register creates the potential for sudden leaps downward into the first register, and back again. A dense series of singularities such as this does not work unless the different registers are comprehended as distinct musical voices.

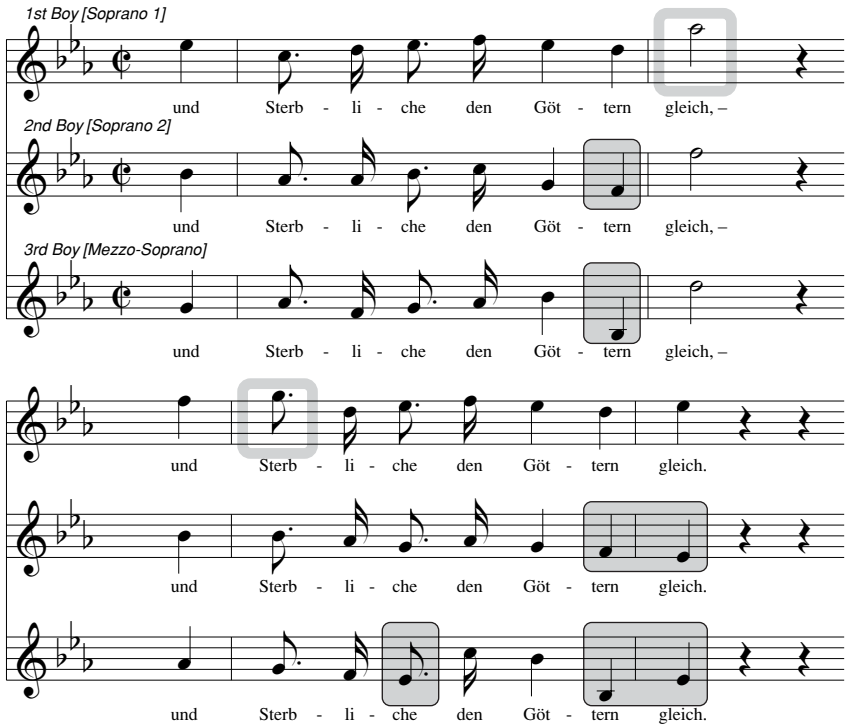
Figure 3.13 Mozart, *Exsultate, jubilate,* K. 165



Mozart deliberately saved a major development highlighting the third register for the third and final movement of the cantata. The effect is ruined at A=440, because the third register would already be introduced in the very first bar sung by the performer.

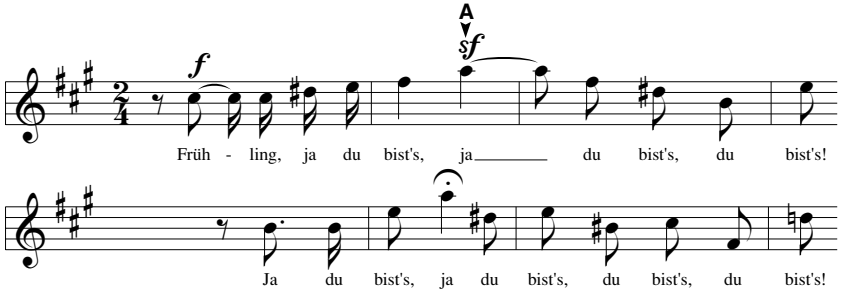
This example, from the opening of the third movement, sung entirely on "Alleluja," is based on inverting the registral relations of the first movement. In the first movement, the poetical statement was in the second register, with a resolution into the first register, whereas here the musical idea is presented in the second register, and is then elevated to a new idea in the third register. The passage is followed by repeated, joyous coloratura runs into the third register. None of these features are evident at A=440.

Figure 3.14 Mozart, "Bald prangt, den Morgen zu verkünden" from *Die Zauberflöte,* Act III, Scene 26, No. 21



In this example for three boy singers, from Mozart's opera *The Magic Flute,* the repeated phrase "und Sterbliche den Göttern gleich" ("and mortals [become] like the gods") is sung first with "Sterbliche" in the second register, and is then shifted up into the third register on the high G. This puts the repeated phrase into a new light.

Figure 3.15 Schumann, "Er ist's," from *Liederalbum für die Jugend,* Op. 79, No. 23

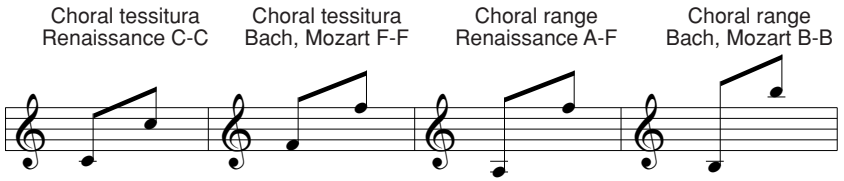


The high A is demanded of the youthful soprano several times in the piece, as shown here. The words mean, "*Yes*, Spring, it is thou!"

Throughout his Opus 79 *Song Album for the Young,* Robert Schumann implicitly advises teachers to start the training of children in this higher range, beginning with the second-to-third register shift, in order to fully elevate the voice into the head. Not only were many of his children's songs pitched quite high, but the first four songs in Opus 79 utilize the second and third registers exclusively.

In his "House-Rules and Maxims for Young Musicians," published in connection with Opus 79, Schumann advised children to pay good attention to all the species of the human voice and their registers: "You should early come to understand the compass of the human voice in its four principal species. Listen to it in the chorus; seek to discover in which intervals lies its principal strength and through which of them it best expresses softness and tenderness. . . . Try to sing at sight, without the help of an instrument. . . . If you possess a sonorous voice, however, do not lose a moment's time but cultivate it immediately, and look upon it as a most precious gift bestowed by Heaven. . . . Lose no opportunity for making music in company with others, in duos, trios, etc. This will render your playing more fluent and sweeping. Accompany singers oftentimes. . . . Regularly sing in choruses, especially the middle voices. This will make you musical."

Figure 3.16 Characteristics of the Child Soprano Voice

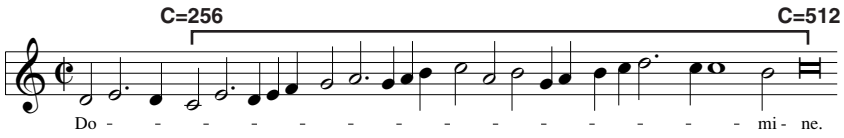


In addition to the primary characteristic of the register shift, which defines the species of each human voice species, each species has its secondary characteristics: tessitura, range, and color.

"Tessitura," from the Italian *tessere,* "to weave," refers to the strongest part of a cloth upon the loom, the area where the warp and weft meet in the center. It indicates the area of the scale where a voice is strongest, "feels comfortable," or sings most frequently.

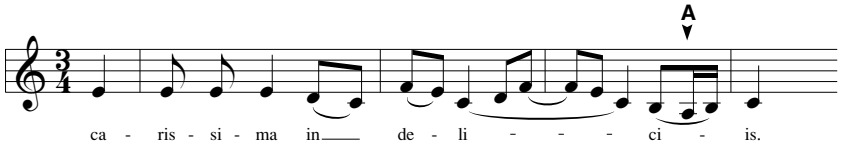
Choral range indicates the extreme low and high notes which the average chorus member is expected to sing. Solo range indicates the extreme low and high notes of the trained soloist.

Figure 3.17 Josquin des Prez, *De profundis*



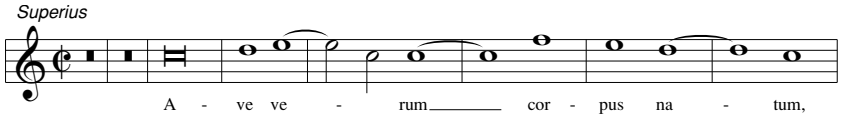
Most of the tessitura of the vocal passagework in the average boy soprano choral part of the Renaissance, sits squarely within the octave from C=256 to C=512. The register shift divides the soprano's tessitura precisely in half.

Figure 3.18 Dunstable, *Quam pulcra es*



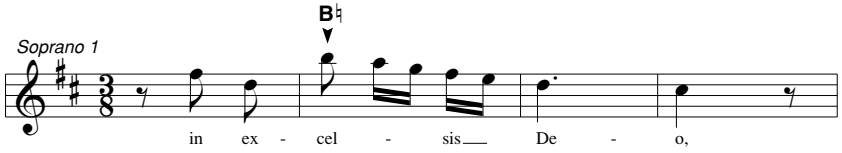
The full range of the boy soprano voice extended in Renaissance repertoire from the A below C=256, to the E or F above C=512.

Figure 3.19 Josquin des Prez, *Ave verum corpus*



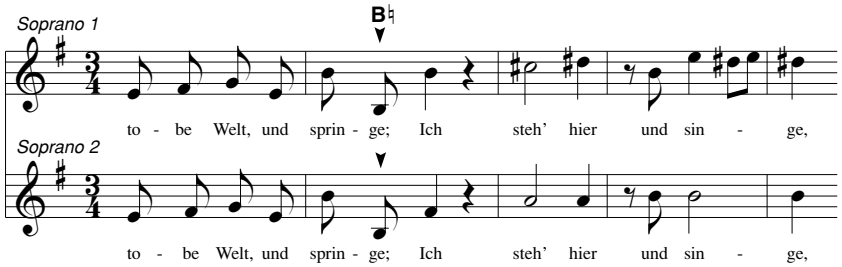
It was reportedly the great Josquin who first extended the soprano range from the D of the 1400s to the F above C=512.

Figure 3.20 J.S. Bach, "Gloria" from *Mass in B Minor,* BWV 232



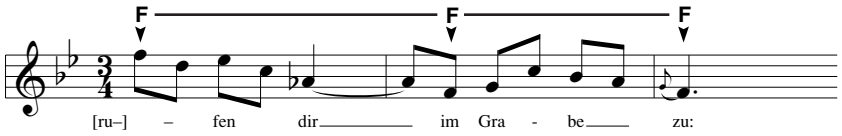
By the generation before J.S. Bach, in the late seventeenth century, composers had discovered how to utilize and develop the third register in sopranos, including children. J.S. Bach extended the choral and solo range of the child soprano to the high B-natural above the staff.

FIGURE 3.21 J.S. Bach, *Jesu, meine Freude,* BWV 227



The range of the choral soprano part in J.S. Bach's compositions extends up to a high B-natural (Figure 3.20) and down to the B-natural two octaves below.

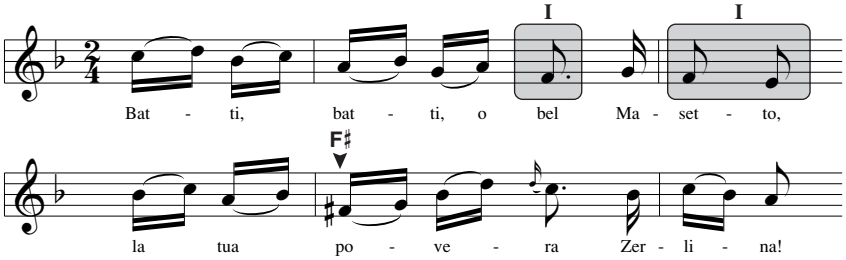
FIGURE 3.22 J.S. Bach, "Wir setzen uns mit Tränen nieder" from *St. Matthew Passion,* BWV 244, Part II, No. 68



Bach took advantage of this to raise the tessitura of the average soprano line to the octave from F to F above C=256. The characteristic soprano tessitura in the eighteenth century is in the range of F above middle C to the F above.

The Adult Soprano Voice

FIGURE 3.23 Mozart, "Batti, batti" from *Don Giovanni,* Act I, Scene 4, No. 12



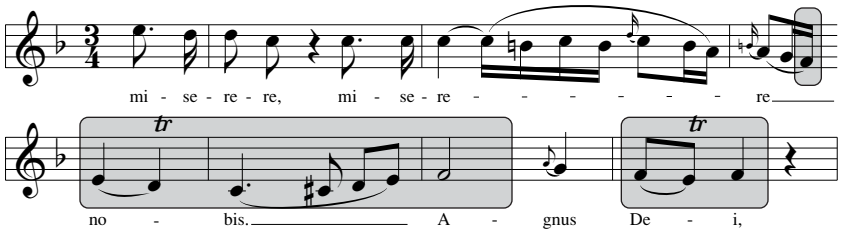
The adult soprano has the same register shifts as the child soprano, at the F-sharp above C=256 and the F-sharp above C=512.

Adult females were allowed to sing solo roles in opera and in some churches during the seventeenth century. In churches, however, women were only allowed to sing in choruses in Germany after about 1750, although they were admitted into choruses somewhat earlier in England and Italy.

The example above indicates another way of utilizing the central role of register shifts. The statement of the theme is in the ironic double-voicing of "Batti, batti" ("beat [me], beat [me]") in the second register, separated by a comma from the following "bel Masetto" ("nice Masetto") in the first register.

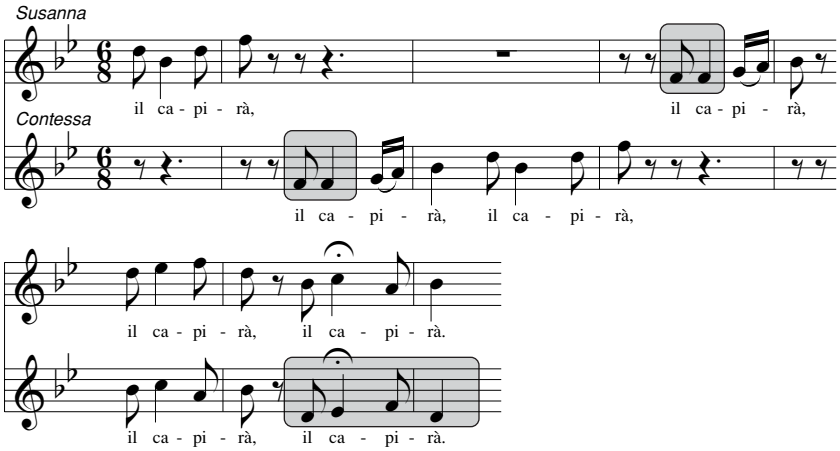
In the second line of the couplet, the F is raised to F-sharp, in keeping with a new idea with a new voicing, all in the higher register, referring to "your poor Zerlina." This is doubly ironic, since "poor Zerlina" has left Masetto on their wedding day for the degenerate Don Giovanni, and she is nowhere near as sweet and fine as her charming light second register line pretends.

Figure 3.24 Mozart, "Agnus Dei" from *Mass in C Major* ("Coronation"), K. 317



The use of the adult soprano voice brought new emphasis to the importance of the first register. It was readily observed that the most dramatic difference between adult female registers was the richer, deeper sound of the first register, in comparison with the softer tones of the adjacent lower part of the second register.

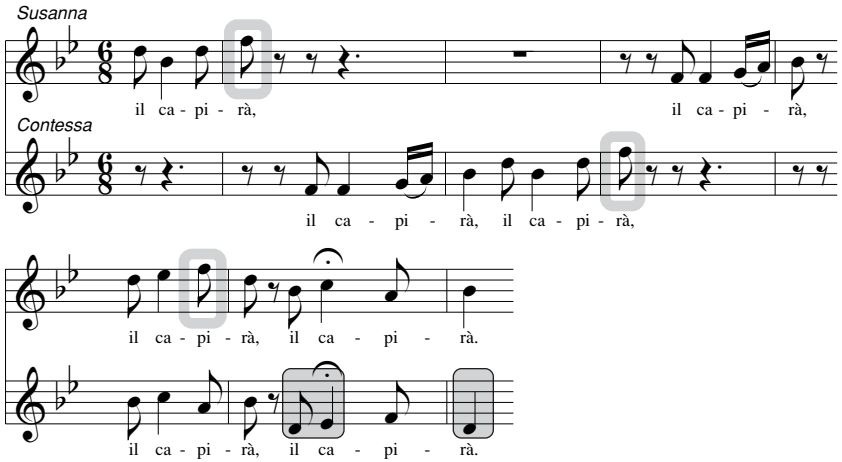
Figure 3.25 Mozart, Duet "Sull'aria" from *Le nozze di Figaro,* Act 3, Scene 10, No. 20, at C=256



Mozart had great fun with the first-to-second register shift when he wrote for two sopranos together. In this riotous duet, the two ladies plot to exchange gowns and trick the lord of the manor in the garden, and at the end assure each other that "Il capirà" ("He'll get it"—i.e., the joke).

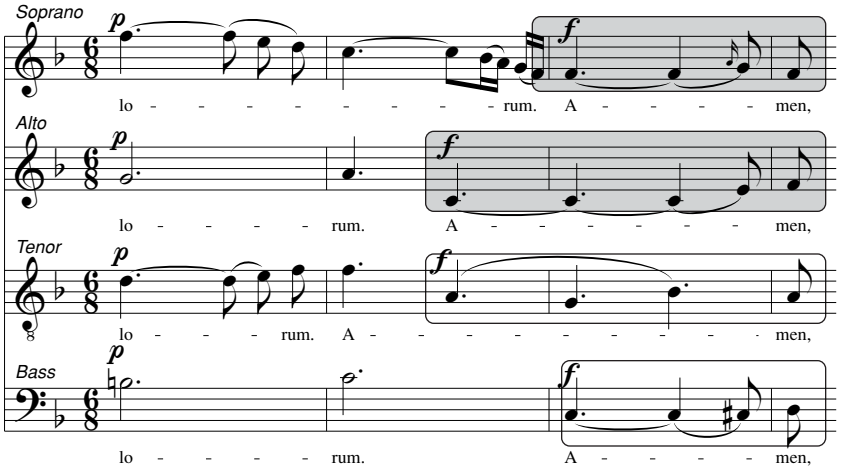
At C=256, the two soprano soloists use the more chesty quality of the first register on "Il capirà" to accent its irony. The Countess, the older of the two, sings it first in her characteristically more dramatic voice, and then Susanna, the servant girl who usually sings more lightly, imitates her mistress comically.

Figure 3.26 Mozart, Duet "Sull'aria" from *Le nozze di Figaro,* Act 3, Scene 10, No. 20, at A=440



At A=440, this double entendre is all but erased. The low register accent on "Il capirà" is gone, and replaced by third register shifts on either its second or its final syllable. Susanna's comic imitation of the Countess is obliterated. Since the republican Mozart based the entire opera on the ability of the more ingenious commoners Figaro and Susanna to outwit and educate their lord and lady, this is a good example of how the wrong tuning pitch can destroy a composer's intentions.

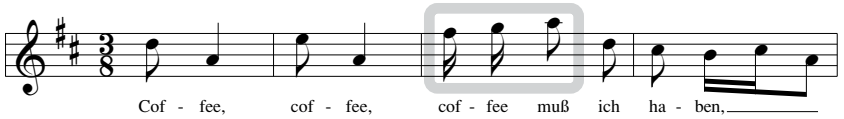
Figure 3.27 Mozart, "Laudate Dominum" from *Vesperæ solennes de confessore,* K. 339



Mozart was so pleased with the poetic declamation possible with this use of the soprano first register that he extended it to entire soprano choral sections. The final "Amen" of the benediction is set off from the preceding word, "in sæcula sæculorum" ("world without end"), by the sopranos' descent into the low register. Observe that the lower voices (alto, tenor, and bass) also shift into the low register at this point.

Even a cursory survey of the extent to which all music from Mozart's time onward was based explicitly on this differential between the F-natural in one register, and the F-sharp in a higher register, makes clear that those who forced the pitch upwards beginning in the nineteenth century, did so in full knowledge of its implications for effacing that distinction.

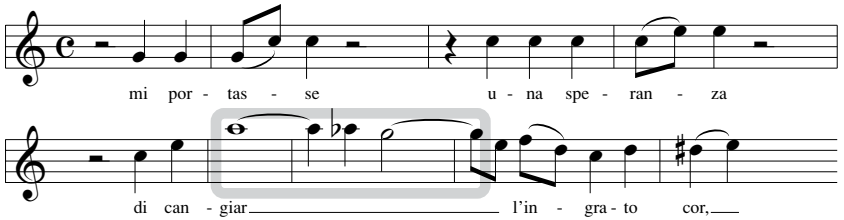
Figure 3.28 J.S. Bach, *Coffee Cantata,* BWV 211



The adult soprano's shift from the second to the third register is also used to indicate major poetic changes.

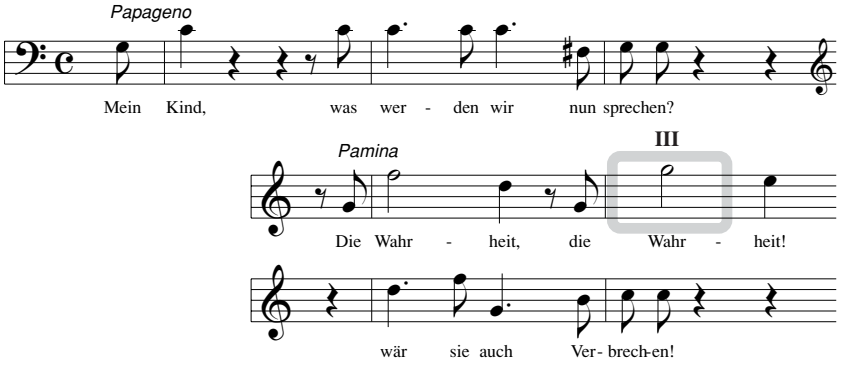
Bach's humorous *Coffee Cantata* is one of many such examples. When the young Lieschen demands her coffee, she does so twice at the top of the second register (D and E), and then underlines her insistence by singing most of the third repetition in the third register (F-sharp–G–A).

Figure 3.29 Mozart, "Dove sono" from *Le nozze di Figaro,* Act III, Scene 8, No. 19



The lyrics mean ". . . should bring me a hope to change his ungrateful heart." The shift into the third register occurs with the verb "cangiar" ("to change").

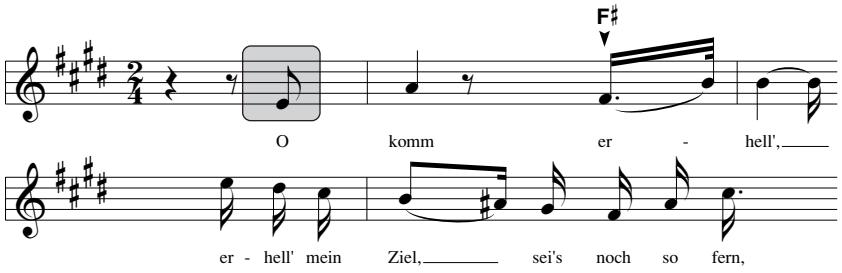
Figure 3.30 Mozart, *Die Zauberflöte,* Act I, Scene 17, No. 8



This example shows how an entire extended work can be centered around the new voice which enters at a vocal register shift. The princess Pamina insists she must tell Sarastro the truth, "die Wahrheit," even if her escape from imprisonment by Sarastro's malevolent servant is a crime under what she imagines to be Sarastro's law. Pamina's response contrasts with the fearful Papageno (a baritone), who asks: "My child, what are we going to say now?" Her response is constructed in C major, such that the first "die Wahrheit" is sung on F-natural, followed by a restatement on a high G in the third register. This register shift sets the stage for the entrance of the philosopher-king Sarastro, and is thus the turning point of the entire opera, when we are obliged to rethink the "media line" about a good Queen of the Night who has been so unjustly wronged by the evil Sarastro. Modern performances at A=440 obscure this transition, by forcing both the F and the G into the third register.

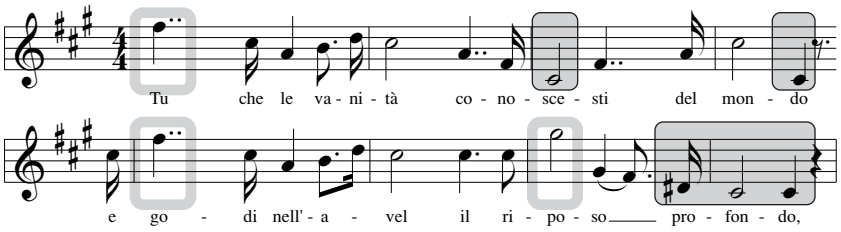
There is an exactly parallel development of register shifts in the instruments of the orchestra at this point in the opera.

Figure 3.31 Beethoven, "Abscheulicher! Wo eilst du hin?" from *Fidelio,* Act I, Scene 6, No. 9



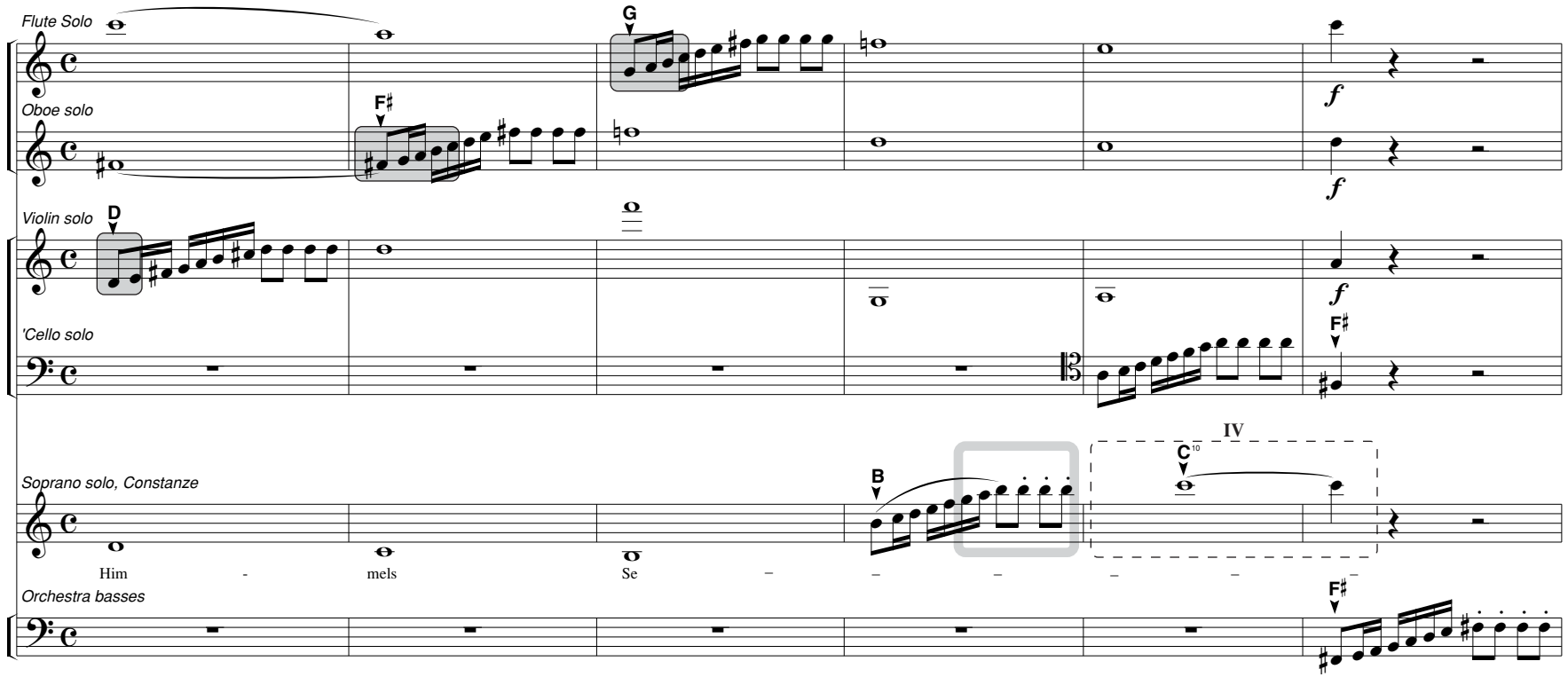
Every great vocal composer through the turn of the twentieth century used this registral principle. Beethoven in his opera *Fidelio* constructed this aria to reveal the heroic character of Leonore, around the emotional distinction between the rich low E ("Come [hope!]") in the first register of the dramatic soprano, and the lighter F-sharp ("illuminate my goal") in the second register.

Figure 3.32 Verdi, "Tu che le vanità" from *Don Carlo,* Act IV



Similarly, Giuseppe Verdi's final statement for Friedrich Schiller's heroine, Queen Elizabeth, draws the moral point of the opera, and is entirely based around the F-sharp shifts, both high and low. In the phrase, "Thou, who didst know the vanities of the world, and who enjoyest the deep repose of the tomb," the words "thou," "enjoyest," "repose," are in the third register, while for "know," "world," and "deep," Verdi brings the soprano low into her first register.

Figure 3.33 Mozart, "Martern aller Arten" from *Die Entführung aus dem Serail,* Act II, Scene 3, No. 11



Mozart also extensively developed the contrapuntal use of the high range of the soprano soloist, especially the poetical use of the soprano's fourth or "super-high" register, known also as the "bell" register.

During the seventeenth century, the castrati in Italy had developed the ability to sing extremely high florid passages from high C=1024 and above, and female soloists had begun to imitate these (see Figure 3.44). Handel had developed this fourth register from the realm of mere gymnastics into a new voice for expression of poetic ideas, and Mozart wrote arias based around this fourth voice, in a range extending to the G above high C.

In C=256 tuning, the fourth register begins on C=1024, and not on the high B-flat or B-natural as is taught in modern pedagogy, adjusted as it is to higher tunings of A=440 and above.

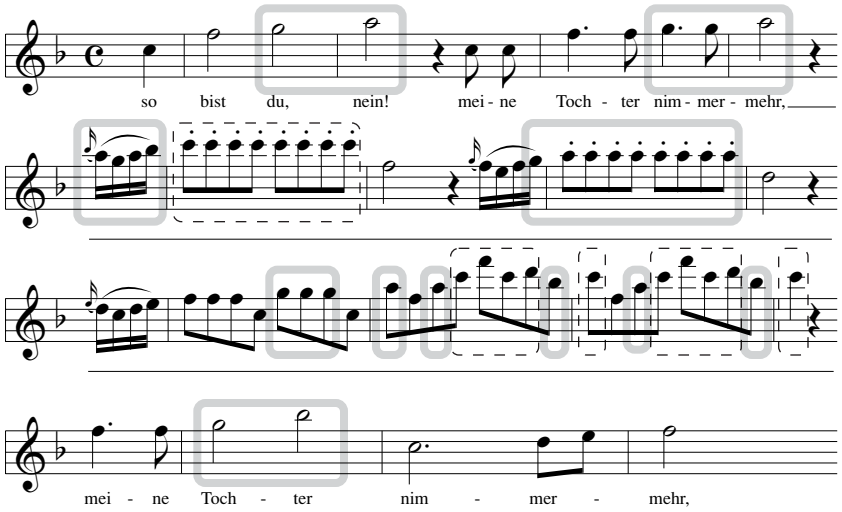
The aria cited above, from Mozart's *Abduction from the Seraglio,* requires the soprano to hold the B-natural in the third register, and to enter into the new register only on the high C. This can be seen from the parallel register and phrasing shifts which occur in these passages with the solo flute, oboe, violin, and violoncello in the orchestra, which along with the soprano soloist constitute a solo quintet.

In the first measure of the example, the violin solo plays a D major

scale up to the repeated D at the end of the bar, which leads to the cross-voice of the entering oboe on the F-sharp at the downbeat of the next bar. Each succeeding voice enters in the same way in the succeeding measures, with cross-voices on F-sharp–G, G–B, B–A, and finally A–F-sharp, all on the first beat of each measure. The soprano, as a member of the quintet, must shift registers at the downbeat high C as part of this process.

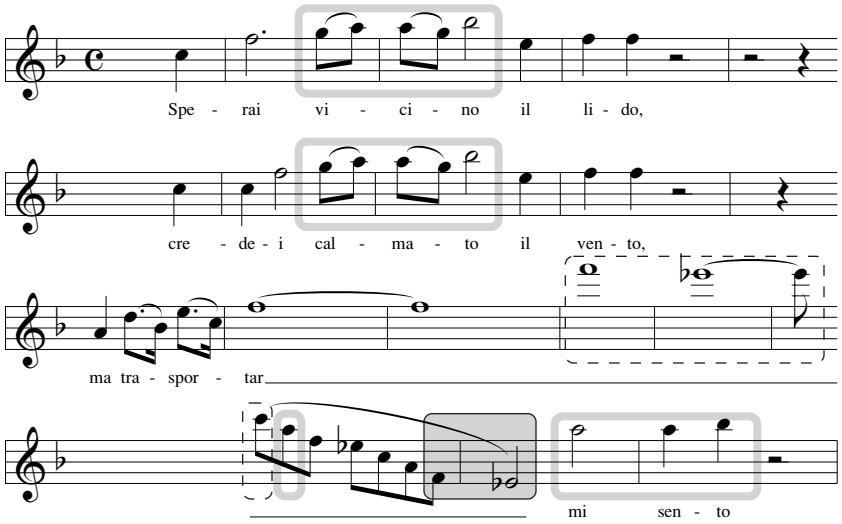
As will be analyzed further in Book II, many of the solo instruments likewise have register shifts on the first beat of each measure here.

FIGURE 3.34 Mozart, "Der Hölle Rache klopft in meinem Herzen" from *Die Zauberflöte* , Act II, Scene 7, No. 14



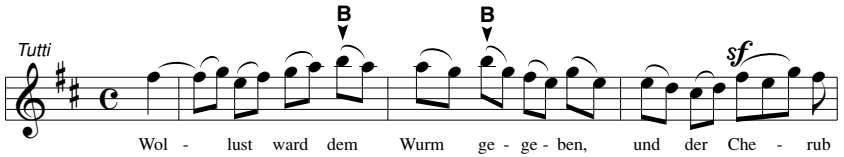
Mozart uses a similar device of shifting to the fourth register on a signficant—in this case repeated—note of the phrase to emphasize the witch-like psychological state into which the Queen of the Night has suddenly "flipped." At the entrance of the high C, she is heard to laugh in a new voice, as though her evil intentions all along had suddenly come out.

FIGURE 3.35 Mozart, *Sperai vicino il lido,* K. 368



Lest the Queen of the Night's infamous high passages be considered extraordinary, it should be pointed out that Mozart wrote even more sustained fourth register passages, especially in his concert arias. This one, composed for his wife's sister Aloysia Weber, makes a shift into the fourth register by suddenly jumping a full octave, from F in the second register to the F above, on the verb "trasportar" ("I feel myself transported").

Figure 3.36 Beethoven, *Symphony No. 9,* Fourth Movement



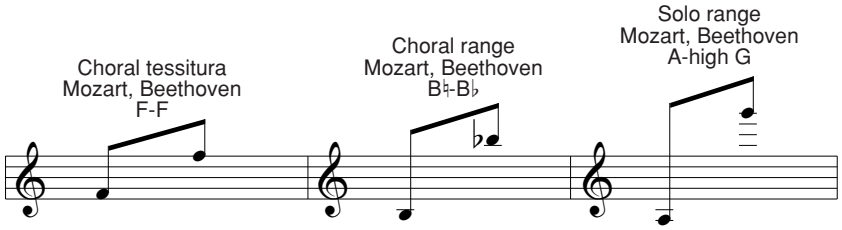
The necessity to defer the shift into the "super-high" until the high C=1024 is also clearly seen from these measures from the choral finale of the last movement of Beethoven's Ninth Symphony. The entire soprano choral section is expected to execute a succession of B-naturals as a passing note. No choral director would ever expect an entire soprano choral section to execute a register shift at such a point (even though such vocal acrobatics were indeed demanded of soprano soloists, as seen in Figure 3.34). At A=440, however, there is hardly a soprano alive who can keep a high B-natural in the third register without her voice cracking.

The fourth register should not be the peculiar domain of exceptional voices, but should be the common property of all soprano voices. When the voice is properly placed, the fourth register develops naturally in the majority of adult sopranos to a D or an E above high C or beyond. The F-sharp above the high C is common in the fully trained light soprano voice.

Thus, the trained light soprano solo voice is frequently capable of a full range of three octaves, from the G above C=128 to the G above C=1024.

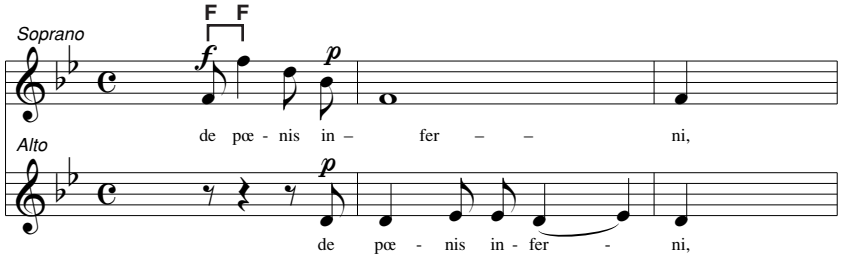
Dozens of standard Classical opera roles for soprano require singing in the fourth register. Famous such roles include the sorceress in Handel's *Rinaldo,* the angel Gabriel in Haydn's oratorio *Die Schöpfung* (*The Creation*), both Blondchen and Constanza in Mozart's *Entführung aus dem Serail,* Fiordiligi in Mozart's *Così fan tutte,* both sopranos in Mozart's *Der Schauspieldirektor,* Elektra in Mozart's *Idomeneo,* the Seraph in Beethoven's *Christus am Ölberge,* and two dozen more of the famous heroines of operas by Donizetti, Bellini, Verdi, and Rossini.

Figure 3.37 Characteristics of the Adult Soprano Voice



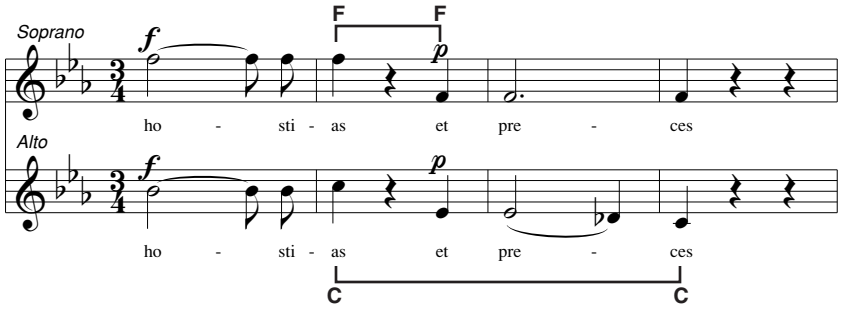
In choral composition, the adult soprano has the same tessitura and range as the child soprano. The higher tessitura for the soprano on the octave F–F, as well as the range from the low A to the high B-natural, established by J.S. Bach for the boy soprano, were retained by Mozart, Beethoven, and Brahms in most writing for the average choral adult soprano voice.

Figure 3.38 Mozart, "Domine Jesu" from *Requiem,* K. 626



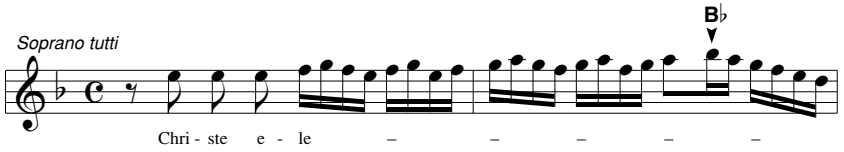
The soprano line has a tessitura between F and F.

Figure 3.39 Mozart, "Hostias" from *Requiem,* K. 626



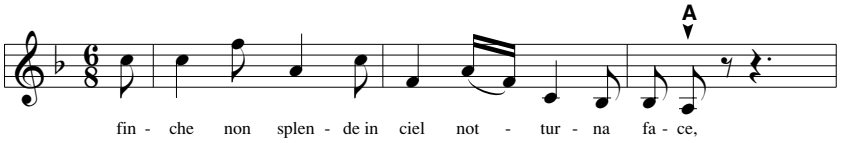
The soprano tessitura of F–F contrasts with the alto (mezzosoprano) tessitura of C–C. This particular passage makes it clear that by Mozart's time, the tessitura of C–C, which had been the soprano staple tessitura for 300 years in the Renaissance, had been transferred to the voice of the mezzosoprano, making it possible to establish four distinctly different choral voices.

Figure 3.40 Mozart, "Kyrie" from *Requiem,* K. 626



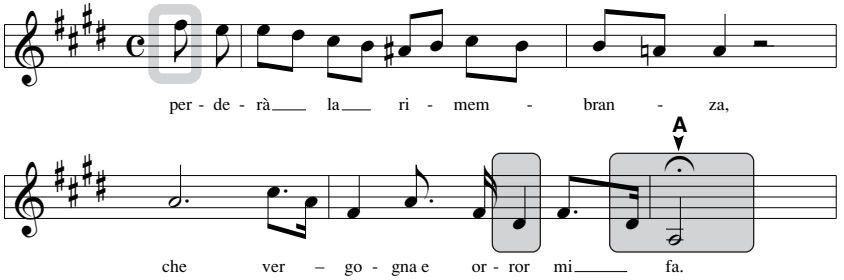
The passage shows Mozart's established practice of keeping entire soprano choral passages at the very top of the second register, in order to maintain the widest possible separation of voices. He also expected choral sopranos, as did Beethoven, to sing B-flat and B in the third register.

Figure 3.41 Mozart, "Deh, vieni, non tardar" from *Le nozze di Figaro,* Act IV, Scene 10, No. 27



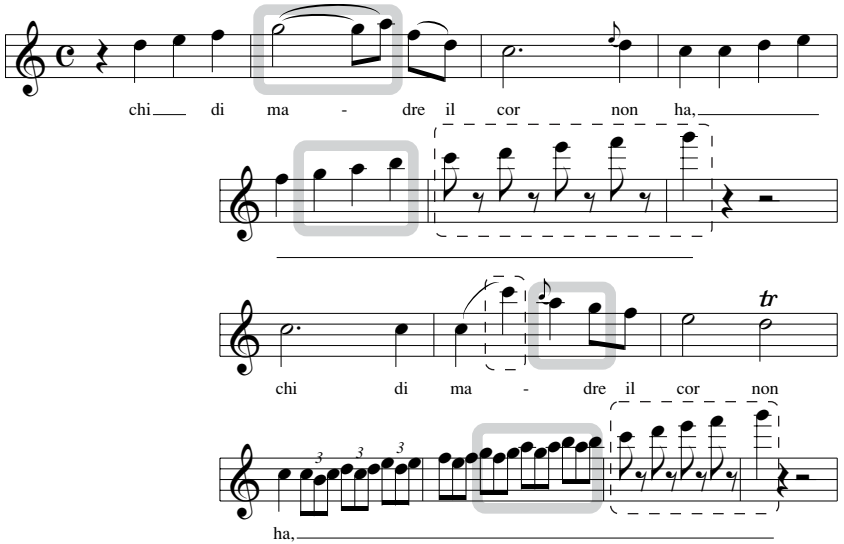
While boy sopranos did descend to low A below the staff, Mozart in solo composition often emphasized this lower region of the adult soprano voice because of its strong change in register color.

Figure 3.42 Mozart, "Per pietà" from *Così fan tutte,* Act II, Scene 7, No. 25



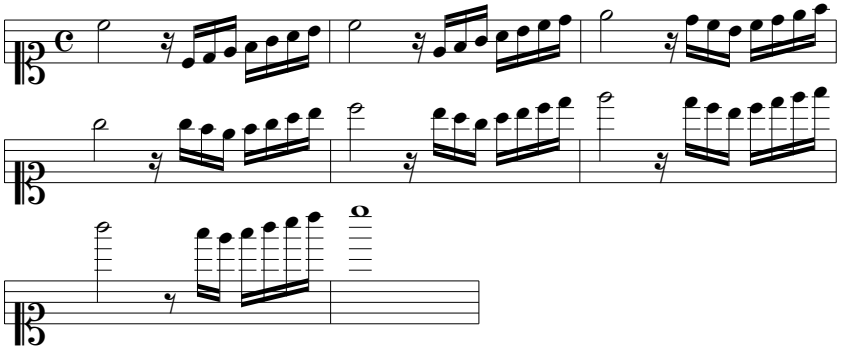
Both this and the previous example show the lowest note which Mozart wrote for the soprano soloist, A below middle C.

FIGURE 3.43 Mozart, *Popoli di Tessaglia!* K. 316



This passage from another of Mozart's concert arias for Aloysia Weber, features a high G above high C—one full step higher than the fabled F of the Queen of the Night. Such a passage is virtually impossible at A=440, which is why this and other of Mozart's concert arias are rarely sung today.

FIGURE 3.44 "La Bastardella" of Parma, Transcribed by Leopold Mozart



Voices are so poorly trained today, and pitches set so absurdly high, that our culture has lost memory of the full potential of the singing voice. Here is a passage written down by Mozart's father Leopold as it was sung in Parma in 1770 by Lucrezia Agujari (1743–83), known as "La Bastardella," who sang in London and throughout Europe. Leopold Mozart's letter reads: "At Parma we made the acquaintance of a singer whom we heard sing very beautifully in her own house. She is the celebrated Bastardella, who has (1) a beautiful voice, (2) a rapid execution, and (3) can reach an incredibly high note. She sang the following notes and passages in my presence."

The high note is a C=2048, one full octave above normal high C=1024.

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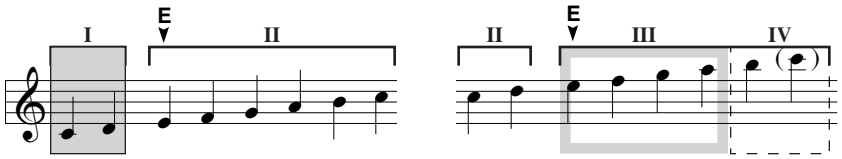
CHAPTER 4

The Mezzosoprano Voice

FIGURE 4.1 Mezzosoprano Division of the C=256 Major Scale

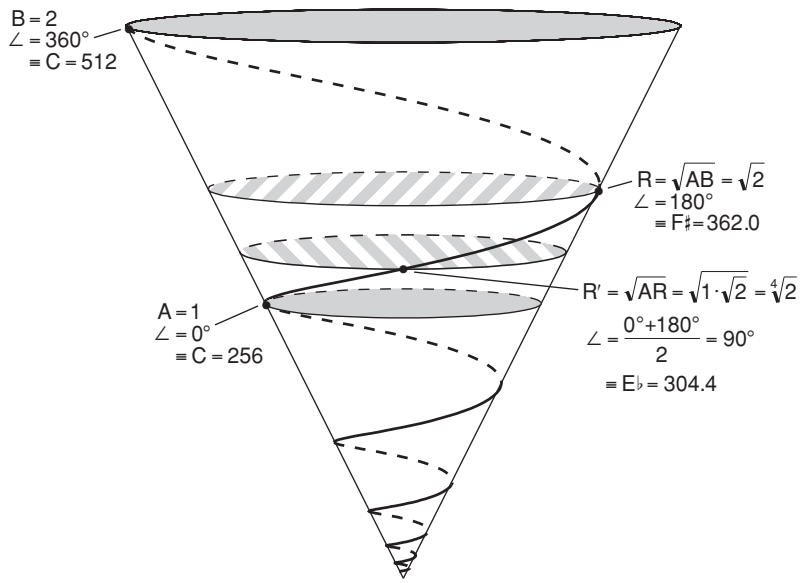


The mezzosoprano voice is much more rare than the soprano voice. All children start out as sopranos, but after approximately age ten, about 15–20 percent of all children's voices drop somewhat, making them mezzosopranos from that point until puberty three to five years later, when the voice changes again (in both girls and boys). Following puberty, about 15–20 percent of women are mezzosopranos.

The primary characteristic of the mezzosoprano voice species is a register shift at E-natural between the first and second, and the second and third registers.

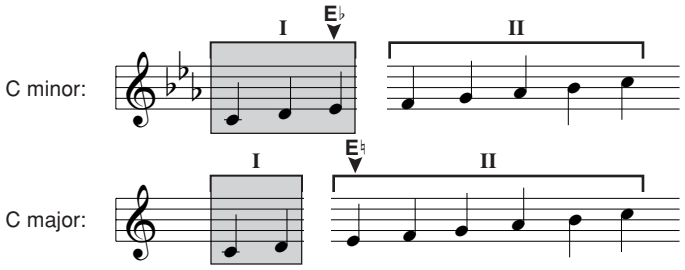
J.S. Bach's introduction of the mezzosoprano voice in the eighteenth century represented a major advance in classical polyphony. For the three centuries following the establishment of Classical bel canto during the Florentine Golden Renaissance, composers had been limited to only three voice species: soprano, tenor, and bass. The introduction of the new mezzosoprano E-flat–E-natural register shift made available, for the first time, *four* degrees of musical freedom, laying the groundwork for Mozart and Beethoven's subsequent breakthroughs (see Figures 12.18–12.22).

FIGURE 4.2 Geometric Construction of the Mezzosoprano Register Shift



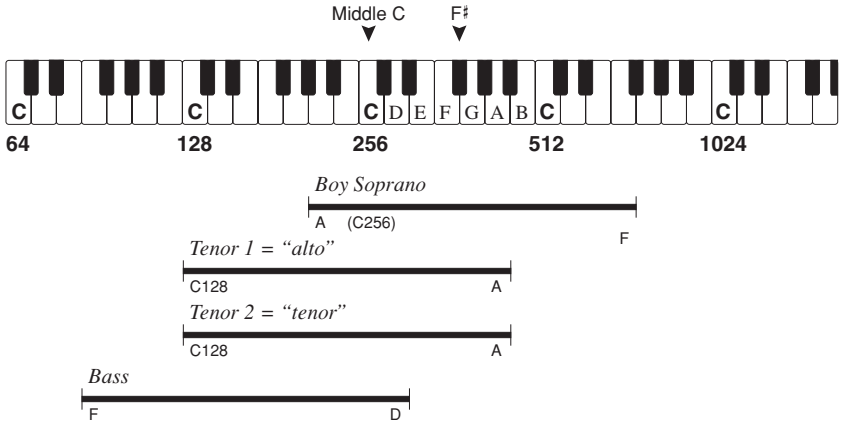
While the upper boundary of the soprano's register shift is at F-sharp, which is the geometric mean of the octave from C=256 to C=512, the lower boundary of the mezzosoprano's register shift is E-flat, which is the geometric mean of the same octave when measured from C=256 to the F-sharp above. The F-sharp occurs at a rotation of 180 degrees, half the octave, while the E-flat occurs at the 90-degree rotation. As in Figure 1.8, movement upward along the cone's axis represents increase in frequency, while each cross-section represents a musical tone generated by the self-similar conical spiral action.

FIGURE 4.3 Mezzosoprano Division of the C Minor Scale



Just as the soprano register breaks divide the C–C octave into two tetrachords, such that the lower tetrachord C–F lies in the lower register and G–C in the upper, so the mezzosoprano voice divides the *fifth* into two parts, such that that the minor third C–E-flat lies in a different register than the upper minor third E–G. The difference in color between the mezzosoprano's E-flat and E-natural makes this voice suitable for emphasizing shifts between C major and C minor, just as the soprano voice is used to emphasize the relation between the subdominant (G) and the dominant (G) in the domain of C major/minor.

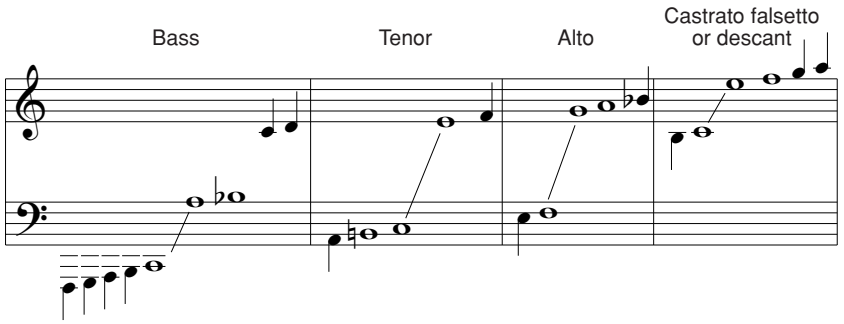
FIGURE 4.4 The Three Species of Renaissance Voice



It was not until the early eighteenth century that the mezzosoprano voice was formally recognized in written music.

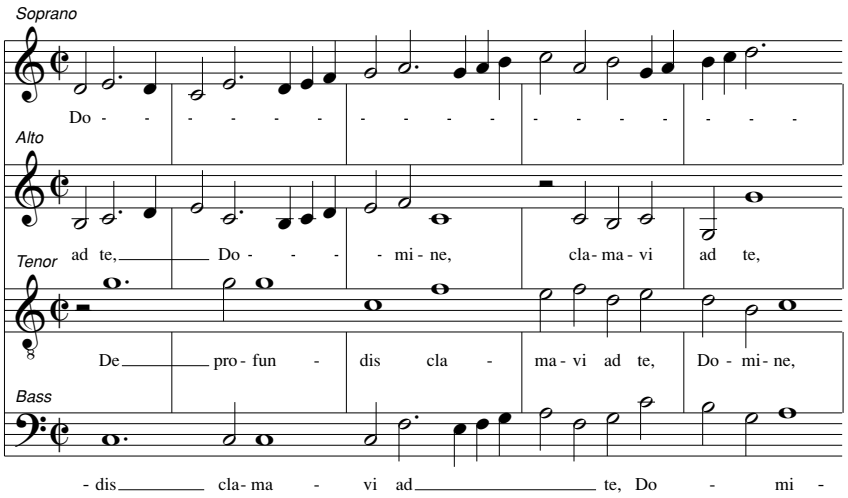
In the medieval church, polyphony was limited to only three "degrees of freedom," three different possibilities of registration and vocal color. Up through the late seventeenth century, only male voices were allowed in Catholic liturgical music: boy soprano, tenor, and bass. As has been noted earlier, the term "alto" referred to men who sang the higher tenor vocal line; it did not describe the species or type of voice the person had, but rather which line he sang.

FIGURE 4.5 Michael Praetorius, Chart of Human Voices



This chart, from Michael Praetorius's 1619 *Syntagma Musicum,* indicates that as late as that time, the major species of singing voice were considered to be the bass, the tenor and alto-tenor (both of whom were male tenors), and the descant (superius) or soprano, sung by boys or castrati. During the 250-year span of 1400–1650, almost no written music survives which was composed expressly for women or children as mezzosopranos, with a known register shift on E-natural.

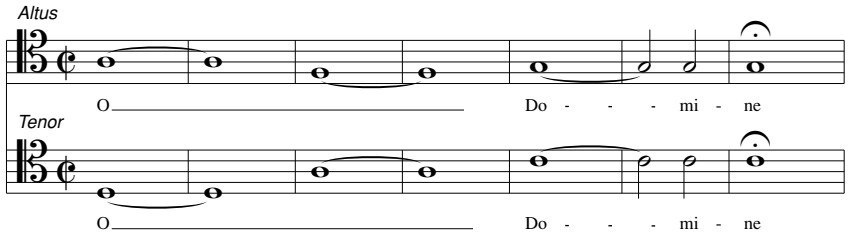
FIGURE 4.6 Josquin des Prez, *De profundis*



This example from Josquin des Prez (ca. 1520) shows the standard official Renaissance church choral format of soprano, tenor-alto, tenor, and bass.

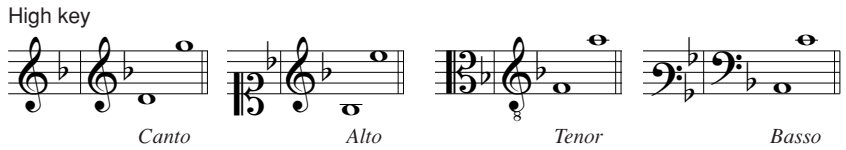
The alto line lies almost exactly in the modern tenor's range.

FIGURE 4.7 Josquin des Prez, *O Domine Jesu Christe*



The fact that Renaissance altos were tenors, is underscored by the use of the tenor clef for both alto and tenor.

FIGURE 4.8 Thomas Morley's Compass of Voices

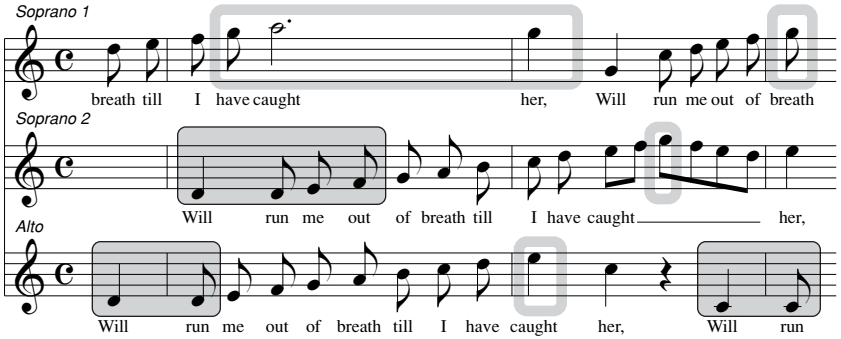


Although women were banned from polyphonic church music, educated women sang privately and in secular polyphonic settings such as madrigals. The mezzosoprano voice was therefore probably known for centuries before printed music appeared for it.

The chart is from Thomas Morley's *A Plaine & Easie Introduction to Practicall Musicke* (1597), which was assembled at a point when the division between sacred and secular music was becoming less strict. The range Morley gives for the alto is given in soprano clef, and is far too high for any male tenor, even a falsettist, extending to an E above C=512.

Morley wrote many madrigals for women to sing in secular settings. His textbook, although it never explicitly mentions women's voices, contains an exercise in six voices, with an alto part extending to this same high E.

FIGURE 4.9 Thomas Morley, *I follow, lo, the footing*

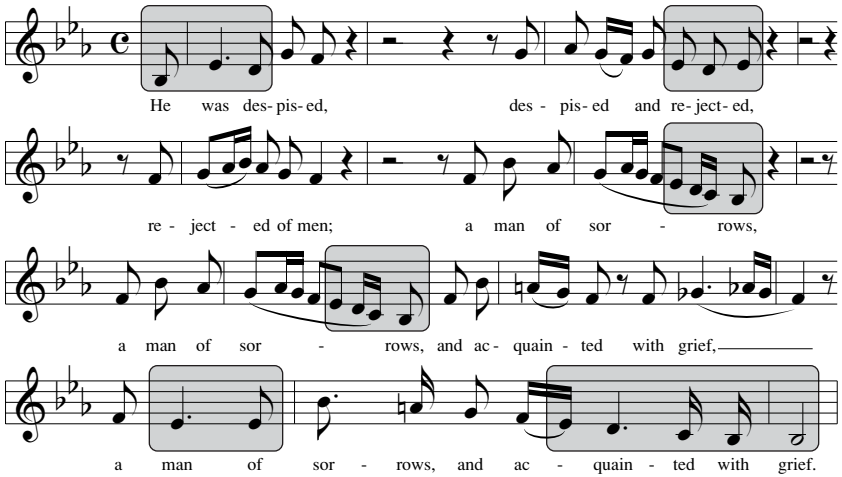


This secular madrigal by Morley is meant to be sung by a mixed ensemble including at least an adult female mezzosoprano on the alto part, and probably adult female first and second sopranos. The poem's theme makes it unsuitable for children. As the two soprano lines ascend to their third register on the high G, the alto line answers by rising to the high E, appropriate to the mezzosoprano's shift into the third register on E-natural.

In Italy during the early sixteenth century, some educated women, such as Leonardo da Vinci's collaborator Isabella D'Este, are known to have sung in secular settings, as paintings of the period show. Private *concerti delle dame* (all-female choirs) were formed, as well as mixed *concerti a voce piena* (full-voiced choirs). Some of Josquin's secular works, such as *Cœur desolez,* contain alto lines which seem to indicate a true mezzosoprano register shift.

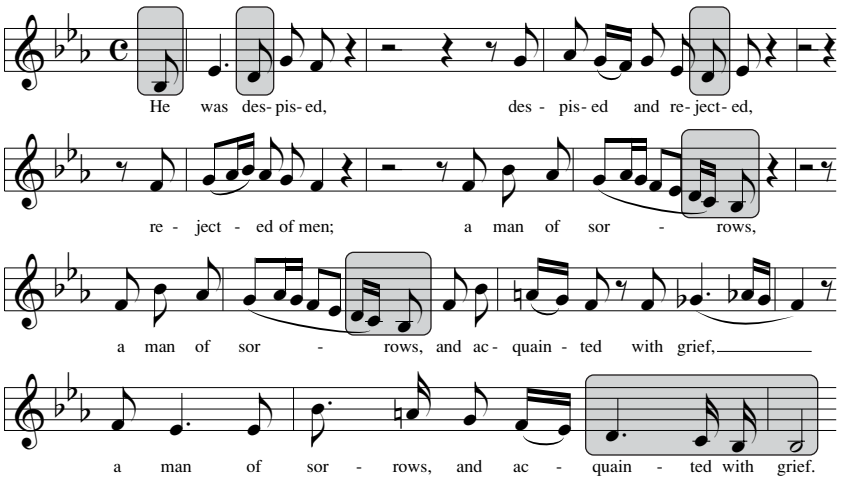
It was only after 1537 that the Roman Church banned women from all choral singing in church services, and began to allow the use of castrati to sing both soprano and mezzosoprano parts.

FIGURE 4.10 Handel, "He was despised" from *Messiah,* Part II, No. 23, at C=256



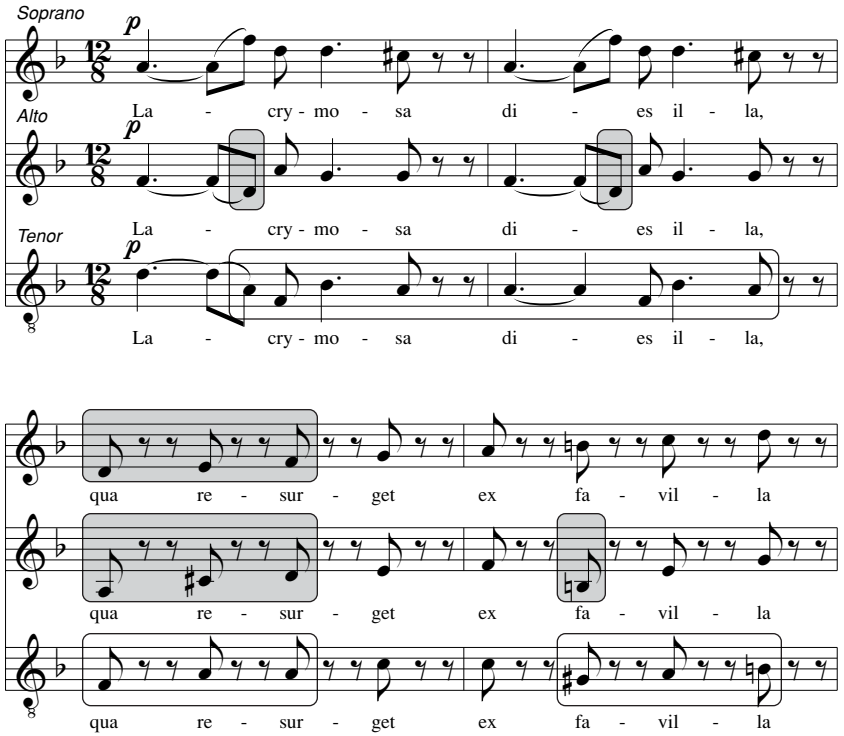
This aria is constructed entirely around the E-natural register shift. Handel set the text in the key of E-flat expressly in order to take advantage of the fact that E-flat and its leading tone D (as on "rejected," at the end of the first line), are solidly in the mezzosoprano's lower register. The drop into the first register on the word "rejected" at the end of the first line, becomes an important thematic element of the aria.

FIGURE 4.11 Handel, "He was despised" from *Messiah,* Part II, No. 23, at A=440



At A=440, the poetry is distorted by obliging the mezzosoprano to force the E-flats up into the second register. The register shifts become arbitrary with respect to the text.

FIGURE 4.12 Mozart, "Lacrymosa" from *Requiem,* K. 626



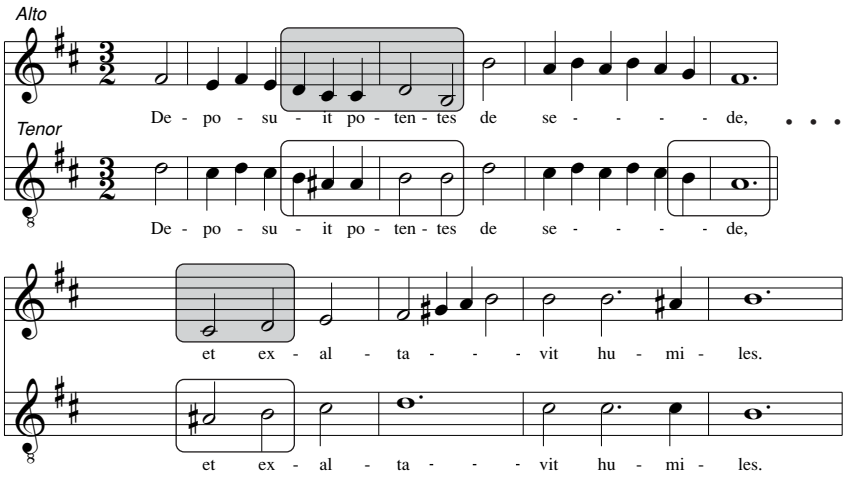
The additional degree of freedom offered up by the E-natural register shift was especially welcomed by composers for polyphonic choral settings of four distinct voices with four distinct register shifts.

Because the E-natural register shift is exactly one whole step below that of the soprano, it affords the possibility for composers to coordinate the register shift among as many as three voices simultaneously.

In this example, the sopranos, the altos (sung by mezzosopranos), and the tenors shift simultaneously from the first to the second register, on the verb "resurgit" ("to rise"). In the Renaissance, with only sopranos and tenors, such an effect was possible only if several voices were set in unison. Conversely, Mozart could not have composed this chorus without having the mezzosoprano register shifts available to him.

The Child Mezzosoprano Voice

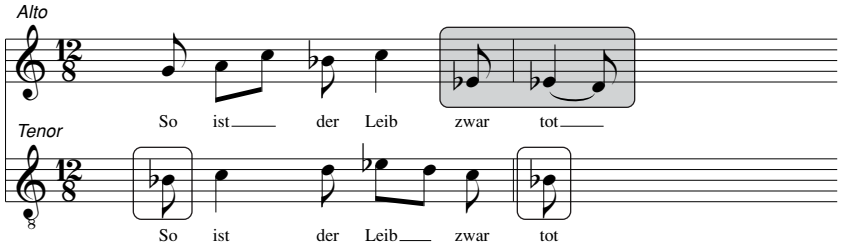
FIGURE 4.13 Buxtehude, *Magnificat*



The desire to create a fourth degree of polyphonic freedom led composers sometime during the period 1650–1700 to create a true mezzosoprano line in their choral writing. Knowing that a minority of adult women were mezzosopranos, composers surmised that some child sopranos might also be able to shift on E-natural. Church choir schools began to train the older boys, as their voices descended, as mezzosopranos.

This example, from J.S. Bach's teacher Dietrich Buxtehude (1637–1707), is one of the earliest uses of a boy mezzosoprano line. As with Mozart in the previous figure, Buxtehude used the fact that the tenor's first-to-second register shift is a major third below the mezzosoprano first-to-second shift, to achieve contrapuntal clarity. In the second system, on the phrase "et exaltavit humiles" ("and exalts the humble"), both the mezzosoprano and tenor rise into the second register on the verb "exaltavit." The sopranos do not sing in this passage, in keeping with the composer's desire for a distinct mezzosoprano sound in the uppermost voice.

Figure 4.14 J.S. Bach, "So aber Christus in euch ist" from *Jesu, meine Freude,* BWV 227

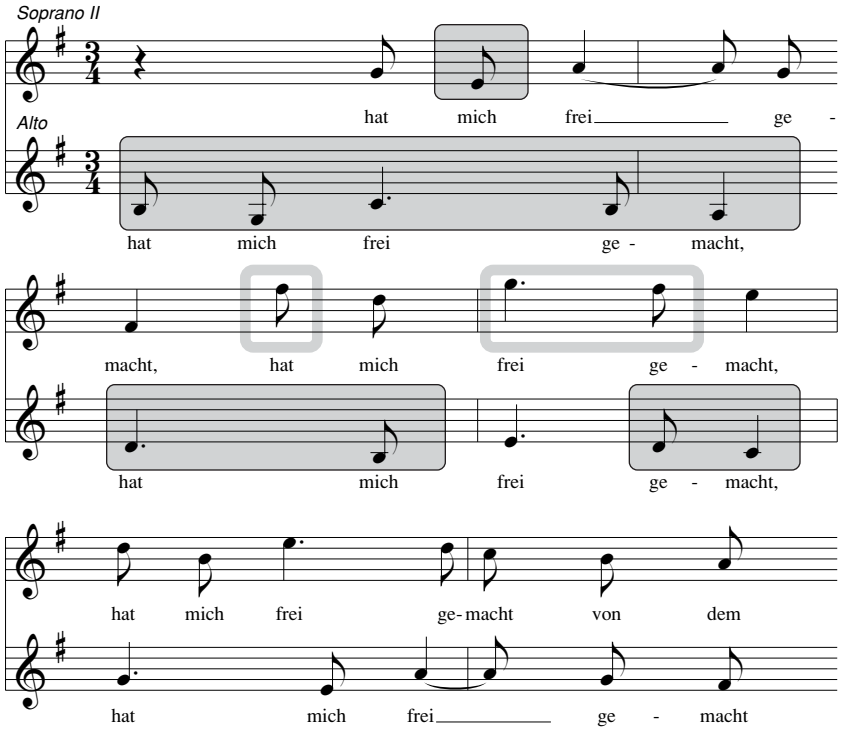


Buxtehude's *Magnificat* dates from before 1705, when the young J.S. Bach traveled from his first job as organist at Arnstadt to the Marienkirche in Lübeck for three months to study with Buxtehude. Upon Bach's return, his employers complained that Buxtehude's teaching had radically altered Bach's compositional voicing, creating "strange new harmonies." Among those innovations was his use of the mezzosoprano voice species.

The idea of a distinct register shift for the child mezzosoprano has been all but forgotten today. The practice in contemporary boys' singing schools, such as the Vienna Boys Choir, is to simply class boys according to "how high they comfortably sing," with no regard to register. This is a result of the Italian bel canto school of head voice having been drummed out of favor and replaced by a British-origin school of "white voice," produced half in the head and half in the throat, with little or no vibrato. But unless the voice is produced in the head, it is impossible to hear a natural register shift or the true tessitura.

The excerpt above is from a trio using the three lower voices of a five-part chorus, namely, alto, tenor, and bass. Only the two upper voices are shown here. Bach uses the alto line as a mezzosoprano, in contrapuntal coordination with the tenor. The mezzosoprano shifts to the lower register at "zwar tot" ("indeed dead [to sin]"), as does the tenor.

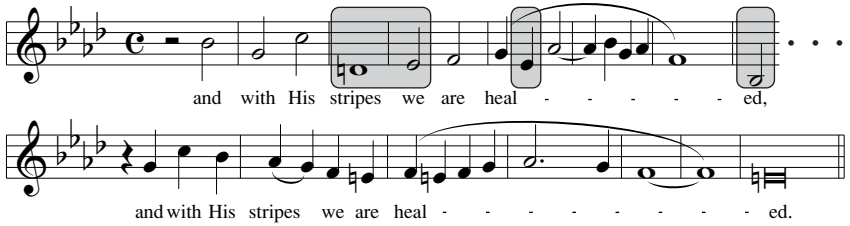
Figure 4.15 J.S. Bach, "Denn das Gesetz" from *Jesu, meine Freude,* BWV 227



J.S. Bach used the mezzosoprano to create multiple voices within the alto line, distinct from those within either the soprano or tenor line. In this section for first soprano, second soprano, and alto, the mezzosoprano is the lowest line. Only the interaction between the second soprano and mezzosoprano/alto are shown here. The alto line "hat mich frei gemacht" ("has made me free") is initially stated in the first register, and is then restated in two register voices, the E-natural shifting to the second register on "frei." The second soprano shifts simultaneously into the third register on high G, emphasizing the mezzosoprano E-natural shift.

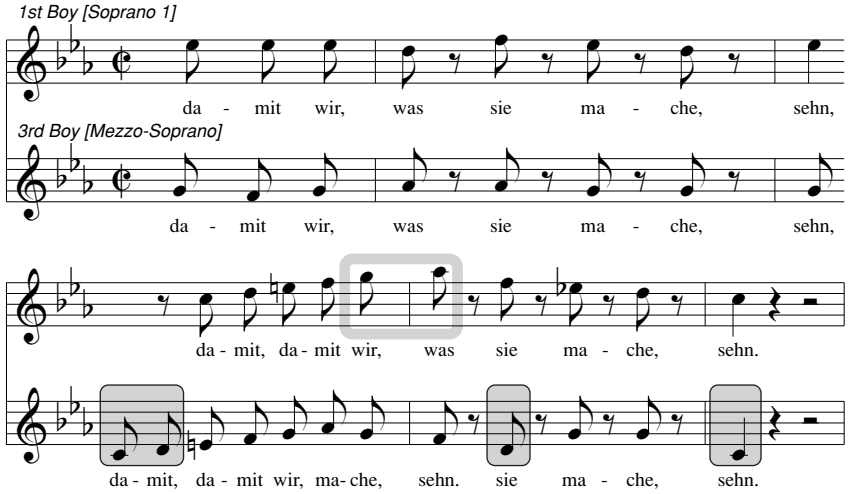
By the third repetition, the anchoring alto line has been translated entirely into the second register.

Figure 4.16 Handel, "And with His stripes" from *Messiah,* Part II, No. 25



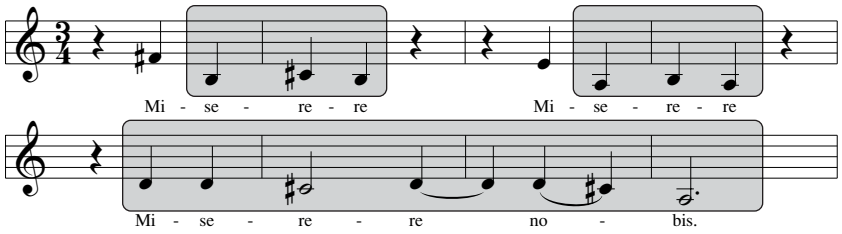
The mezzosoprano shift is often generalized for use to emphasize all shifts in tonality which hinge on movement from E-flat to E-natural. Here Handel uses it to emphasize a transition from sorrow to hope by introducing the repeated E-naturals in the cadential second line.

Figure 4.17 Mozart, "Bald prangt, den Morgen zu verkünden" from *Die Zauberflöte,* Act II, Scene 26, No. 21



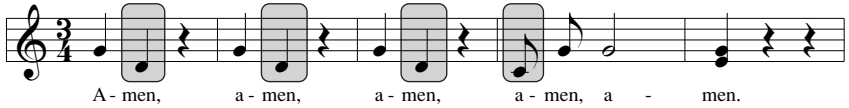
The Third Boy introduces a shift with his E-natural register change at the trio's denouement. Mozart introduces the E-natural to prepare the First Boy's shift into the third register.

Figure 4.18 Mozart, "Agnus Dei" from *Mass in C Major* ("Sparrow"), K. 220



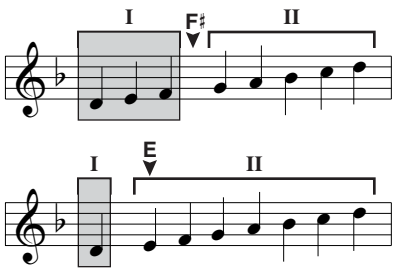
Mozart's "Sparrow" Mass, composed for boys' choir, shows the same use of the mezzosoprano shift throughout the alto line. It features Mozart's characteristic downward resolution into the first register at the end of a poetic statement. The first two statements of "miserere" span two different registers, while the third statement falls into an extended resolution in the first register.

Figure 4.19 Mozart, "Sanctus" from *Mass in C Major* ("Sparrow"), K. 220



Mozart sets the "amen" to resolve downward into the first register, with the exception of the final two, which reverse direction, rising into the second register and remaining there in anticipation of the following section of the mass.

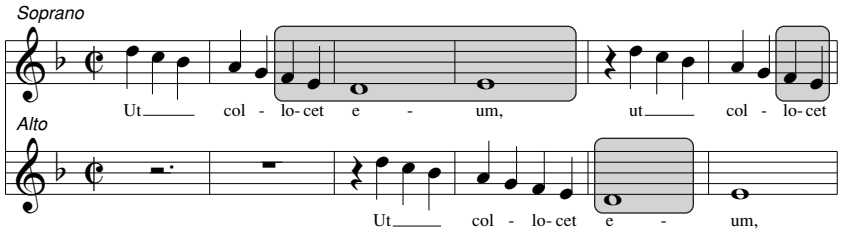
FIGURE 4.20 Soprano and Mezzosoprano Division of the D Minor Scale



The mezzosoprano shift gives the composer the ability to restate the same theme, first with a soprano shift, then with a mezzosoprano shift, even when the voices enter singing precisely the same tones.

Consider how the two voices differently divide a key such as D minor. The soprano register shift has three notes in the first register in the D minor scale, while the mezzosoprano has only one note in the first register.

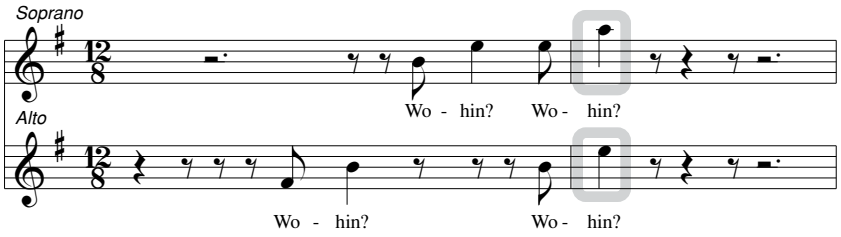
FIGURE 4.21 Mozart, "Laudate pueri" from *Vesperæ solennes de confessore,* K. 339



Mozart used the mezzosoprano to create two distinct ideas from a single phrase. The soprano line emphasizes the verb "collocet" ("set" or "place") with the first register. The mezzosopranos repeat the same line, but emphasize "eum" ("him").

The Child Mezzosoprano Third Register

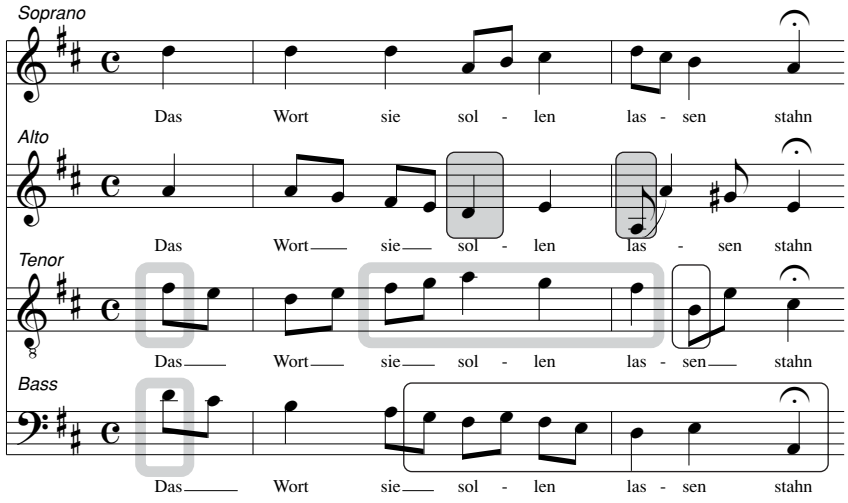
FIGURE 4.22 J.S. Bach, "Kommt, ihr Töchter" from *St. Matthew Passion,* BWV 244, Part I, No. 1



J.S. Bach and Mozart also composed for the second-to-third register shift for mezzosoprano voice. After the tenors (not shown) execute a shift out of the third register, the boy mezzosopranos shift in response to the third register on high E, just as the sopranos shift into the third register on high A.

J.S. Bach at C=256

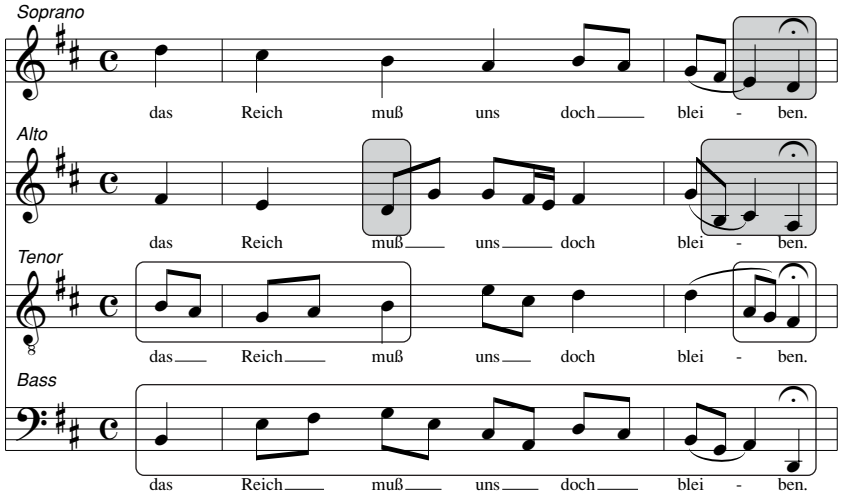
FIGURE 4.23 J.S. Bach, "Das Wort sie sollen lassen stahn" from Cantata No. 80 ("Ein' feste Burg"), BWV 80



Bach's use of the higher boy mezzosoprano voice instead of men's voices for his alto line, and the registration and tessituras of Bach's vocal writing, generally demonstrate that he composed at C=256. Wherever he had to perform with instruments pitched either higher or lower than approximately C=256—an all too frequent occurrence in those days—he would transpose the instrumental part or parts in order to keep the voices as close to C=256 as possible. Performing them at any tuning lower than this would have made it difficult for the mezzosopranos (either boys or women) to readily sing the lowest notes; conversely, Bach's tenor line, with its frequent high A's, is exceedingly difficult to perform at tunings any higher than C=256.

In the example above, both the low A for boy alto and the high A for adult tenor are used simultaneously. Only one tuning will accommodate them both.

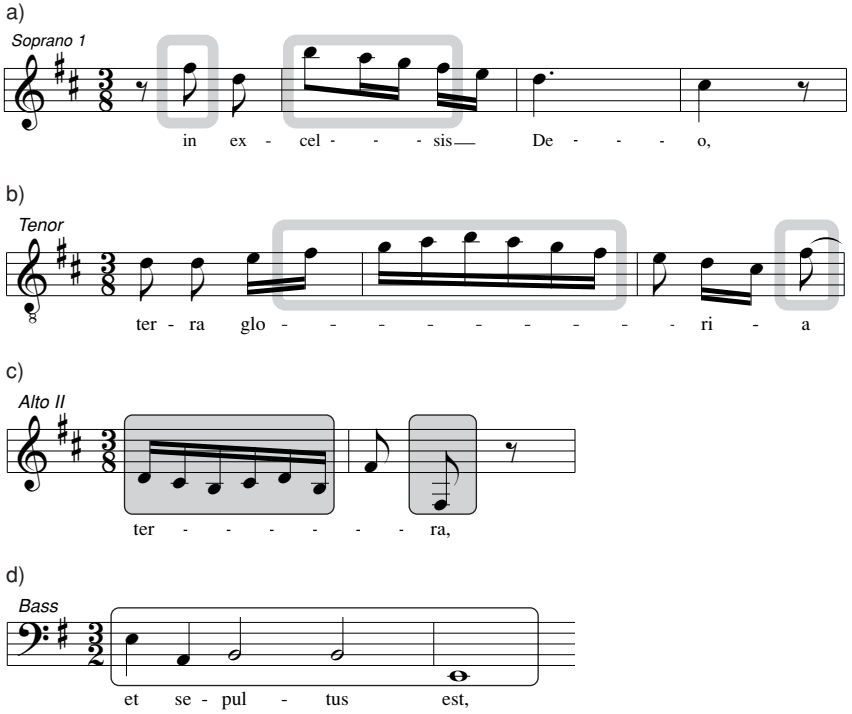
FIGURE 4.24 J.S. Bach, "Das Wort sie sollen lassen stahn" from Cantata No. 80 ("Ein' feste Burg"), BWV 80



A few measures later, both the alto and bass lines sit low, the bass continuing the Renaissance practice of falling to the low D.

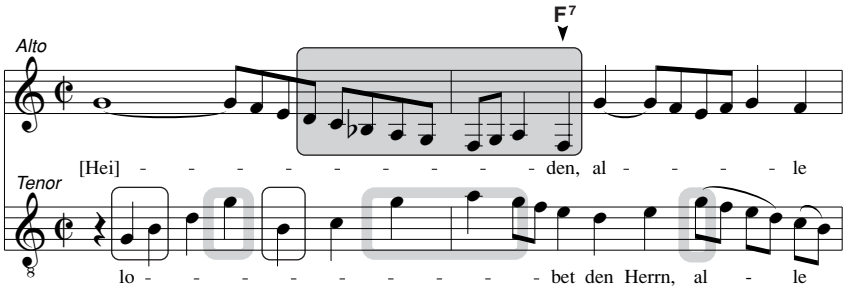
This same low D, which appears frequently in Bach's works for average choristers, is the lowest note which Mozart is known to have ever written for bass singers, and then only for virtuoso soloists. It is also lower than the lowest bass note written by Verdi, who composed at A=432 (C=256.9). It is therefore highly unlikely that Bach composed at a tuning any lower than that, as is claimed by some musicologists.

FIGURE 4.25 J.S. Bach, *Mass in B Minor,* BWV 232



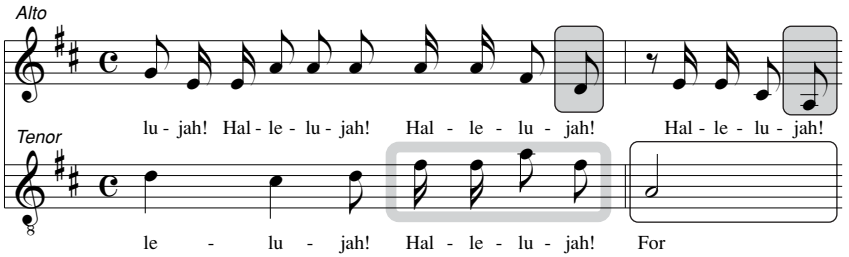
In this mass, Bach places most strenuous demands on both the sopranos and the tenors to execute high B-naturals, while also demanding low E's of the basses and low F-sharps of the mezzosopranos. Proper execution of both extremes is impossible at any tuning lower or higher than C=256.

FIGURE 4.26 J.S. Bach, *Lobet den Herrn, alle Heiden*, BWV 230



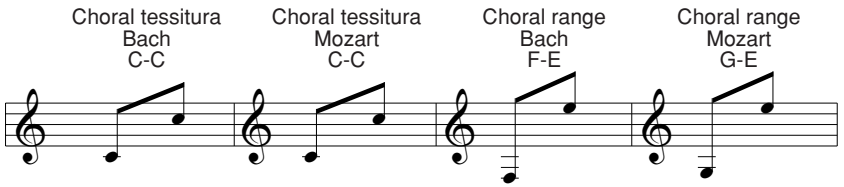
The motet shows typical Bach low alto and high tenor lines simultaneously. No boy could sing such a line at what is claimed by some today to be the "baroque tuning" of A=392, almost one full step below C=256.

FIGURE 4.27 Handel, "Hallelujah" from *Messiah,* Part II, No. 44



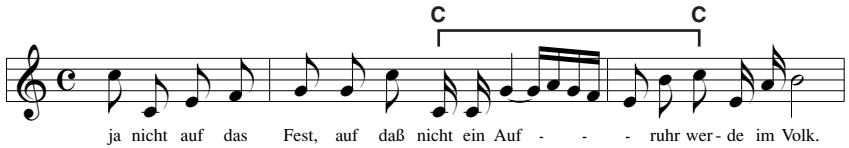
This famous chorus becomes almost polemical on this point concerning the upper extreme of the tenor voice and the lower extreme of the mezzosoprano as the boundary conditions for C=256 tuning. The tenors' high A is immediately answered by the altos descending to a low A.

FIGURE 4.28 Secondary Characteristics of the Child Mezzosoprano Voice



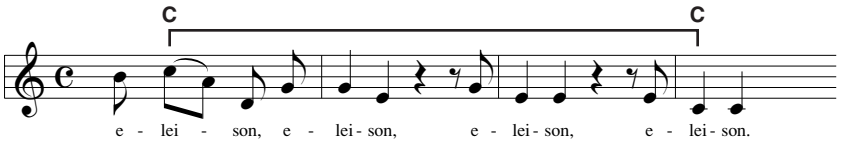
J.S. Bach raised the tessitura of both the soprano and the mezzosoprano voice, such that the mezzosoprano took over the area of the scale where the Renaissance soprano formerly sat, namely at C=256–C=512. Beginning with Bach's generation, the mezzosoprano is centered on the octave C–C, while the soprano is raised to be centered on the octave F–F. Bach extended the alto range to the mezzosoprano's high E (see Figure 4.22).

FIGURE 4.29 J.S. Bach, "Ja nicht auf das Fest" from *St. Matthew Passion,* BWV 244, Part I, No. 4b



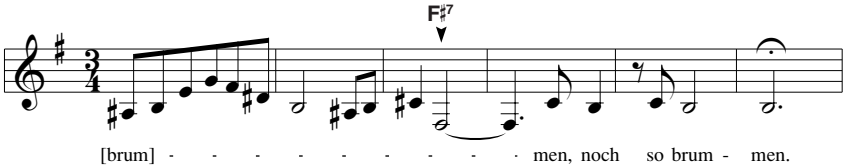
J.S. Bach's alto line, for mezzosoprano, ranges in tessitura over what was formerly the soprano domain of C=256 to C=512.

FIGURE 4.30 Mozart, "Kyrie" from *Mass in C Major* ("Sparrow"), K. 220



Mozart continued the practice of setting the mezzosoprano alto line in the tessitura C=256 to C=512, both for boys as shown here, and for female choral singers.

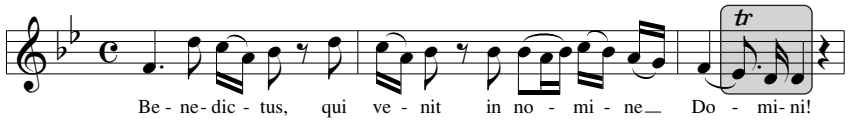
FIGURE 4.31 J.S. Bach, "Trotz dem alten Drachen" from *Jesu, meine Freude,* BWV 227



Bach demanded extended low notes from his boy alto section, achievable only at tuning of C=256 (or higher).

The Adult Mezzosoprano Voice

Figure 4.32 Mozart, "Benedictus" from *Requiem,* K. 626, at C=256



The adult mezzosoprano register shifts are identical to those of the child: at E-natural above middle C, and at E-natural above C=512.

Because the full depth of the mezzosoprano voice is only available in an adult female, the need for this "new voice" in composition came to symbolize the major changes in the social role of women, which took place during the eighteenth century as the ideas of the American Revolution and the universal rights of man took hold.

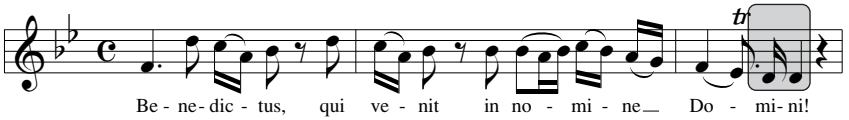
As vocal works grew longer and more demanding dramatically, especially during Mozart's time, composers sensed the need for mature adults in *all* choral voices, including adult mezzosopranos and sopranos, who could fully comprehend such works and execute them.

Adult female mezzosopranos were at first only permitted as soloists, in the early eighteenth century. According to Johann Joachim Quantz (1697–1773), Faustina Bordoni (1693–1783) was a mezzosoprano who debuted in Venice in 1716, and in London in 1726, in an otherwise forgotten opera, *Astianatte* by Giovanni Battista Bononcini. Handel made her a star in his London Italian operas, and by the time of *Messiah* (1741) he had written extensively for the adult female mezzosoprano soloist.

While women did sing in choruses in England after that, on the continent church choirs still used boys for soprano and alto during much of Mozart's lifetime. Only in Mozart's mature works after 1780, such as the *Requiem* (1791), is it clear that the alto line is intended to be sung by adults.

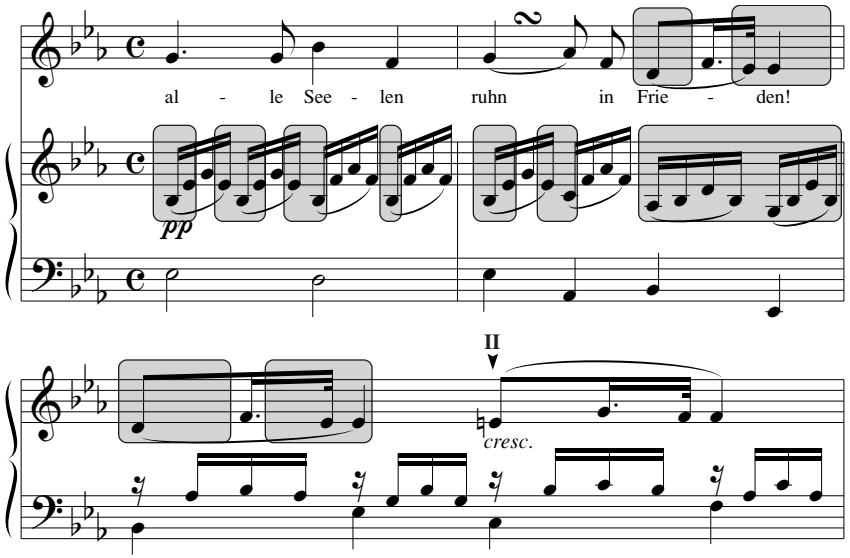
In the example above, the mezzosoprano soloist opens the solo quartet. Mozart tailored the key such that the poetry may depend upon the mezzosoprano's register shift for the alto line down into the first register at E-flat, placing emphasis on the first syllable of "Domini."

Figure 4.33 Mozart, "Benedictus" from *Requiem,* K. 626, at A=440



At A=440 or above, the poetry is thrown off such that the stress falls only on the last two syllables of "Domini." This is doubly the case, since at A=440 the trill is executed in the second register, whereas at C=256 it is executed entirely in the first register, including the upper-neighbor F.

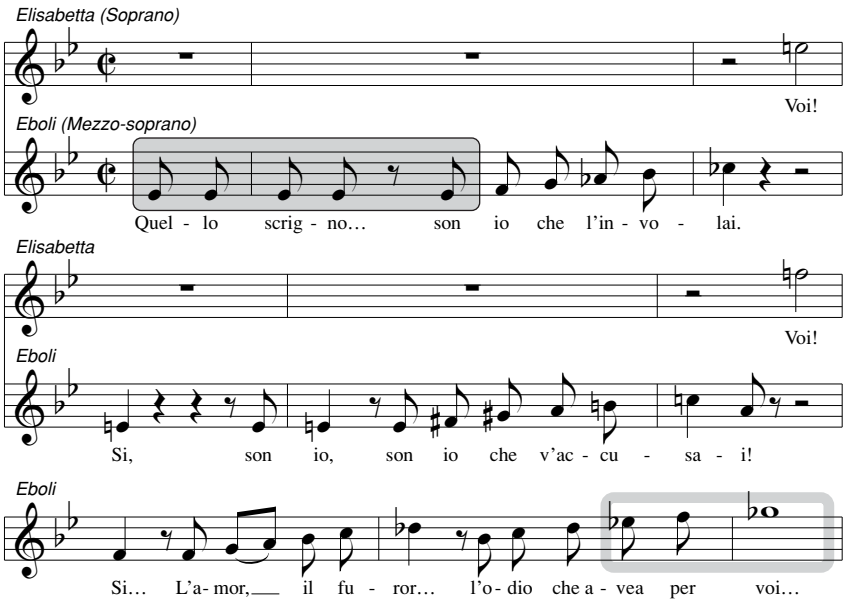
Figure 4.34 Schubert, *Litanei,* Nachlaß, Lieferung 10



Some of the greatest vocal compositions revolve around this principle. It was the basis not only of oratorio and opera, but also of many of Franz Schubert's approximately 900 *Lieder*.

Here the most significant register shift occurs in the piano postlude, in the shift from the E-flat to E-natural in the right hand—a shift which does not occur anywhere in the mezzosoprano's vocal line. The absence of that shift until the end of each stanza is therefore critical to building up poetic tension, which is then resolved by the piano in cross-voice.

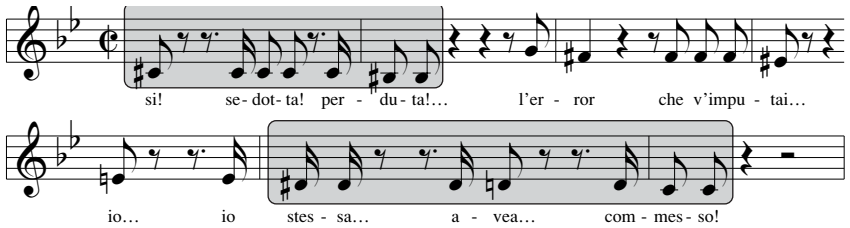
Figure 4.35 Verdi, "Pietà, pietà!" from *Don Carlo,* Act III, Scene 1



Many Italian operas composed by Verdi and his contemporaries revolve around dramatic character distinctions between the soprano voice registers and color, and the distinct mezzosoprano voice. Verdi was the greatest proponent in music of Friedrich Schiller's idea of the theater as a moral institution, and sought to memorialize in his operas Schiller's stress on the role of the individual at critical points in determining the outcome of humanity's great battles against oligarchical forces. In *Don Carlo,* the contrast in voice between the heroic Queen Elizabeth, a soprano, and the smaller-minded Princess Eboli, a mezzosoprano, is critical.

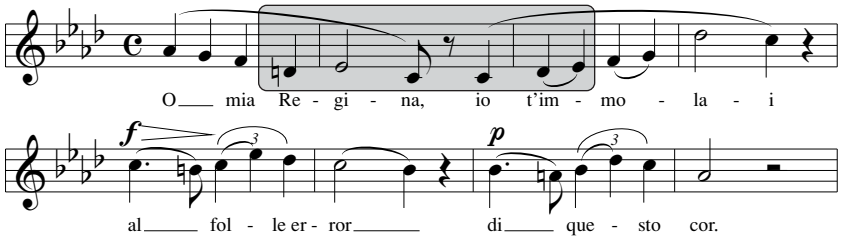
Verdi often used the mezzosoprano register shift to state an idea in one register, and then repeat it in another. The figure above shows a statement in the first register on E-flat in the first line, and then its translation into the second register by raising it to E-natural in the second line. As the soprano approaches her third register singing high E-natural and high F, the mezzosoprano completes the idea and shifts into the third register on the high F and G-flat.

FIGURE 4.36 Verdi, "Pietà, pietà!" from *Don Carlo,* Act III, Scene 1



At the turning point of the opera, where Eboli admits it was she who slandered the Queen, Verdi uses a flat key and shifts the word "io" to the E-natural, in order to obtain the register shift on Eboli's admission "I . . . I *myself* . . ."

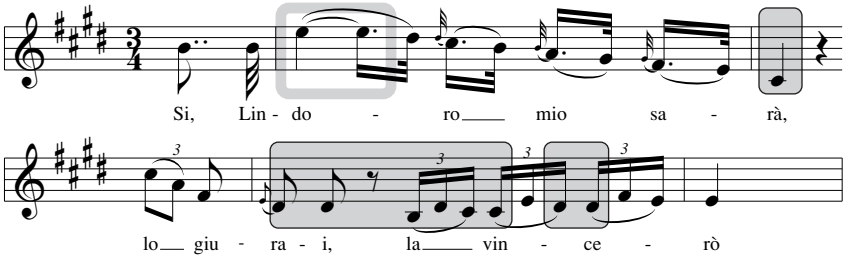
FIGURE 4.37 Verdi, "O mia Regina" from *Don Carlo,* Act III, Scene 1



This is Verdi's application of Mozart's practice of creating a second voice by a sweep down into the first register.

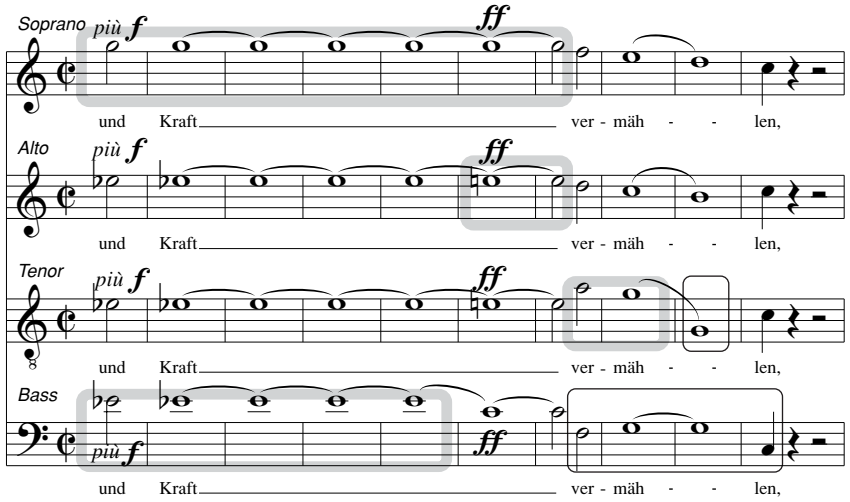
The Adult Mezzosoprano Third Register

FIGURE 4.38 Rossini, "Una voce poco fa" from *Il Barbiere di Siviglia,* Act I, No. 7



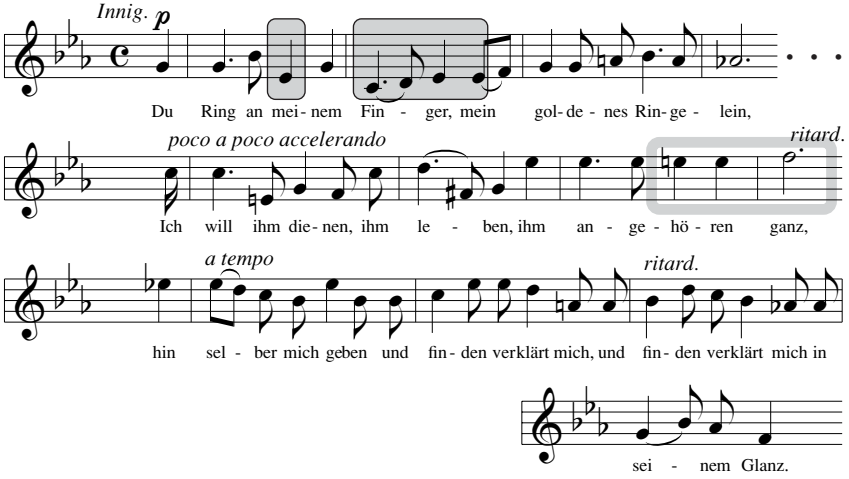
This is perhaps the best-known aria for mezzosoprano. To emphasize that Lindoro "mio sarà" ("will be mine"), Rosina's voice drops firmly into the first register, and again on "lo giurai" ("I swear it").

FIGURE 4.39 Beethoven, *Chor-Fantasie,* Op. 80



As the piece reaches its joyous conclusion, a sequence of cadences based on G is interrupted by the drop of a major third to E-flat, a drop which is strengthened by all three lower voices, on the words "und Kraft" ("and strength"). The phrase (and the idea of the composition) is then completed with the mezzosoprano's shift into the third register on E-natural. (Later, Beethoven used this same device in the fourth movement of his Ninth Symphony, in the sudden cadence from A to F on the words "und der Cherub steht vor Gott," just before the "Turkish march" section.)

FIGURE 4.40 Schumann, "Der Ring," Op. 42, No. 4

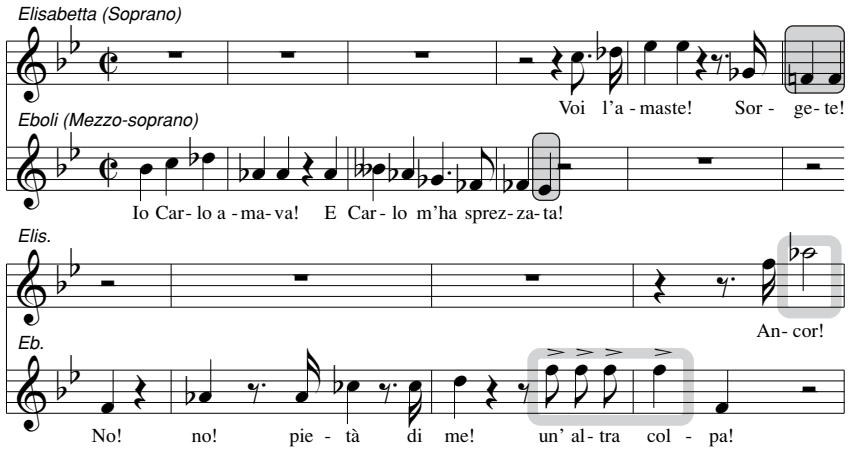


Frauenliebe und Leben was one of several song cycles composed by Schumann in 1840 as a polemic against the banality of Romanticism. Like his contemporary Heinrich Heine, he sought to reinforce the Classical definition of "love" as the biblical *Agapē,* or "charity"—as opposed to the Romantic "new music" of Hector Berlioz and, a few years later, Richard Wagner, who sought to redefine "love" as worship of the pornographic *Eros*.

Schumann's cycle makes extensive use the mezzosoprano register shift as a pivot point. For example, the first five songs, all in flat keys, are followed by No. 6 ("Süßer Freund, du blickest"), whose subject is the day following the wedding night, and whose key is G major. The first five songs are heavily dependent on the rich colors of the first register, while the sixth song does not utilize the first register at all. This contrast is entirely lost if the cycle is sung by a bel canto soprano at C=256, instead of a mezzosoprano.

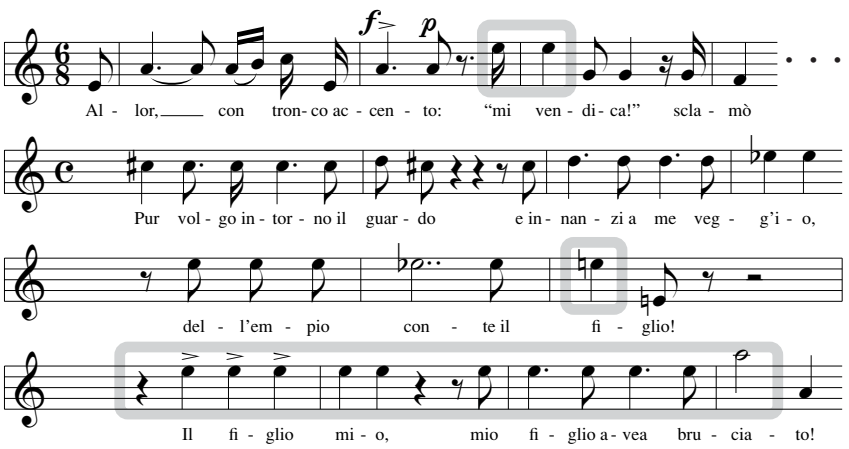
In the example above, the theme is stated with heavy emphasis on the E-flats in the first register. In the development section, the E-natural is introduced, moving entirely into the second register, and this is immediately reflected in a shift into the third register on "angehören ganz" ("belong completely [to him]").

FIGURE 4.41 Verdi, "Pietà, pietà!" from *Don Carlo,* Act III, Scene 1



Verdi uses the distinction between soprano and mezzosoprano[1] to establish moral distinction through the use of a simple cross-voice. When the mezzosoprano, after a sustained first- and second-register development, rises up into her third register on "Un'altra colpa!" ("Another sin!"), the soprano answers by rising into her own third register on "Ancor!" ("Yet again!").

FIGURE 4.42 Verdi, "Condotta ell'era in ceppi" from *Il Trovatore,* Act II, Scene 1, No. 10



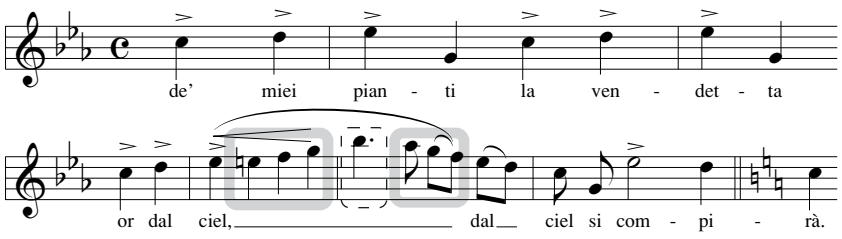
Here the mezzosoprano register shift underscores a crucial turning point in the opera. Azucena's mother has been burned at the stake, and the mezzosoprano, consumed with vengeful emotion, sings her theme "Mi vendica!" at the register shift. She then reveals fitfully that when she tried to kill the Count's baby brother in revenge, she killed her own son ("il figlio mio") in error.

Later in the opera, when the Count, a baritone, goes to abduct the heroine Leonora from a cloister, Verdi has him echo this very same theme on his own register shift, which is precisely one octave below that of the mezzosoprano, with similar words of vengeance: "Leonora è mia!" (See Figure 7.13.)

[1] Although it has been documented that the part of Princess Eboli was extended upward in range during the composition of the opera in order to be sung by a dramatic soprano instead of the mezzosoprano for whom it was originally intended, it is clear that Verdi maintained the mezzosoprano registration. The fact that he allowed the score to be published with Eboli designated "mezzosoprano" corroborates this.

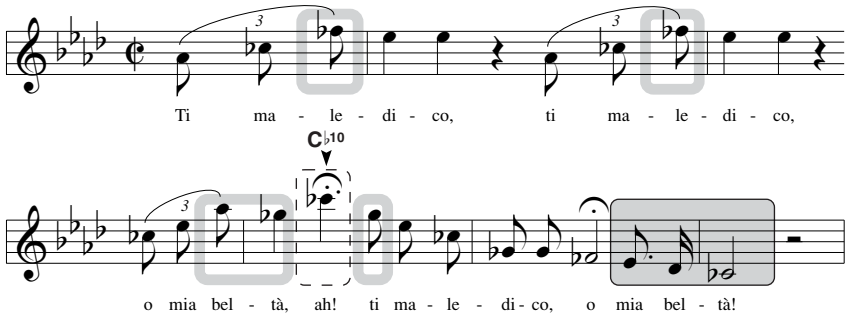
The Mezzosoprano Fourth Register

FIGURE 4.43 Verdi, "L'abborrita rivale me sfuggi" from *Aïda,* Act IV, Scene 1



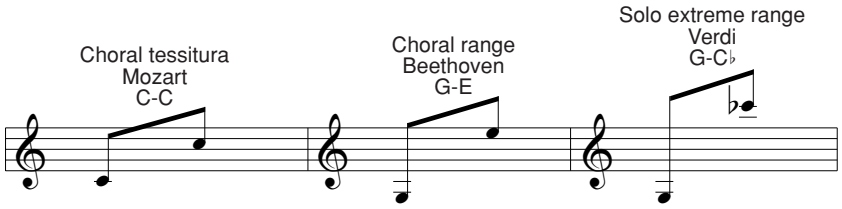
Verdi extended the mezzosoprano to what has become known as "Verdiana," a quasi-fourth register, beginning at B-flat, one whole step below the soprano fourth-register shift on high C. It functions precisely as does the soprano fourth register, and its geometric determination is the same as that for the baritone's first-to-second register shift (See Figures 2.7–2.8).

FIGURE 4.44 Verdi "O don fatale" from *Don Carlo,* Act III, Scene 1



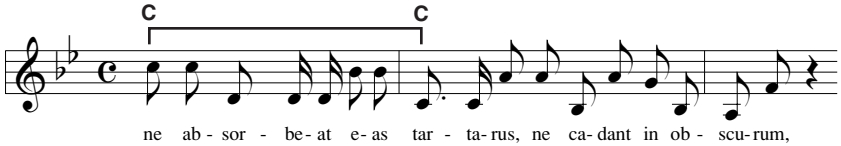
Here the mezzosoprano Eboli breaks out into a cry of anguish on a high C-flat, and then moves downward through each of the other three registers.

FIGURE 4.45 Secondary Characteristics of the Adult Mezzosoprano Voice



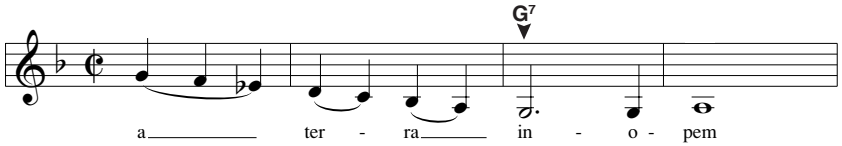
The adult mezzosoprano tessitura used by Mozart sits between C=256 and C=512. The extreme choral range of the adult mezzosoprano voice in the most demanding Mozart, Beethoven, and Verdi choruses extends from G below C=256, to E above C=512.

FIGURE 4.46 Mozart, "Domine Deus" from *Requiem,* K. 626



The passage illustrates the standard adult mezzosoprano tessitura.

FIGURE 4.47 Mozart, "Laudate pueri" from *Vesperæ solennes de confessore,* K. 339



The passage shows a held low G sung by the mezzosoprano choral section. See Figure 4.39 for a sustained choral high E-natural.

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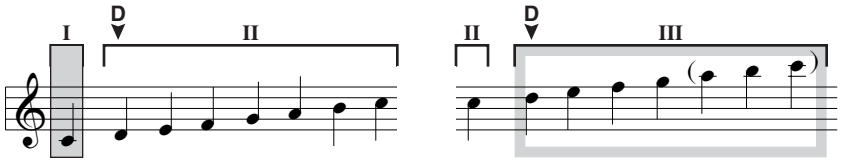
CHAPTER 5

The Contralto Voice

FIGURE 5.1 Contralto Division of the C Major Scale



We define "contralto" as it was defined historically in the age of bel canto of the sixteenth and seventeenth centuries: a third species of treble voice, distinguished from the soprano and the mezzosoprano by distinct register shifts at D above C=256, and at D above C=512. The only valid judgments about these register shifts are those which are based on examination of musical score, and not from recordings or modern practice, since all trained voices in the age of recording have been adversely affected by modern higher tunings.

Applying this criterion to an extensive (but by no means complete) survey of classical vocal literature for low treble voices, it appears that *a distinct contralto voice is to be found only in classical compositions for that unfortunate victim of history, the castrato contralto.*

What, then, about the female "contralto"? It has been mentioned in Chapter 2 that all voice species contain sub-types, commonly referred to as *leggero* or light, lyric, dramatic, and combinations thereof, who share a common register shift. For example, while Mozart's Susanna (Figure 3.26) is for a light soprano, his Countess is for a lyric soprano, and Beethoven's Leonore (Figure 3.31) is for a dramatic soprano, all of them shift registers at F-sharp.

Many women, such as Mrs. Cibber, who premiered the "alto" solos of Handel's *Messiah,* have been called contraltos; strictly speaking, however, they are simply "dramatic" or darker-voiced mezzosopranos. The score for many "contralto" arias such as "He was despised" from *Messiah* (Figure 4.11) shows them to be constructed around the E-natural register shift. This is uniformly true from the time women were allowed to sing in public, in the late seventeenth century, on through the later Verdi. Verdi's Magdalena in *Rigoletto,* Ulrika in *Un Ballo in Maschera,* the Countess in Verdi's *Luisa Miller,* and the lower female soloist in Verdi's *Requiem,* are all dramatic mezzosopranos, in that their vocal lines are constructed around the mezzosoprano register shift. Verdi never designated any of these roles "contralto," although the singers premiering the roles sometimes affected the term.

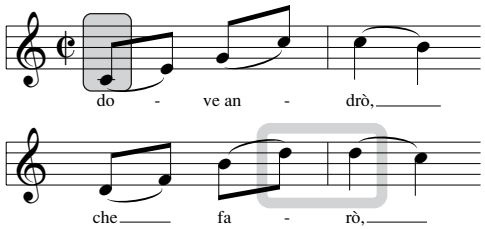
When the autograph score is consulted on many roles now called "contralto"—such as the title role Isabella in Rossini's *L'Italiana in Algeri*—they are found to have been orginially designated for mezzo-soprano by the composer himself (see Figure 5.19 below).

Regarding discographic evidence, although Marian Anderson, Ernestine Schumann-Heink, and many supposed "contraltos" recorded at the pre-war pitch of A=435 or below, they all shift not at D, but rather at E-natural or even higher. All of them are therefore either dramatic or lyric mezzosopranos. Especially Marian Anderson's discography shows her to consistently utilize the E-natural register shift.

Occasionally the deepest, most dramatic female mezzosoprano voices, such as Dame Clara Butt or Kathleen Ferrier, are heard to shift registers at D in both octaves, but only when they are singing scores composed for bass or castrato contralto, such as Gluck's "Che farò senza Euridice" (Figures 5.2–5.5) or Brahms's *Vier ernste Gesänge.* This shows that these performers heard the poetry as the composer wanted it, and modified their normal register shift on E to accommodate the composer.

Further investigation of the choral literature from 1550–1750 is required to establish with certainty whether castrato singers were used regularly in choral singing during that time. Regarding children's voices, J.S. Bach's choral works contain several instances of a possible contralto shift on D, but none of these was conclusive enough to be included here.

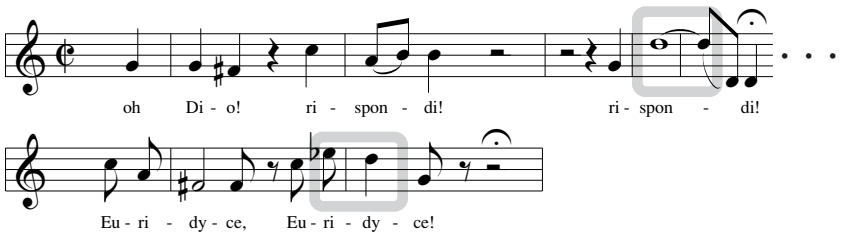
Figure 5.2 Gluck, "Che farò senza Euridice" from *Orfeo ed Euridice*



This shows the theme, and the major transformation of the aria. The role of Orpheus was written for Gaetano Guadagni, a famous castrato contralto, and is constructed around the D register shift. The aria begins with the theme of a C major arpeggio (not shown but similar to the first line of the example here), based on the shift from the first register at the low C up to a statement in the second register.

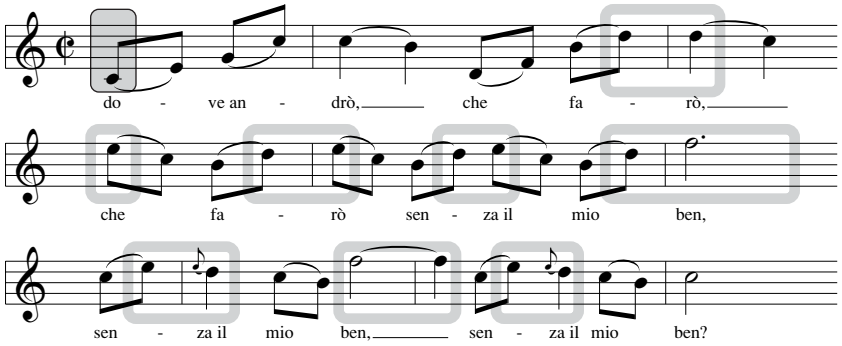
Here, near the conclusion of the aria, the theme is transformed. First it is restated in original form, with the first-to-second register shift, and then it is repeated one whole step higher, creating a second-to-third register shift at its high point.

Figure 5.3 Gluck, "Che farò senza Euridice" from *Orfeo ed Euridice*



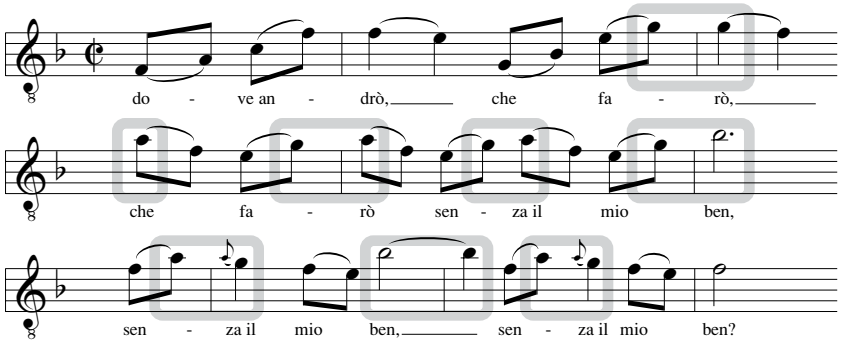
Here is the same registral pattern as it occurs earlier in the aria, where a statement in the second register is immediately transformed and intensified by restating it in such a way that a new voice, in the third register, enters at the high D.

Figure 5.4 Gluck, "Che farò senza Euridice" from *Orfeo ed Euridice,* for Contralto in C Major



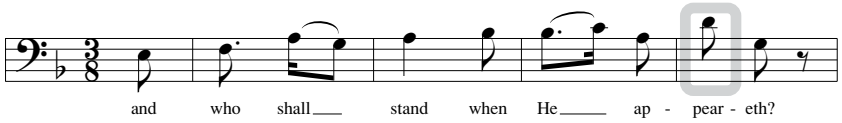
This is the final section of the aria as originally written by Gluck. It shows that the transformation of the theme in Figure 5.2 above leads to an increasingly dense series of shifts into the third register at the D.

Figure 5.5 Gluck, "Che farò senza Euridice" from *Orfeo ed Euridice,* for Tenor in F Major



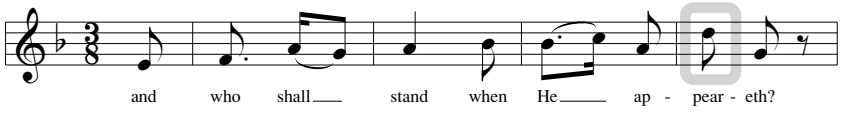
The proof that Gluck intended the contralto to shift on D as in Figure 5.4 above, is that Gluck later transposed the same aria for a tenor for the Paris production of 1774, in which castrati were not accepted. The transposition, from C down to F, places the tenor second-to-third register shift (between F and G) at exactly the same points in the vocal line where the contralto's lie in the original C major version.

FIGURE 5.6 Handel, "But who may abide" from *Messiah,* Part I, No. 6, for Bass



This shows a section of the aria as it is usually published today, for bass soloist, resulting in a shift to the third register on his high D—a type of writing for the bass voice which was common from the earliest years of the Renaissance (see Chapter 8).

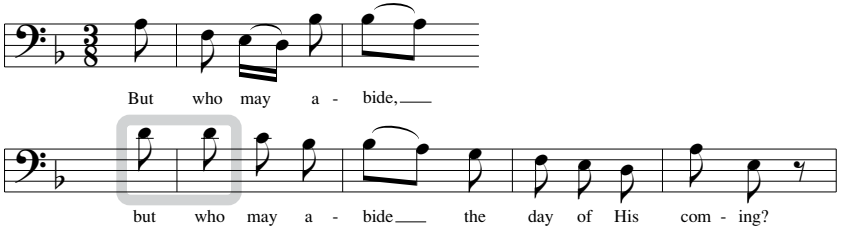
FIGURE 5.7 Handel, "But who may abide" from *Messiah,* Part I, No. 6, for Contralto



Handel himself, however, originally assigned this aria to a male contralto. It thus appears that the contralto was conceived of as a treble analog to the normal adult male bass. As is typical in writing for bass, the phrase in its original setting for contralto shifts into the third register at the high point—here, on the verb "appeareth."

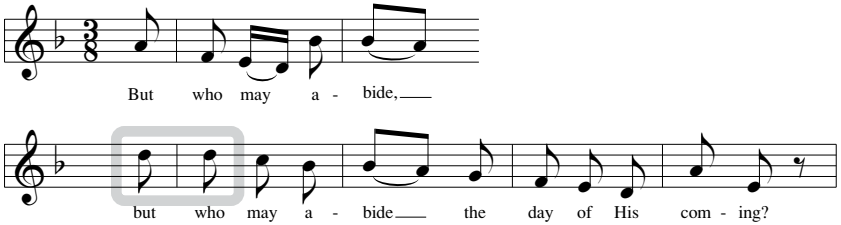
There is no evidence that Handel himself ever reassigned this aria to the bass voice. The reassignment occurred after his death, when castrato contraltos were no longer available and no other female voice was considered fit to sing the original.

FIGURE 5.8 Handel, "But who may abide" from *Messiah,* Part I, No. 6, for Bass



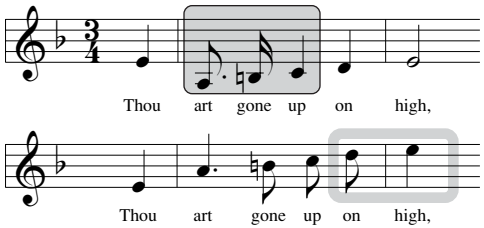
Later in the bass version of the aria, comes a phrase first stated in the lower register, and then restated at the high D third-register shift.

FIGURE 5.9 Handel, "But who may abide" from *Messiah,* Part I, No. 6, for Contralto



Again, the same holds true in the contralto original.

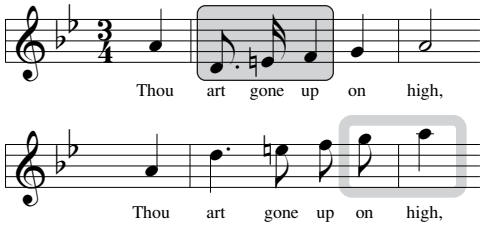
Figure 5.10 Handel, "Thou art gone up" from *Messiah,* Part II, No. 36, for Contralto



This aria, originally written for bass, was adapted twice by Handel, in a way which demonstrates that he intended a D register shift for the contralto.

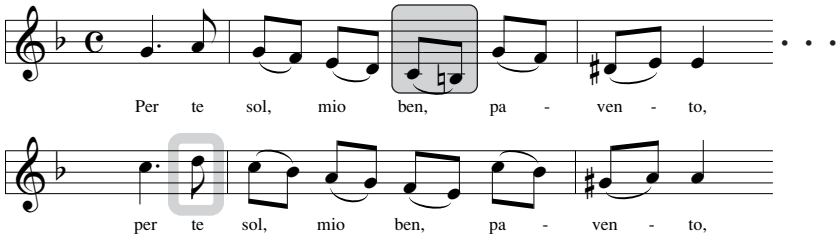
This version is from Handel's adaptation for Guadagni, the castrato contralto for whom Gluck wrote *Orfeo ed Euridice*. The voice shifts into the first register, emerging back into the second on the words "on high." Then, the same phrase is repeated one octave higher, shifting this time into the third register on the same two words.

Figure 5.11 Handel, "Thou art gone up" from *Messiah,* Part II, No. 36, for Soprano



Handel's own adaptation for soprano of the same section, exhibits exactly the same registral pattern. He places the soprano F–G register shift at exactly the same points in the vocal line where he places that of the contralto in Figure 5.10 above (C–D). Handel's original scoring for bass (not shown) does not follow this pattern.

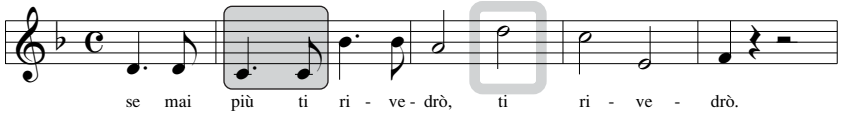
Figure 5.12 Mozart, *Ombra felice,* K. 255



Mozart never used the term "mezzosoprano" or "contralto" in his opera roles for women. His scores designate all women's roles in his operas as "soprano," including the "pants roles" in *La Clemenza di Tito* and *Idomeneo,* as well as the Third Lady in *Die Zauberflöte*.

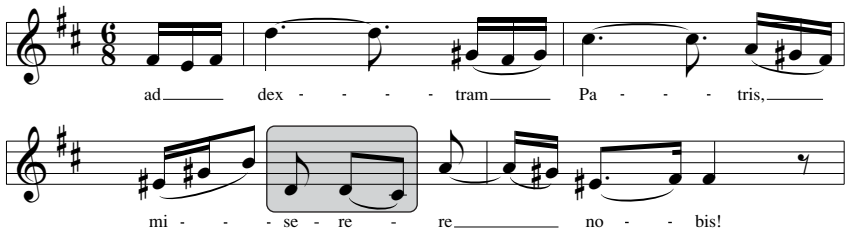
The concert "Ombra felice" is one of the only solo pieces which Mozart wrote with the designation "alto." It was written for the castrato contralto Francesco Fortini. The aria, which extends upward only to D above C=512, makes use of the shift into the third register to make the repetition of the musical idea more dramatic as the aria progresses.

Figure 5.13 Mozart, *Ombra felice,* K. 255



In the final line of the aria, the first and third registers of the contralto voice are juxtaposed in order to intensify emphasis on "ti" ("thee"), first in the first register, and then as a sustained note in the third register.

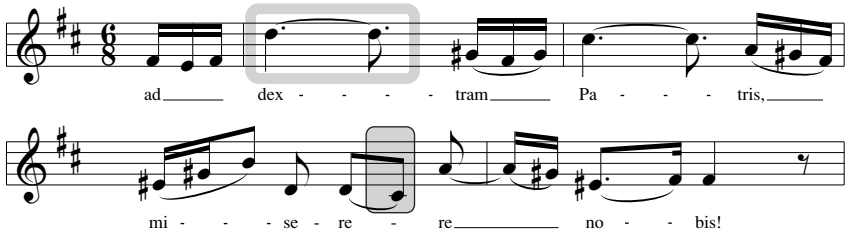
Figure 5.14 J.S. Bach, "Qui sedes" from *Mass in B Minor,* BWV 232, with Mezzosoprano Register Shifts



The authors' survey found no clear examples in score of compositions specifically for female soloists which call for a register shift on D.

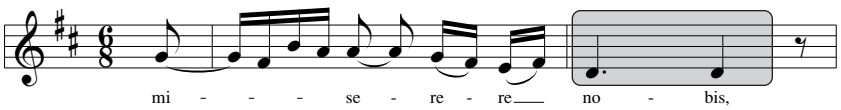
Here, for example, the alto soloist requires a mezzosoprano register shift in order to make the text coherent. The aria alternates between the joyous glory of "Qui sedes ad dextram patris" ("who sitteth at the right hand of the Father") and the pathos of "miserere nobis" ("have mercy on us"). The contrast is brought out by the use of the first register on the first use of the word "miserere," in contrast to the first line which is sung entirely in the second register.

Figure 5.15 J.S. Bach, "Qui sedes" from *Mass in B Minor,* BWV 232, with Contralto Register Shifts



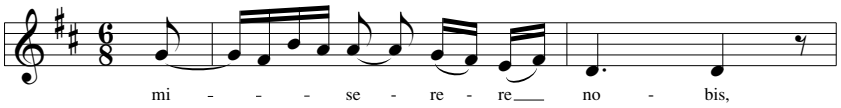
If a contralto were singing, the first line would be interrupted by the sustained D in the third register, while the second line would be relatively uneventful, with only the passing note C-sharp in the first register.

Figure 5.16 J.S. Bach, "Qui sedes" from *Mass in B Minor,* BWV 232, with Mezzosoprano Register Shifts



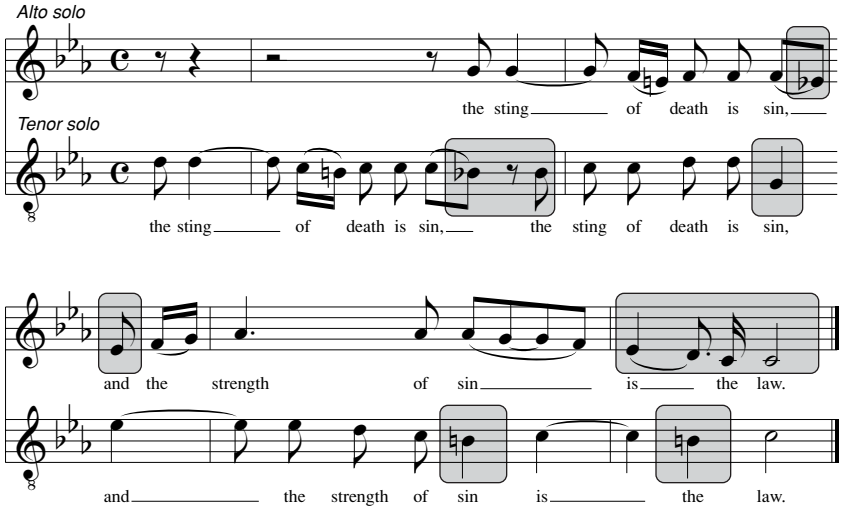
Here the same words end a section of the aria. The mezzosoprano descends into the first register on D, both for the different color of "nobis" ("on us"), and in order to underline the cadence on D.

Figure 5.17 J.S. Bach, "Qui sedes" from *Mass in B Minor,* BWV 232, with Contralto Register Shifts



Performing this passage with contralto register shifts would result in no differentiation, and the cadence on D is weakened.

Figure 5.18 Handel, "O Death, where is thy sting?" from *Messiah,* Part III, No. 50

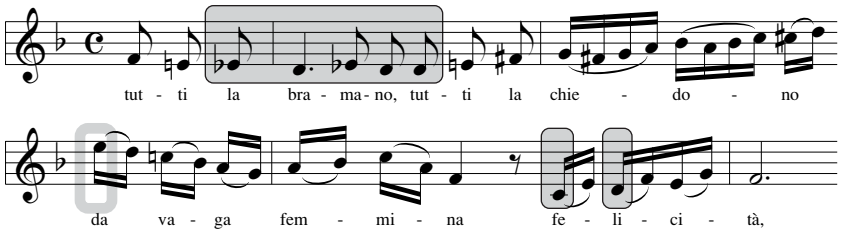


All of the "contralto" solos from Handel's *Messiah* require mezzo-soprano register shifts for poetic coherence; the poetry suffers if contralto shifts at the D are used. "He was despised" has already been described as based upon E-natural register shifts (see Figure 4.10). This is underlined by the fact that the same aria was later rewritten by Handel for tenor, one whole step higher. Since the tenor shifts at F-sharp, this likewise implies that the composer intended an E shift in the original.

In the example above, the poetic counterpoint in the alto-tenor duet is shown to be much stronger if mezzosoprano registers are used. The mezzosoprano shifts into the first register on the E-flat on "sin" at the end of the first phrase, just as the tenor also shifts into his first register. In the second line, which is the conclusion of the duet, the first register of the mezzosoprano voice is used to lend finality to the last phrase, on "is the law."

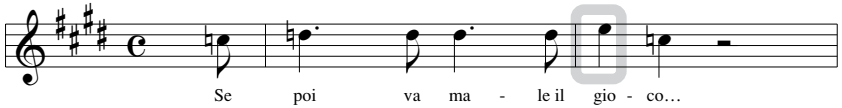
Contralto register shifts would efface these shadings.

Figure 5.19 Rossini, "Cruda sorte!" from *L'Italiana in Algeri,* Act I, Scene 2



The opening aria for the title role of Isabella shows better poetic reading with mezzosoprano shifts. Rossini is famous for writing for the lower female voice, and this opera is now often billed "for soprano, mezzo-soprano, and contralto." The earliest score, however, published in 1818, lists the two upper voices as sopranos, and Isabella as a mezzosoprano. In the section shown, the voice must shift into the richer first register on "bramano" ("desire"), as the singer expounds on what all men are after.

Figure 5.20 Rossini, "Pensa alla patria" from *L'Italiana in Algeri,* Act II, Scene 4



In this aria for Isabella, the phrase "se poi va male il gioco . . ." ("but, if the joke goes badly . . .") is more coherent with a mezzosoprano voice whose D's remain in the second register. The line builds tension in one voice, the second register, and only on "gioco" is a shift introduced.

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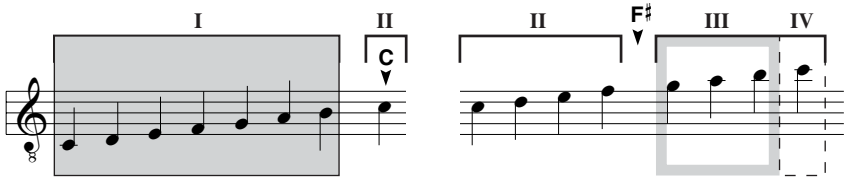
CHAPTER 6

The Tenor Voice

FIGURE 6.1 Tenor Division of the C=256 Major Scale

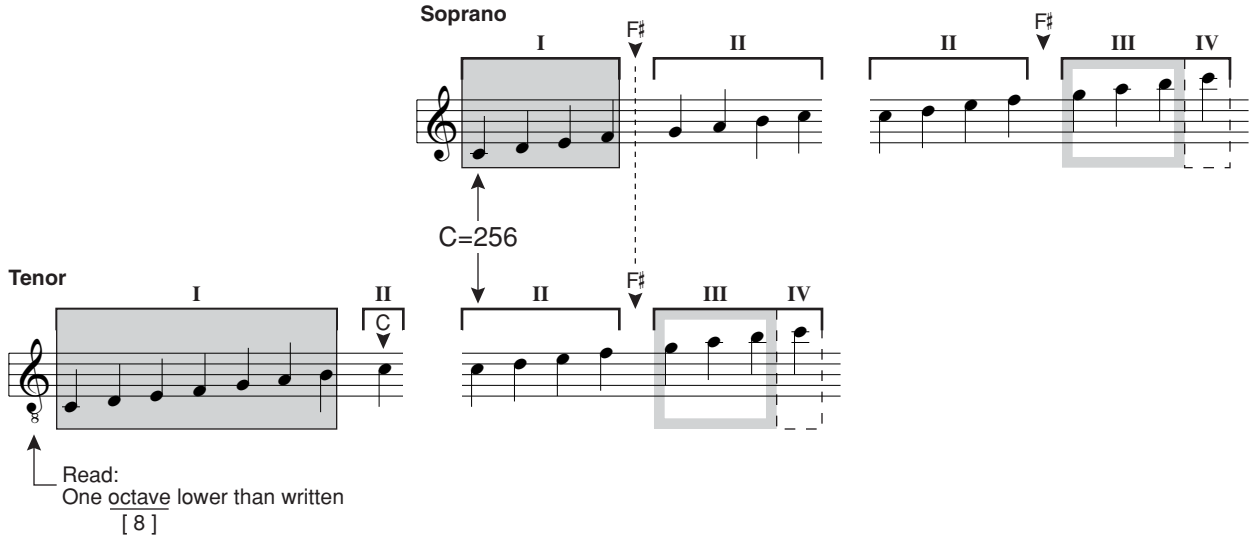


The tenor is the most common voice among adult males, constituting approximately 80 percent of all male voices. The primary characteristic of the tenor voice species is a register shift at the F-sharp above C=256, between the tenor's second and third registers. There is also a secondary tenor register shift between B-natural and C=256, from the first to second register.

The oldest known references to an adult singing voice species, are to the "tenor" voice. In the Middle Ages, "tenor" meant the theme, the voice which held the melody in multi-voiced compositions. It derives from the Italian verb tenere, meaning "to hold" or "to sustain," as in carrying the melodic line.

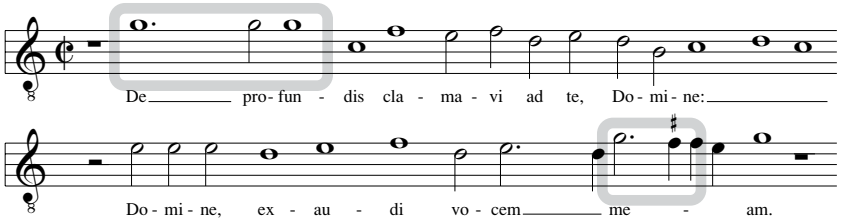
During the first millennium A.D., musical activity in any rigorous sense in Western Christendom, was generally confined to monasteries; and since 80 percent of any male population consists of this kind of voice, the name "tenor" came to be identified with the average higher male voice.

FIGURE 6.2 Comparison of Tenor and Soprano Registers



While in the child and female it is the register shift from first to second register—the lower shift—which is most prominent, in adult male voices it is the higher shift from the second to third register which takes precedence. This is because men's voices (bottom staff), compared to boy soprano voices (upper staff), have dropped a full octave below C=256 during puberty; it is this lower octave which becomes the first register. At C=256, the tenor shifts into the second register. Thus, the tenor's higher register shift, at the F-sharp above C=256, is congruent with the lower register shift of the child soprano voice. Given the greater power of the adult male vocal tract, this high shift is quite striking to the ear.

FIGURE 6.3 Josquin des Prez, *De profundis*

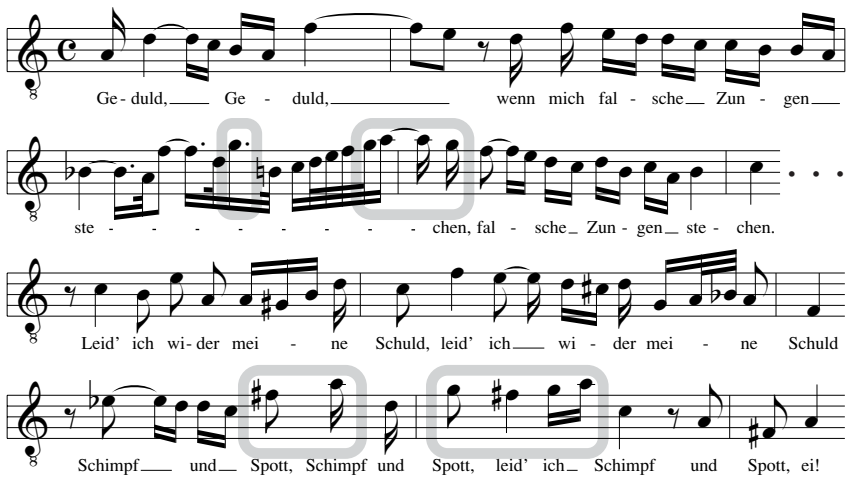


During the Renaissance when boys' choirs were formed, the four voices of today's standard vocal quartet were created, based upon the tenor (see Figure 4.4). The *contra-tenor altus* (alto) was set just above the tenor, and was sung also by the highest male tenor voices. The *contra-tenor bassus* (bass) was set just below the tenor, and the *superius* (soprano) was set above all these and sung by boys.

Renaissance polyphony was thus limited to only three "degrees of freedom"—i.e., three different possibilities of registration and vocal color—because the alto and the tenor were sung by the same voice, the adult male tenor (see Figures 4.6 and 4.7). The average Renaissance "alto" line lies almost exactly where the tenor line lies in modern classical polyphony.

This example shows that the use of the tenor's prominent shift into the third register for poetic emphasis was well-established by the time of the Renaissance. The text is from Psalm 130: "Out of the depths have I cried unto thee, O Lord. Lord, hear my voice." The motet begins (see Figure 3.7) with the boy sopranos singing "De profundis" low in the first register, and then rising into the second register on "Domine." Here, in the development, the tenors invert this registral theme, singing the thematic "De profundis" in the third register, and afterwards shifting downward into the second register.

FIGURE 6.4 J.S. Bach, "Geduld, Geduld!" from *St. Matthew Passion,* BWV 244, Part II, No. 35

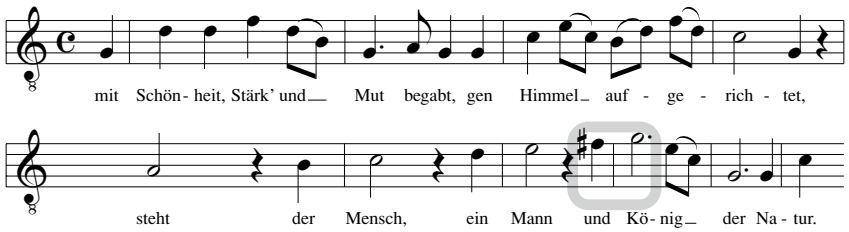


The use of male tenors for both alto and tenor continued well into the early seventeenth century (see Figure 4.5). With the works of Dietrich Buxtehude (1637–1707) and J.S. Bach (1685–1750), boys and women were introduced in order to sing alto lines with the new mezzosoprano voice.

From that time, Bach in particular strongly developed the tenor's upper range. The typical use of the tenor register shift, is to rise upward into the third register. This aria's initial statement (not shown) in A minor repeats the high E and F at the top of the second register, as does the first line of this example. In the development, here, the idea is transformed in the second line by rising into the third register on the verbal action of "stechen" ("wound [me]").

Also observe how Bach and Handel's extensive use of the high tenor range, in conjunction with the low notes they assign to the mezzosoprano, demonstrates that they composed at a tuning no higher than at C=256 (see Figures 4.23–4.27).

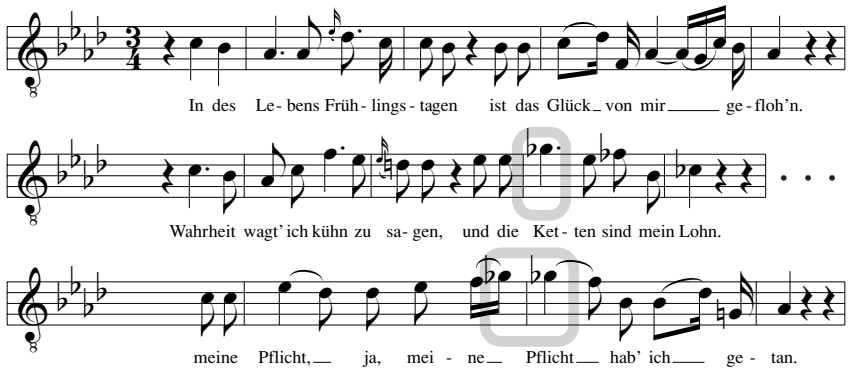
FIGURE 6.5 Haydn "Mit Würd' und Hoheit" from *Die Schöpfung,* Part II, No. 24



The use of the tenor's third register shift to emphasize poetic transformation points was continued by great composers throughout the eighteenth and nineteenth centuries.

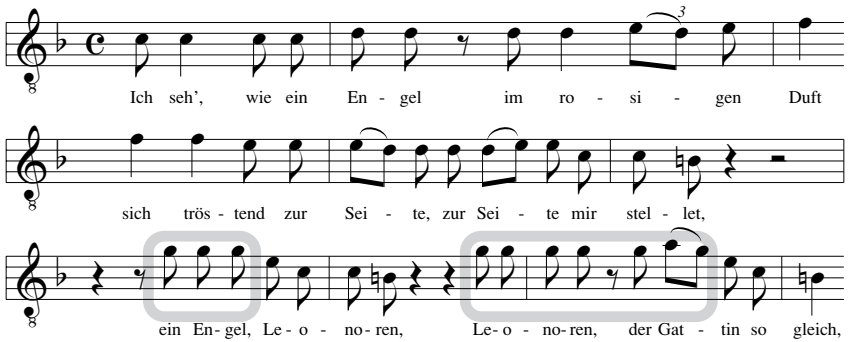
Here, the turning point in Haydn's *Creation* (1798) is structured around the distinction between the world before Man's appearance, and the transformation of the universe by God's creation of Man. Haydn begins with F-naturals in the second register; at the point when Man is created, he interjects a key change and a dramatic shift into the third register with a high F-sharp–G on "und König der Natur" ("and king of Nature").

FIGURE 6.6 Beethoven, "In des Lebens Frühlingstagen" from *Fidelio,* Act II, Scene 1, No. 11



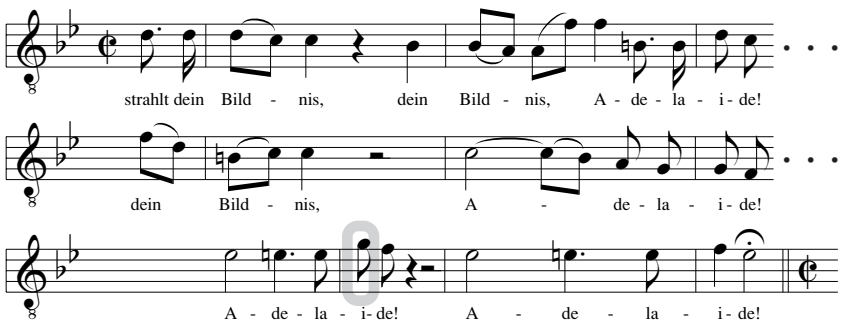
The major tenor aria of Beethoven's *Fidelio* (1805) is also constructed around the tenor's crucial high F-sharp. The aria begins in the first and second registers, rising to "the springtime of life" on the first phrase, with second-register notes on "Frühling" (E-flat) and "Glück" (D-flat). The second line of the opening couplet is already a transformation, as Florestan recalls his defense of the truth, modulating to a high G-flat on "Ketten" at the tragic-ironic "und die Ketten sind mein Lohn" ("and chains are my reward"). This is then developed with repeated G-flats.

FIGURE 6.7 Beethoven, "In des Lebens Frühlingstagen" from *Fidelio,* Act II, Scene 1, No. 11



Repeated second-register high F-naturals introduce the wondrous vision into Florestan's cell. The third register shift to high G's comes only when the vision is recognized to be his wife Leonore: "Ein Engel Leonoren! Leonoren, der Gattin so gleich. . . ." In the subsequent passage (not shown), the F-sharp itself is finally introduced and repeated twice on "der, der führt mich zur Freiheit" ("who . . . who will lead me to freedom").

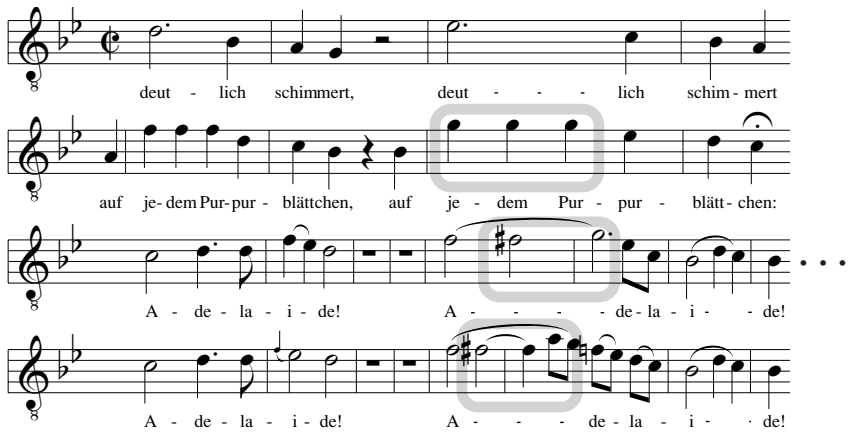
FIGURE 6.8 Beethoven, *Adelaide,* Op. 46



Perhaps Beethoven's most famous *Lied,* written some years before *Fidelio,* is constructed by stating the refrain, "Adelaide," in the second register, and then transforming it into the third register. Beethoven utilizes the vowels of the name itself, /ɑ/, /e/, and /i/ which form a series rising naturally in pitch as the placement of the vowel shifts from the back of the mouth on /ɑ/, to the center on /e/, and to the front of the mouth on /i/. His first few statments of "Adelaide" rise to the top of the second register, then fall back again, as in the first line of this example.

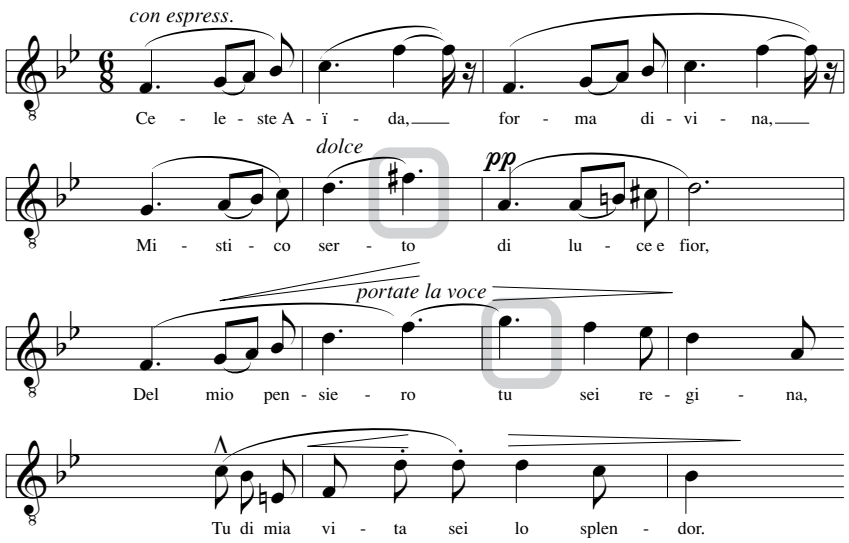
Here, at the end of the first development passage, Beethoven transforms the theme by shifting it up into the third register, playing with the distinction between the high G and the F-natural.

FIGURE 6.9 Beethoven, *Adelaide,* Op. 46



When the song breaks into a new geometry, a cabaletta-like section with a new tempo at the end, shown here, Beethoven repeatedly displays the theme transforming itself, by stating it at the top of the second register, and then shifting it into the third register.

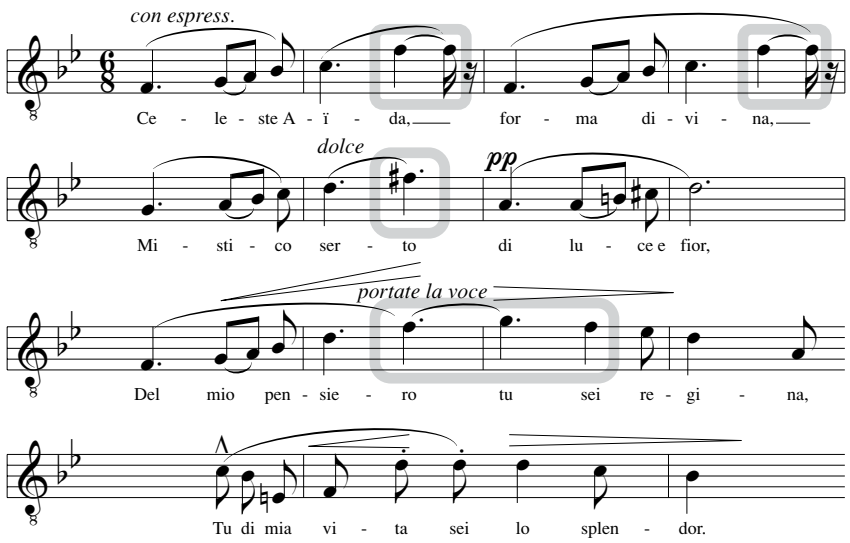
Figure 6.10 Verdi, "Celeste Aïda" from *Aïda,* Act I, Scene 1, at C=256



Verdi's famous aria, composed in 1871, is an obvious variation on Beethoven's *Adelaide*. Verdi, too, utilizes the rising sequence of vowels /ɑ/–/e/–/i/ and the two distinct poetic voices given by the second-register high F and the third-register high F-sharp.

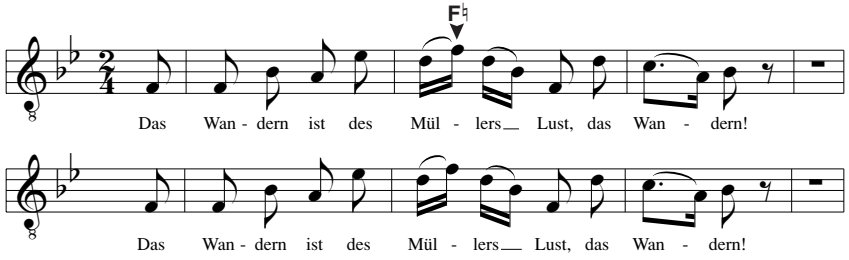
The opening theme must be maintained in the second register, as it is shown here at C=256, in which the composer repeats the rise to the high F-natural twice, in order to emphasize one type of voice quality. Then, he transforms it, by introducing a new voice at the F-sharp of "mistico serto" ("mystical shield") in the second line.

Figure 6.11 Verdi, "Celeste Aïda" from *Aïda,* Act I, Scene 1, at A=440



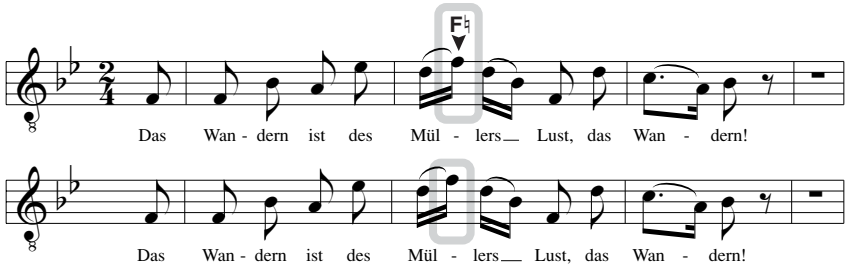
Raising the tuning pitch to A=440 forces the tenor (in order to avoid screaming) to sing the initial high F-naturals up in the third register. The first three poetic lines take on a monotonous character, in which the power of the register shift on "serto" is lost. The personality of the character Radames who sings the aria, is flattened out through this impotent repetitiveness, instead of being revealed as potent and loving in accordance with the composer's intent.

Figure 6.12 Schubert, "Das Wandern" from *Die schöne Müllerin,* Op. 25, No. 1, at C=256



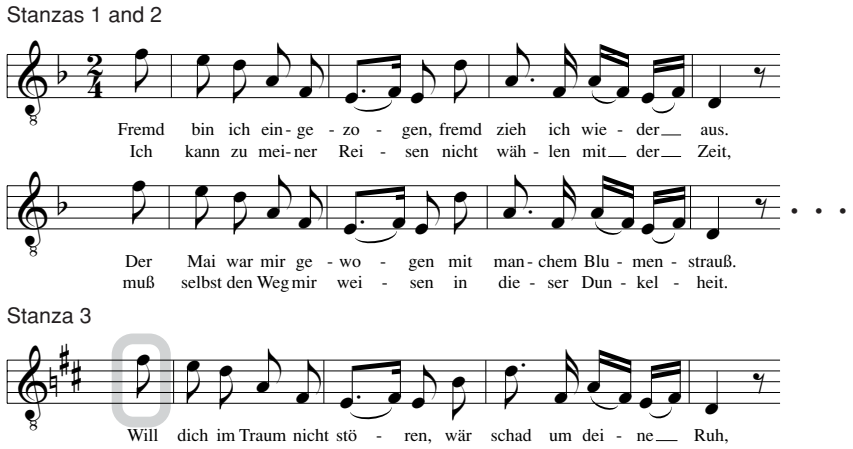
Because dozens of the most beautiful tenor arias and *Lieder* are based upon this prominent third-register shift, the tenor literature especially suffers from the rise of the standard tuning pitch to A=440. Here, in the first of Schubert's 20-song cycle, the opening high F's are sung as passing notes, and thus are maintained within the line of the second register.

Figure 6.13 Schubert, "Das Wandern" from *Die schöne Müllerin,* Op. 25, No. 1, at A=440



At A=440 the voice naturally seeks to shift these incidental notes into the third register, which utterly violates the poetry. The result is that most performers at modern tuning either shout, in an attempt to hold the voice down in the second register, or else break into the third register in an unstable semi-falsetto, so that the high F's do not stand out. Either alternative is detrimental to the voice.

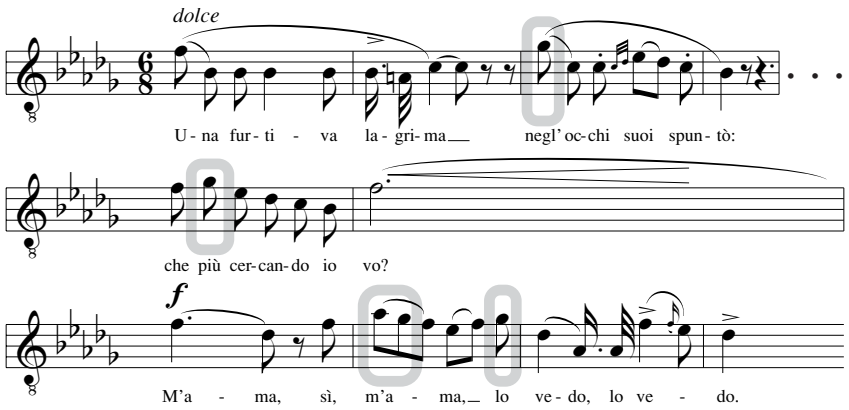
Figure 6.14 Schubert, "Gute Nacht" from *Die Winterreise,* Op. 89, No. 1



Schubert's other major song cycle *Die Winterreise* (1828) revolves around a related thematic feature of this first song. It begins in D minor, with the F-naturals dividing the scale in a particular way, which is repeated three times in the first three stanzas (only the first and second are shown here).

In the fourth and final stanza, Schubert transforms the poetry with a shift into D major, in which the tenor's high F-sharp changes the emotional sense of what is being said. Whereas in the first three stanzas the poem's subject bemoans his own fate, here he turns with loving reflection to address the beloved: "I would not disturb your dreams." At A=440, the F-naturals of the first three stanzas are in the third register, just as is the F-sharp in the critical fourth stanza, thereby destroying the song's effect, and the entire cycle as well.

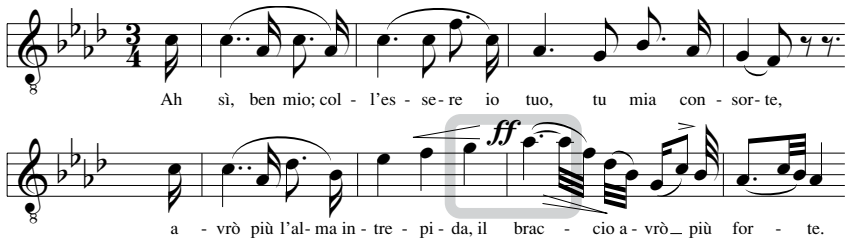
Figure 6.15 Donizetti, "Una furtiva lagrima" from *L'Elisir d'amore,* Act II, Scene 8



With the flowering of Italian bel canto opera under Rossini, Donizetti, and Bellini in the early nineteenth century, dozens of great tenor arias were written around this distinction between the tenor's high E and F-natural in the second register, and the F-sharp and G in the third register; none of these arias makes much sense except at C=256.

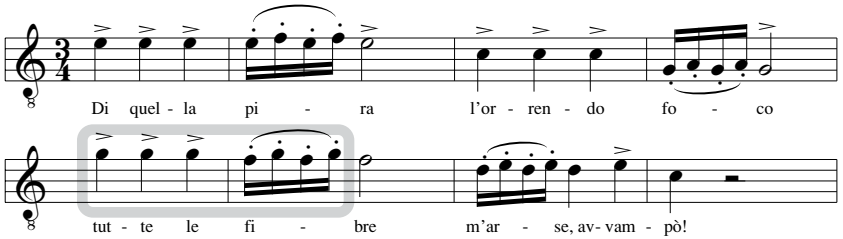
Gaetano Donizetti (1797–1848), perhaps the finest Italian bel canto composer for tenor, constructed this aria for the character Nemorino in 1832 around the high F-sharp register shift. The aria's opening couplet begins on F-natural "Una furtiva lagrima" ("a secret tear") as one statement, and is immediately modified by the second phrase of the couplet with a high G-flat on "negl'occhi suoi spuntò" ("in her eyes appeared"). In the second line shown here, the development is sped up by having the G-flat immediately follow the F. The third line combines the work of the first two.

Figure 6.16 Verdi, "Ah sì, ben mio" from *Il Trovatore,* Act III, Scene 2, No. 18



All of Verdi's tenor roles are made almost impossible to sing effectively at today's tunings. In *Il Trovatore,* "Ah sì, ben mio" and its cabaletta "Di quella pira," are murderous at A=440. The first aria is more difficult, since it is marked *adagio cantabile* but sits on the high F-natural–G-flat register shift. The voice must either shout through these passages in the second register, or, in order to achieve the desired *piano cantabile,* must create strange, squeezed sounds on the F-natural.

Figure 6.17 Verdi, "Di quella pira" from *Il Trovatore,* Act III, Scene 2, No. 18

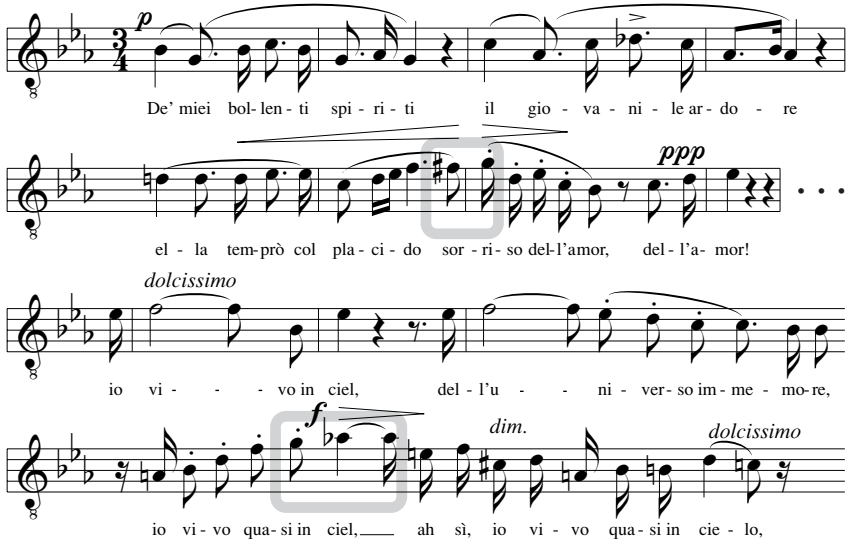


The cabaletta "Di quella pira," if sung frequently at a high tuning, will send most performers into early retirement. "Pira" is meant to be sung as a written-out ornament, E–F–E–F–E, *fortissimo* at the top of the hero's second register, repeatedly through the long aria. At A=440 and above, these passages are invariably shouted. That which should add emotional intensity and fervor, becomes ugly *machismo*.

The two F-naturals in the second line of this example, should be sung as passing notes, remaining in the third register until the half-note F.

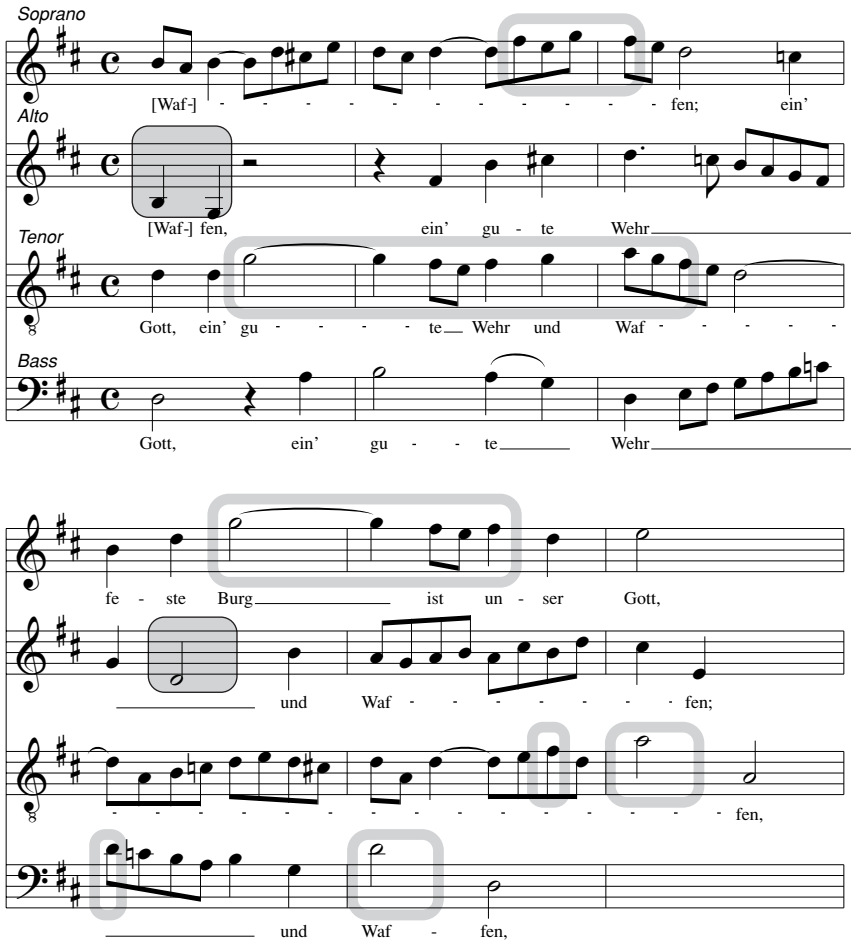
These problems come home at the end of the aria (not shown), where often the final high G is taken up to high C (although Verdi did not write this in score). By the time the repeated high C's are called for, the poor tenor is usually *in extremis*. Most tenors today transpose the entire scene downwards by a half-step, thereby destroying its relation to the rest of the opera.

Figure 6.18 Verdi, "De' miei bollenti spiriti" from *La Traviata,* Act II, Scene 1, No. 7



This aria in E-flat major begins with a transformation from F-natural to F-sharp on "ella temprò col placido sorriso. . . ." Its numerous F-naturals must be differentiated from the high G's and A-flats; singing the F-naturals in the third register makes the aria annoyingly pretentious.

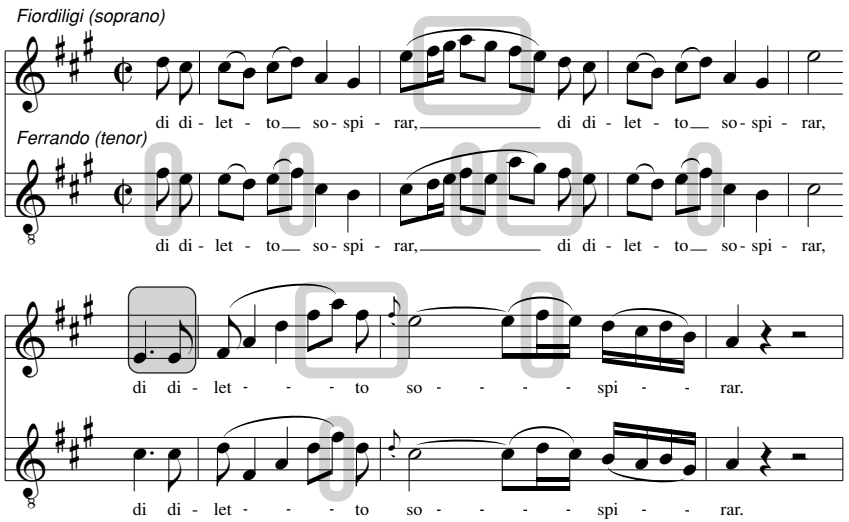
FIGURE 6.19 J.S. Bach, "Ein' feste Burg" from Cantata No. 80, BWV 80



J.S. Bach was a master at constructing choral fugues in which the register shift jumps from voice to voice, creating a cross-voice based on registers. In this, the inner-voice tenor shift is critical. In this passage, the tenors lead the basses and sopranos in a "phased array" of leaps into the third register, starting with the tenor jump "ein' *gu*te Wehr."[1]

This is interrupted by the bass answer, followed by another bass shift.

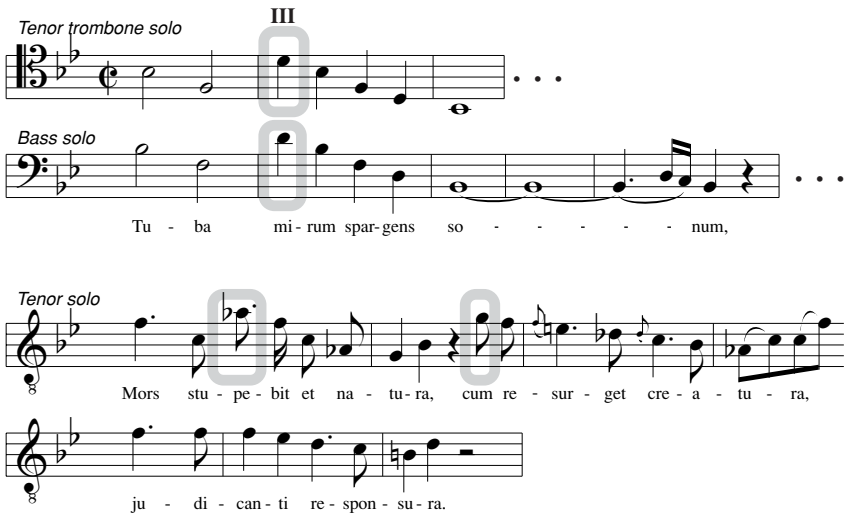
FIGURE 6.20 Mozart, "Fra gli amplessi" from *Così fan tutte,* Act II, Scene 12, No. 29



Mozart became a specialist in such "registral cross-voices," as may be heard in all his operas. In the denouement of this duet, Mozart portrays the two foolish characters rising repeatedly into the third register as they become more infatuated over their love affair. Here the tenor is heard antiphonally answering the soprano's shift into the third register at F-sharp–G–A with his own shift.

[1] Passing notes such as the high E-natural in the soprano line of the first staff system here, are generally treated as lying within a given registral voice, even when the passing note itself lies outside that register. Only when such notes are contrapuntally significant, are they to be performed in a different register.

FIGURE 6.21 Mozart, "Tuba mirum" from *Requiem,* K. 626

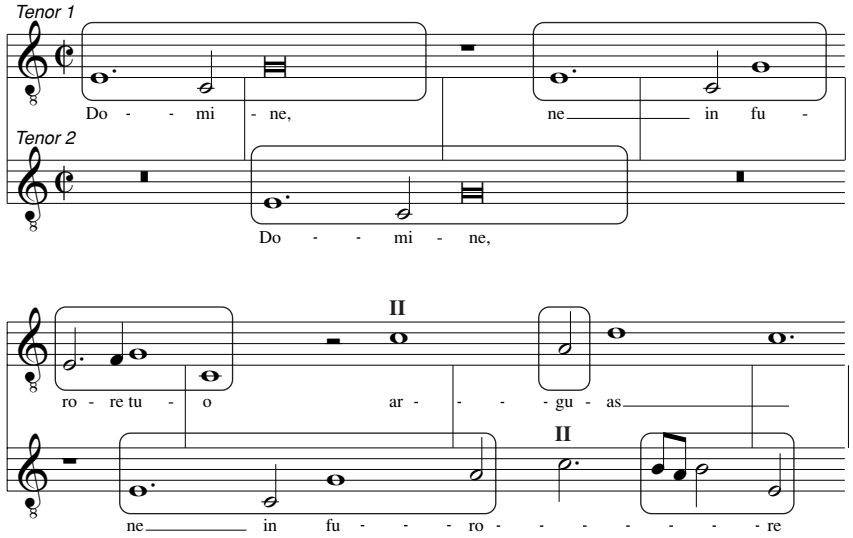


The bass soloist shifts into the third register at the high D on the third syllable of the opening couplet, the verb "*mi*rum." The tenor, entering in sequence, must make precisely the same poetic statement with his third syllable "stu*pe*bit," in his third register. At C=256, this is precisely what happens at the tenor's high A-flat.

At A=440 or above, the tenor's very first note—the noun "Mors" on F-natural—would already be sung in the third register, which turns Mozart's effect into gibberish by destroying the counterpoint between the bass and the tenor.

The Tenor First-to-Second Register Shift

FIGURE 6.22 Josquin des Prez, *Domine, ne in furore*

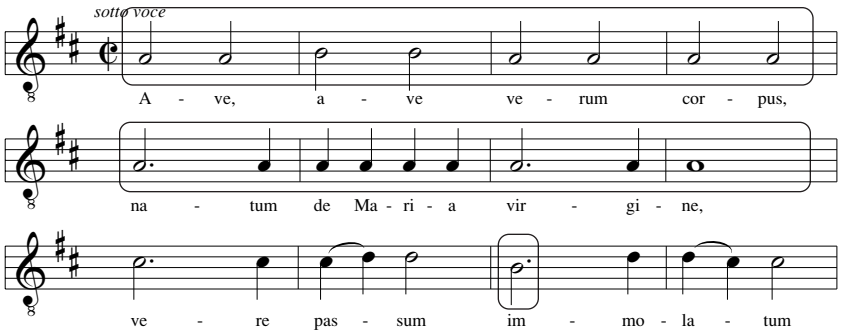


The tenor's shift from the first to the second register at C=256 is far less audible to the untrained ear than the high shift, but occurs naturally if the tenor voice is well-elevated into the head. It is subtle, but nonetheless essential for the balancing of the tenor's voice.

The first-to-second register shift was well-understood from the high Renaissance onward, as may be seen from almost any Renaissance choral composition which includes tenor. This motet for three tenors and a bass is a case in point. The shift, especially in the dramatic form of an octave shift from C=128 to C=256, may be heard beginning with "arguas me" in the upper tenor line of the second staff system, and continues in all three tenor lines throughout.[2]

[2] For ease of reading, a slightly different convention is used to indicate the first register in the male voices. Instead of the shaded box used for the soprano, mezzosoprano, and contralto first register, male first-register notes are indicated by an unshaded, solid-outlined box.

Figure 6.23 Mozart, *Ave verum corpus,* K. 618

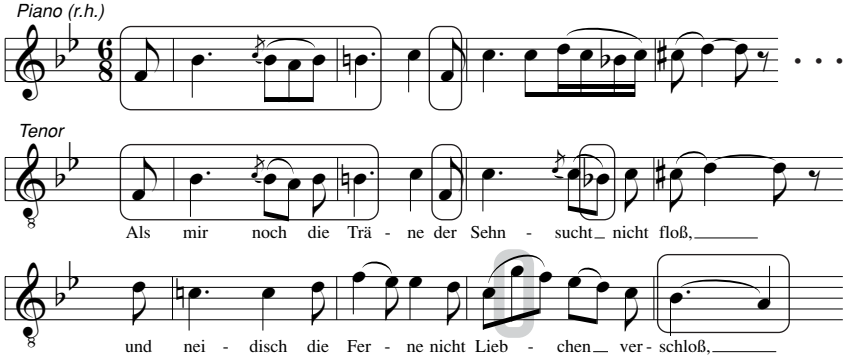


This highly underrated late work of Mozart has a tightly-crafted dialogue of register-shift cross-voicing among the voices. This fits the opening two couplets of the poem.

At the outset, the sopranos and altos pass in and out of the first register in a dialogue. Both start in the second register; the altos then pass down into the first register at the end of the first phrase "Ave, ave verum corpus." The sopranos then join them in the first register on the verb "natum," and both women's voices end the initial couplet in the deeper register on "de Maria virgine."

In the next couplet, the tenors shift up into the second register on "vere passum," which sets off a modulation to the fifth from D major to A major. The basses also shift an octave upwards from first to second register. The shift is quite audible when all members of the tenor section perform it correctly.

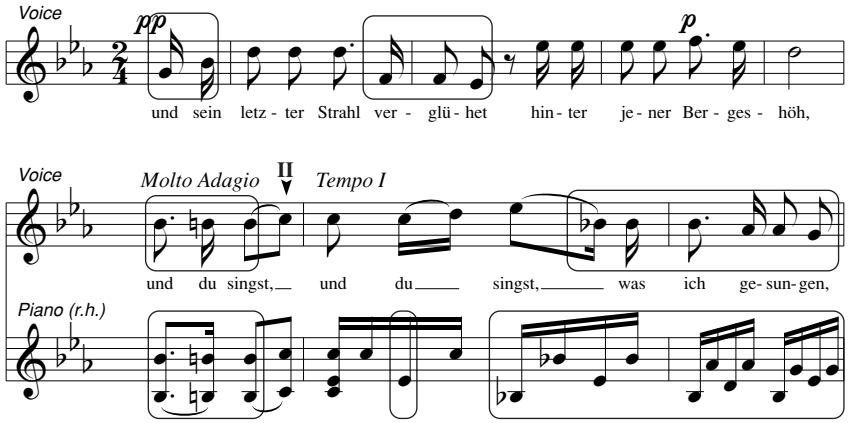
Figure 6.24 Beethoven, *Lied aus der Ferne,* WoO 137



Beethoven in his *Lieder* enjoyed the use of this shift. This song, even in the keyboard introduction, is built on the tenor's C=256 register shift. It begins with the ironical statement of the theme in the first register, around B-flat in the first and second measures, and then in the immediate repetition in the second register, at the C=256 in the second through fourth measures.

When the singer enters and sings the same series of voices, the irony is complete. Observe how Beethoven achieves closure of the idea by falling back into the first register on the verb "verschloß" at the end of the opening couplet.

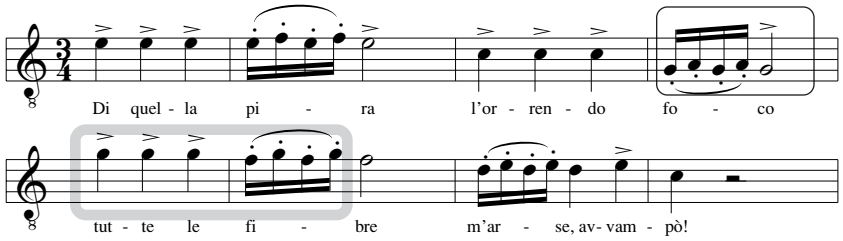
Figure 6.25 Beethoven, *An die ferne Geliebte,* Op. 98



This song cycle, composed in 1816, is in significant degree structured around this register shift.

The first five songs outline the poet's realization that one will be unhappy in love, until he emulates God the Composer, by creation of song, for the beloved. The final song adds the powerful request, that the beloved, too, act creatively, and sing: "Und du singst, was ich gesungen . . ." ("And when thou singest what I have sung . . ."). At this point, interrupting the flow of development, Beethoven introduces the progression B-flat–B-natural–C. The boldly interjected B-natural is heard as the end of one poetic voice, calling for the new idea in the new register at C=256, all on the verb "singst." The breakthrough comes precisely at the shift to C=256.

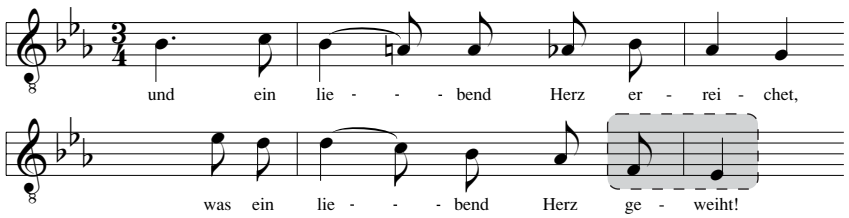
Figure 6.26 Verdi, "Di quella pira" from *Il Trovatore,* Act III, Scene 2, No. 18



Verdi often utilized the tenor's first register, especially in relation to the third register. Here he sets the first two lines of this cabaletta in a counterposition of the two. The first line makes a statement at the top of the second register, and then shifts down and restates the idea in the first register. The second line further develops the same idea in the third register, before resolving back to the second. All of this does not function at A=440.

The Tenor 'Childhood' Register Shift

FIGURE 6.27 Beethoven, *An die ferne Geliebte,* Op. 98



The great Classical composers often utilize the soprano and mezzo-soprano first-to-second register shifts, at F-sharp and at E-natural respectively, *in all the singing and instrumental voices,* including adult male voices.

This is because these register shifts reflect not only the fundamental register shifts of the physical universe, but also the shift which every singer originally had as a child. Composers such as Mozart, Beethoven, and Schubert, who learned to sing as boy sopranos or mezzosopranos, naturally emphasize it.

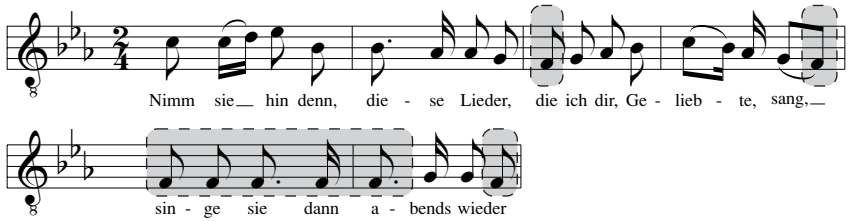
For example, a song composed for tenor will include an obvious register shift called for on the low F-sharp at the bottom of the staff, where the tenor in fact has no physical register shift.

Similarly, a song for baritone will often have an obvious poetic call for a register shift on the low E-natural, where a baritone has no such physical shift.

One of the clearest uses of the soprano's low F-sharp shift, in a song whose poem is obviously for tenor and not for soprano, is Beethoven's *An die ferne Geliebte*. This example is the resolution of the ideas in the first song, which ends by falling into the what is recalled as the boy soprano's first register, on the verb "geweiht" ("consecrated").[3]

[3] The convention for the tenor childhood first register is a shaded box similar to that of the soprano, but with a dotted outline to indicate its metaphoric nature.

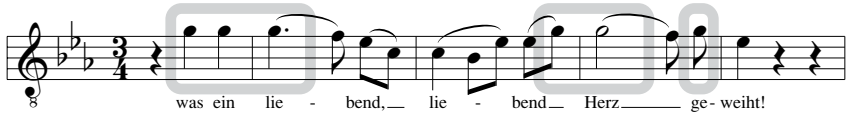
FIGURE 6.28 Beethoven, *An die ferne Geliebte,* Op. 98



In the opening couplet of the final song, Beethoven modulates down into the "soprano" first register on the verb which completes the thought: "sang" in the second line, as in "which, beloved, I sang to thee."

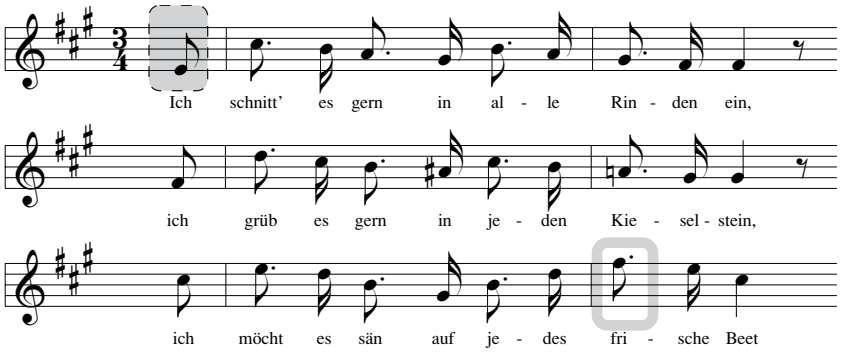
In the second, developmental couplet, he continues in the new voice in the lower register: "Sing them again in the evening."

FIGURE 6.29 Beethoven, *An die ferne Geliebte,* Op. 98



Such dramatic use of the downward directional soprano register shift also serves to highten the later denouement at "Und du singst" on the tenor's upward shift to C=256 (Figure 6.25). All of this is then ultimately resolved at the very end of the cycle with the climactic shift to the high G in the third register on ". . . was, was ein liebend Herz geweiht!" (". . . what a loving heart has consecrated!").

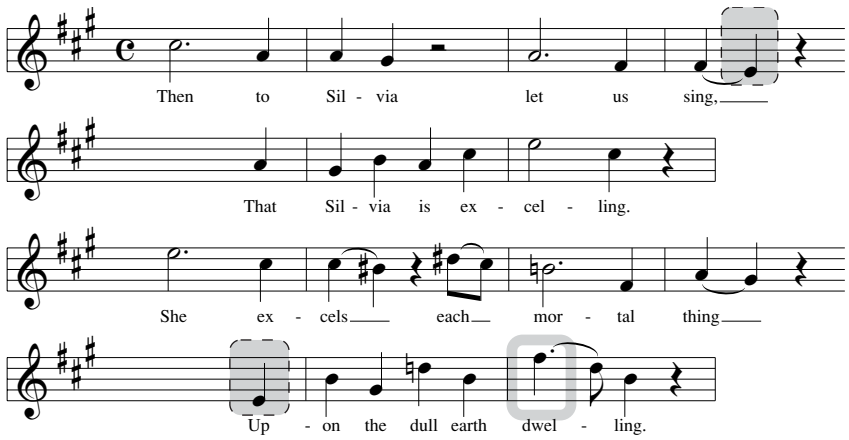
Figure 6.30 Schubert, "Ungeduld" from *Die schöne Müllerin,* Op. 25, No. 7



Schubert's major song cycles, in which the reciter is clearly a man, constantly uses to poetic effect the reflected childhood soprano low F-sharp register shift.

Here the theme in the first line of the song begins with a low E in the first register, and is repeated in the second line, transformed up to the F-sharp of the childhood second register. It is then transformed again, rising into the third register, as if to underline the principle of transformation being applied.

Figure 6.31 Schubert, *An Silvia,* Op. 106, No. 4

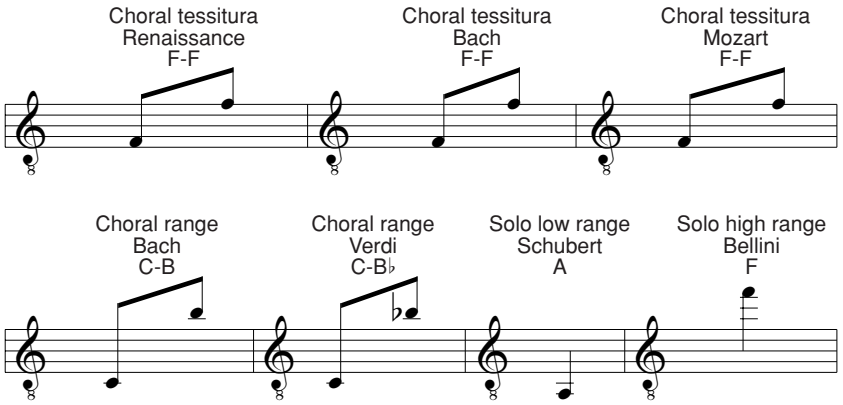


Schubert enjoyed the same sort of compacting of multiple register shifts in his three Shakespeare settings, especially this one from *The Two Gentlemen of Verona*. Analysis of the song by registration uniquely proves, contrary to standard texts, that Schubert composed from the English first, not the German translation. (See Figures 10.4–10.10.)

As with any good composition, this is composed beginning with the irony at the end, Shakespeare's imperative "Then to Silvia let us sing!" This final, most important verbal phrase crosses down dramatically over the low F-sharp to a new voice at the low E, in what would be a soprano's first register—the standard device for the end of a soprano couplet. Yet the singer in the Shakespeare play is a male.

This development of the dominant E as a registral voice continues throughout the song. The second line of the opening couplet rises to the high E defining the top of the soprano-tenor second register, on "that Silvia is excelling." To this is then contrasted a third voice, rising into the third register on the high F-sharp, at the end of the second couplet, "upon the dull earth dwelling." These three distinct voices are used in various combinations until they are all compressed as spanning all three registers in the four-note phrase at the end in measures 23–24 of the song (not shown), on "that adorèd [she might be]."

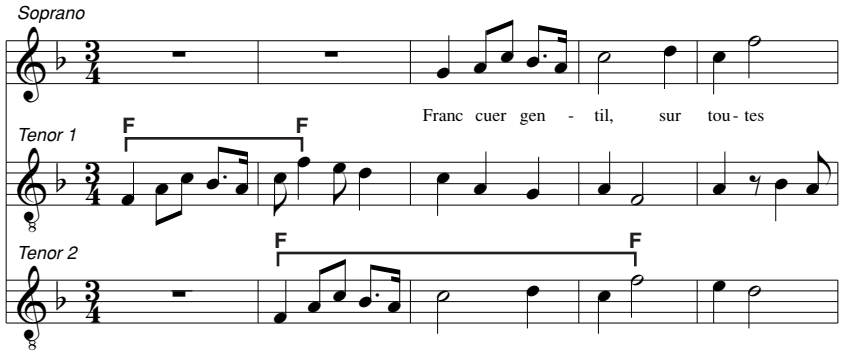
FIGURE 6.32 Secondary Characteristics of the Tenor Voice



The tenor voice was one of the most consistently used voices in polyphonic composition since its beginnings in the early Christian Church. From the earliest available printed music of the Renaissance, the tessitura of the tenor centered on the octave from F below C=256 to the F above. It continued to be used in this manner through the period of Bach, Mozart, Beethoven, Brahms, and Verdi.

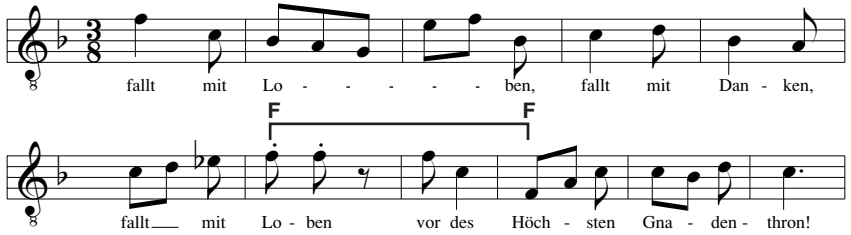
Over the centuries, the range of the tenor was gradually extended to as low as the optional low A in Schubert's original scoring of *Die Winterreise*, and as high at the high F used often by Bellini and Donizetti.

FIGURE 6.33 Dufay, *Franc cuer gentil*



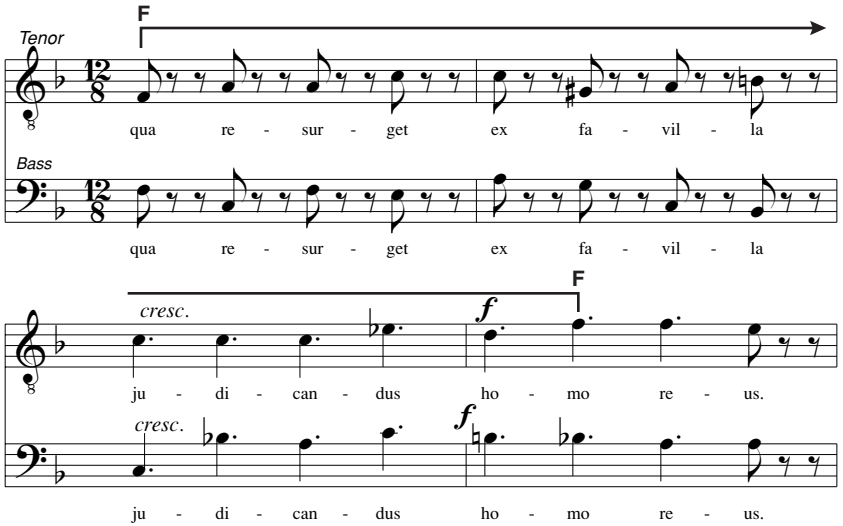
Both the tenor and alto or *contra-tenor altus* of the Renaissance had the same basic tessitura, in keeping with the physiology of the tenor's vocal apparatus.

FIGURE 6.34 J.S. Bach, "Fallt mit Danken" from *Christmas Oratorio,* BWV 248, Part IV, No. 36



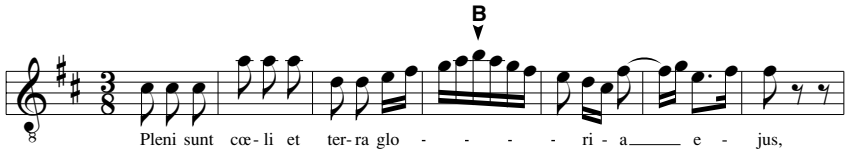
The use of an F–F tessitura for the tenor was maintained by J.S. Bach, while he went on to develop the higher range of the tenor voice.

FIGURE 6.35 Mozart, "Lacrymosa" from *Requiem,* K. 626



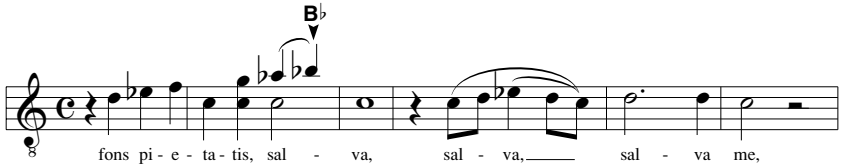
Mozart also continued to center the tenor choral part on the octave of F–F.

FIGURE 6.36 J.S. Bach, "Pleni sunt cœli" from *Mass in B Minor,* BWV 232



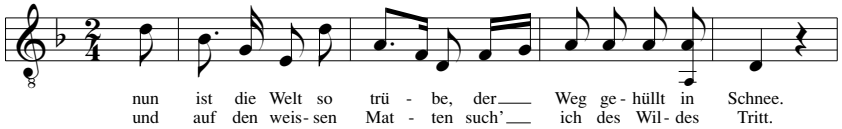
Bach extended the use of the tenor's high range to a frequent choral high B above the staff.

FIGURE 6.37 Verdi, "Rex tremendæ" from *Requiem*



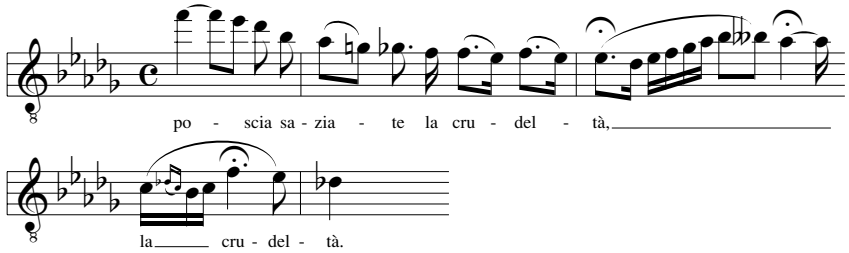
Mozart, Beethoven, Brahms, and Verdi all continued to require the average tenor chorister to sing a high B-flat, demonstrating that they all composed for a tuning no higher than C=256.

FIGURE 6.38 Schubert, "Gute Nacht" from *Die Winterreise,* Op. 98, No. 1



In the same song in which Schubert uses the tenor's F-sharp register shift as the crucial poetic transformation (see Figure 6.14), his original score also calls for an optional low A. The cycle also contains a required low A-sharp in No. 7, "Auf dem Flusse."

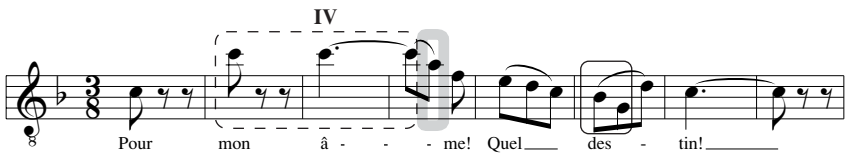
FIGURE 6.39 Bellini, *I Puritani,* Act III, Scene 3



Donizetti and Bellini frequently required a superhigh E or F of the tenor soloist.

The Tenor Fourth or 'Superhigh' Register

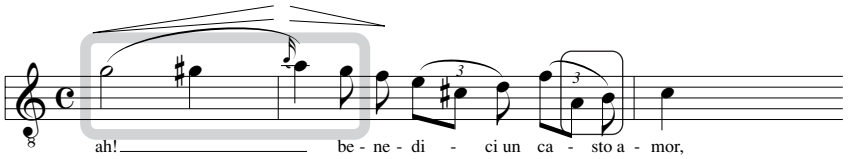
FIGURE 6.40 Donizetti, "Ah! mes amis" from *La fille du régiment,* Act I



In addition to the first three childhood registers, the adult tenor possesses a fourth or "superhigh" register which extends from high C to the F above this in composition, and to the G above that in classroom vocalization. As with the soprano, this register is destroyed by A=440 tuning, in which it is forced to commence early, at the B-natural or even at the B-flat, thus throwing out of kilter the entire high range of the tenor voice.

Tonio's signature aria from Donizetti's "French period" is based on the theme of repeatedly rising to the high C as he announces to the regiment that Marie does indeed love him. The humorous allusion to a military bugle call with the repeated high C is intentional.

FIGURE 6.41 Verdi, "Io la vidi" from *Don Carlo,* French edition, Act I, Scene 2



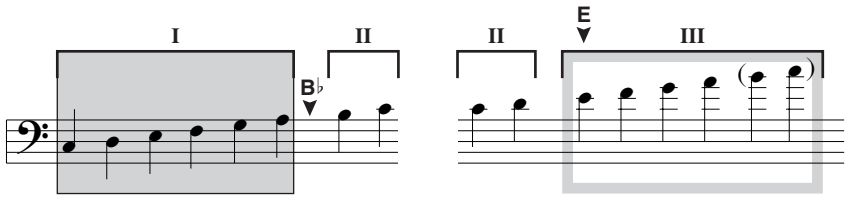
The fourth register is not peculiar to exceptional tenor voices. When the voice is properly placed in the head, the fourth register develops naturally in the majority of tenors. That is, the unwritten high C's of such bravura arias as Verdi's "Di quella pira," which are supposed to be the prized property of only a handful of living tenors, would be commonplace if vocal training today were done with reasonable rigor at C=256 tuning.

This example shows that at the proper tuning, the shift to the fourth register must be precisely at high C. The line at the denouement of the aria must be kept in one coherent passage in the third register, including the climactic high B-natural *appoggiatura*. To shift register anywhere in this passage from G up to B, and back again to G, would be poetically disruptive, and would subject the voice to great strain. Consequently this aria is not often sung in most modern productions of *Don Carlo*.

CHAPTER 7

The Baritone Voice

Figure 7.1 Baritone Division of the C Major Scale



The baritone voice is a relatively new discovery in the history of singing. It lies between the tenor and bass, and is defined by a primary register shift from second to third register between E-flat and E-natural above middle C. The baritone voice was first used by Mozart, for the Count in *Le nozze di Figaro* in 1785. It has always been a specialized solo voice, and is not generally used in Classical choral compositions. In today's male population at large, more voices seem to be classified as baritone than as bass; this, however, should be weighed against the fact that at modern high tunings, many of the more robust tenor voices are misclassified as baritone. Moreover, the registral imbalances caused by higher tunings act to inhibit the full development of the lower voices, both male and female.

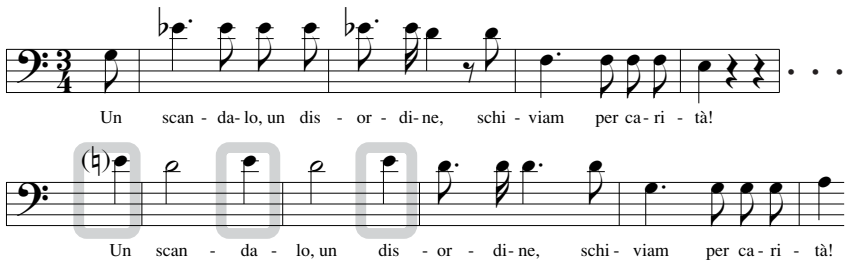
Mozart discovered this voice after studying J.S. Bach's use of the mezzosoprano, which, as described in Chapter 4, was developed during the eighteenth century in order to allow a fourth type of voice in addition to the Renaissance soprano, tenor, and bass. Realizing the increased richness created by the mezzosoprano's shift on E-natural, Mozart developed a correlative male voice with the same register shift. Mozart continued to call this new voice "bass," but already within a few years after his death, usage of the term "baritone" had become universal.

As with the mezzosoprano register shift, the baritone's E-flat–E-natural register shift is geometrically determined (see Figure 4.2).

The baritone voice also has a secondary shift, from first to second register, between A and B-flat below middle C. This secondary shift occurs at exactly the half-way point of the E–E octave defined by the primary shift at E-natural.

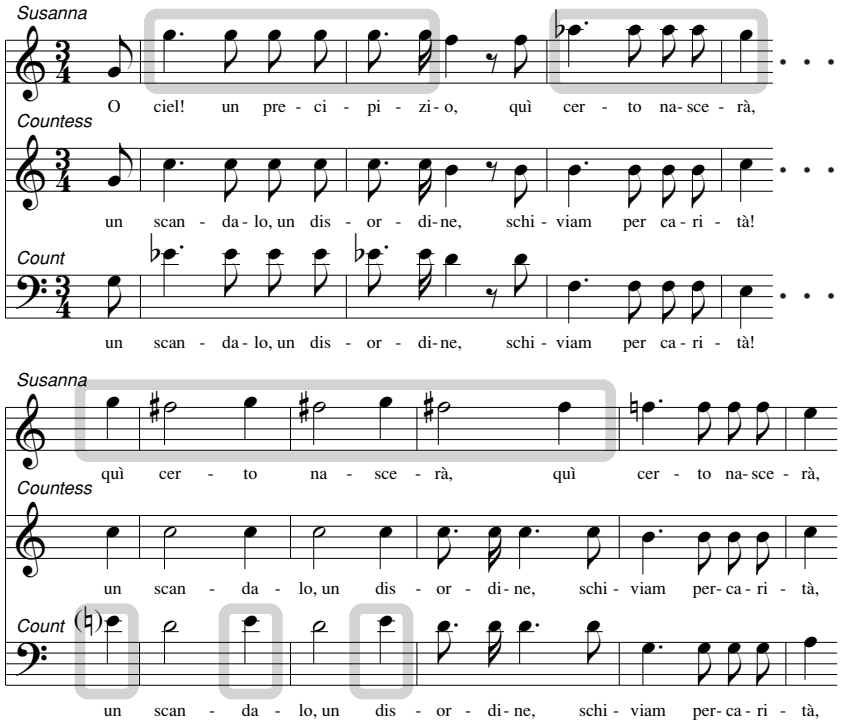
Like the mezzosoprano (see Figure 4.3), the baritone's primary register shift is a characteristic of the difference between C minor, whose triad includes E-flat; and C major, whose triad includes E-natural.

Figure 7.2 Mozart, "Susanna, or via sortite" from *Le nozze di Figaro,* Act II, Scene 6, No. 13



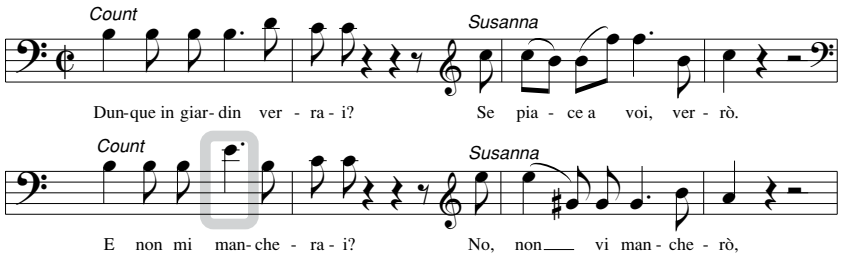
The Count, uncertain about whether he wants to cause a scandal, sings a phrase first in C minor, with the E's flatted, at the top of the second register. When he repeats the phrase after having decided to act, it is shifted into the third register on E-natural, emphasizing the new idea.

FIGURE 7.3 Mozart, "Susanna, or via sortite" from *Le nozze di Figaro,* Act II, Scene 6, No. 13



All three voices in the same passage as shown in Figure 7.2, show that the first phrase is based on the tones of the C minor triad, in which the sopranos sing the C and G, while the pivotal E-flat is sung by the Count in the second register. In the second phrase, the women's voices repeat virtually the same material, while the baritone creates the critical voice which shifts the ensemble from C minor into C major.

FIGURE 7.4 Mozart, "Crudel, perchè finora farmi" from *Le nozze di Figaro,* Act III, Scene 2, No. 16

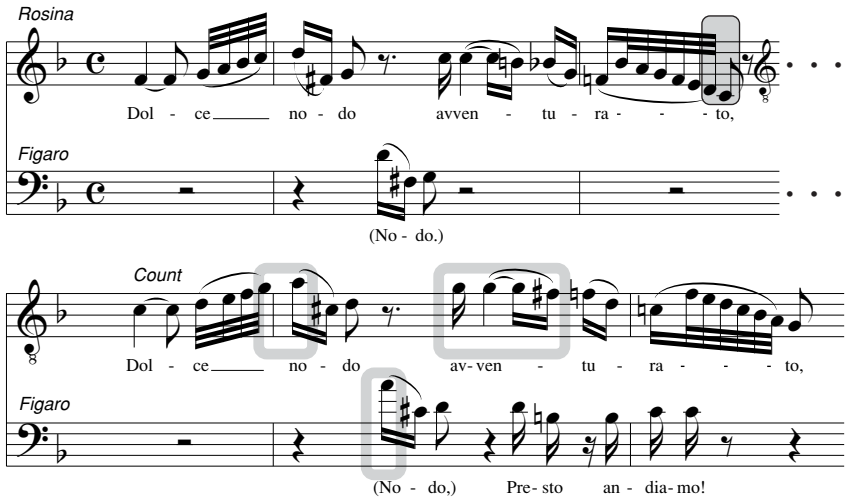


Later the Count asks his servant Susanna if she will attend a tryst; he stays within his second register (including the high D on "verrai"). The baritone becomes more insistent, and varies the same idea, rising into the third register on E-natural at "mancherai."

If Mozart had used the standard bass voice for the Count, this example (as well as Figures 7.2 and 7.3) would merely repeat the same idea twice without alteration. Since the bass must shift into the third register at D, in this instance both the Count's first and second phrases would rise into the third register.

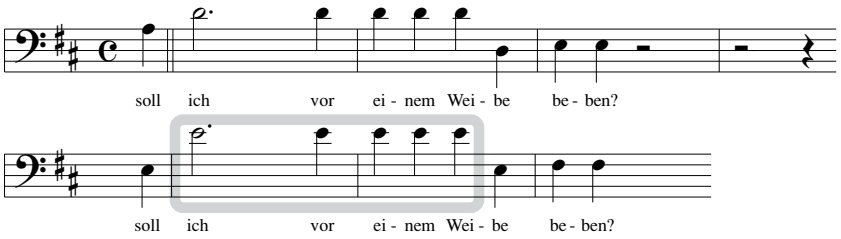
These examples are strong evidence that the newly discovered baritone register shift is being used. The difference in both examples would have been particularly notable to Mozart's audience, accustomed as they were to hearing the lower male voice use the bass shift on D.

FIGURE 7.5 Rossini, "Ah! qual colpo inaspettato!" from *Il barbiere di Siviglia,* Act II, No. 18



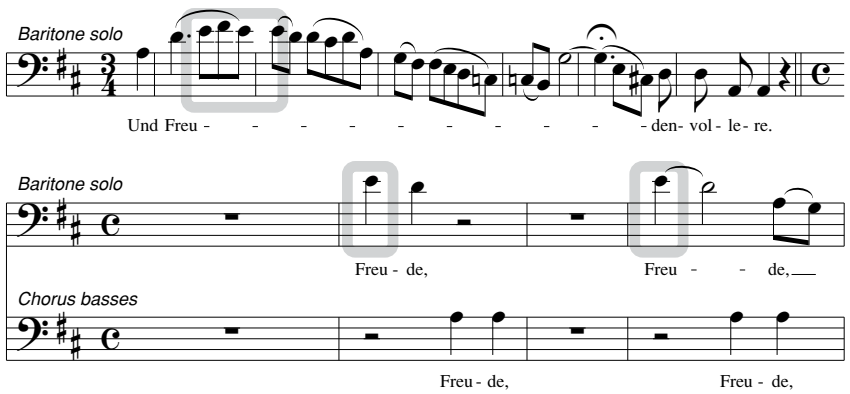
The specific use of the baritone voice is evident here. In the first line, the mezzosoprano Rosina sings in the second register, and Rossini's Figaro, a baritone, comments on her statement, in his own second register. In the next phrase (second staff system), the Count (who in Rossini's opera is a tenor) restates the idea, but rises into the third register, and the baritone's comment also uses the third register, thus echoing the new registral voice as well as the same notes. This would not be true if Rossini's Figaro were a bass; the latter would rise monotonously into the third register both times.

FIGURE 7.6 Beethoven, "Er sterbe!" from *Fidelio,* Act II, Scene 3, No. 14



Beethoven also took up the baritone voice, using it for the villain of his only complete opera, *Fidelio* (begun 1803). Here, Pizarro, surprised by the heroine Leonore, asks twice: "Soll ich vor einem Weibe beben?" ("Shall I tremble before a woman?"). The register shift allows a clear shift in meaning. In the first line, the singer uses the second register, falling into the first register on "beben," so that the emphasis is on his trembling. In the second line, there is an emotional shift, as Pizarro suddenly asserts his willful decision to kill the wife along with the husband, and on the word "ich" ("I") he breaks into the third register.

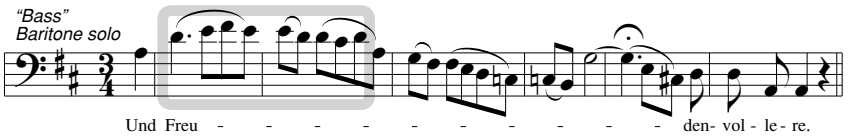
FIGURE 7.7 Beethoven, *Symphony No. 9,* Op. 125, Fourth Movement



The choral finale of Beethoven's Ninth Symphony calls for a baritone, not a bass, as soloist. The distinction is crucial: Beethoven required a soloist whose register shift was *not* on D, the key of the composition; rather, his register shift had to be just above D, such that, when the solo line drops at the end, resolving on D, the resolution is in the next-lower register.

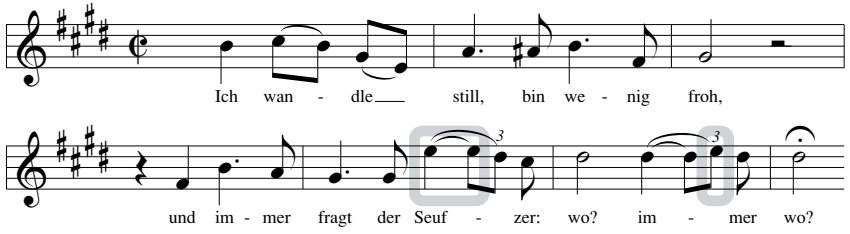
The first setting of the word "Freude" ("joy") is on the phrase "Freudenvollere" ("more joyful [tones]"). Here, the phrase is marked with baritone registers as Beethoven intended. There are three distinct registral voices in the opening figure: the A in the first register (first register is not shown here; see Figures 7.21–7.26), the D in the second, and then a descending figure, which is varied in the third, second, and first registers successively, resolving each time into the lower register. (See Figure 7.28 for additional features of this passage.)

FIGURE 7.8 Beethoven, *Symphony No. 9,* Op. 125, Fourth Movement



If the same passage is sung by a bass, the registral relationships would be as shown (see also Figure 7.29). The soloist's distinctive four-note phrase, which was elucidated by the baritone's register shifts, is now obscured by arbitrary, unrelated registral displacements. The registers would go against the phrasing, and the internal counterpoint would be lost.

Figure 7.9 Schubert, *Der Wanderer,* Op. 4, No. 1



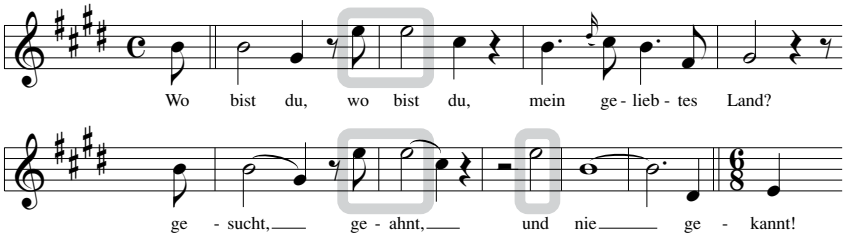
The baritone voice was also used for *Lieder,* as in this example, from Schubert's youth (1816). Although Mozart and Beethoven had established the convention of writing opera and oratorio for the new baritone voice in the bass clef, Schubert, Brahms, and other composers often also published *Lieder* for baritone in the treble clef, with an implicit transposition into the lower octave.

Conclusive evidence that Schubert composed *Der Wanderer* for the baritone voice, is the fact that two years after the song's publication, Schubert himself transposed it down for bass voice. His revised version was transposed a whole step downward, from C-sharp minor/E major in the original, to B minor/D major. Schubert wrote the arrangement for Johann Nepomuk Count Esterhazy, who was known to have a deep bass voice. The transposition puts the bass D register shift precisely where a baritone's E register shift was in the original.

The example above gives the third and fourth lines of the poem. The first three lines are in the lower registers, continuing in the lower registers through the third line (the first line shown here) of the second couplet, as the poet describes his wanderings.

On the entrance of a new voice, at the point where the sigh ("der Seufzer") asks where happiness can be found, the singer for the first time breaks into the third register on E. This also serves first to lead into, and then to establish, the sustained D-sharp of the question "wo?" ("where?").

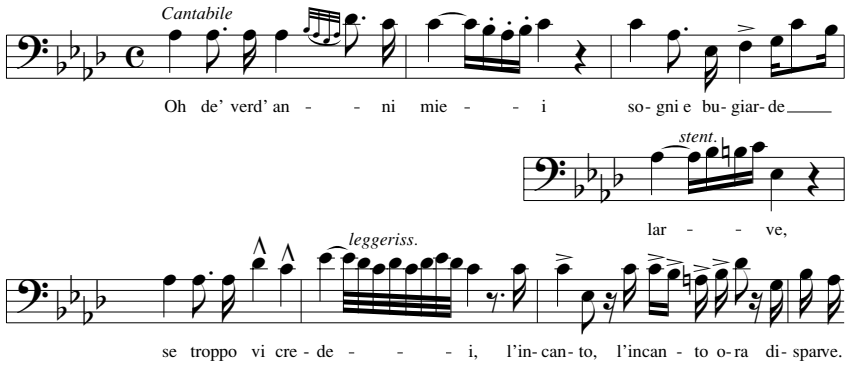
Figure 7.10 Schubert, *Der Wanderer,* Op. 4, No. 1



This passage immediately follows a transition to the major key which was already emotionally identified with the register shift on the E-natural—a transition from the grayness of wandering, to a joyful vision of the sought-after homeland, an imaginary sort of promised land.

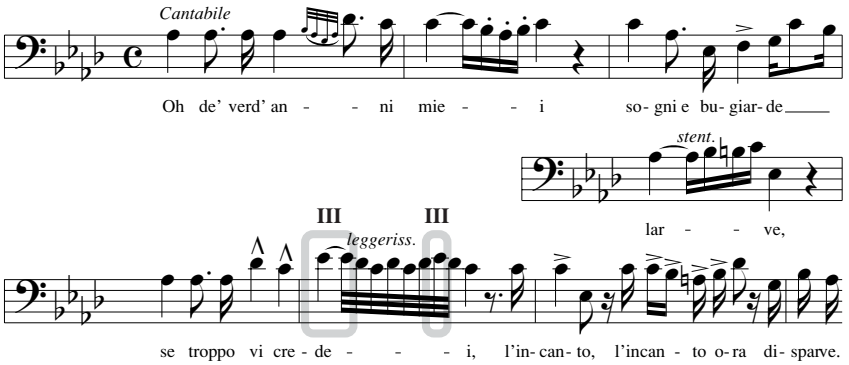
As the reciter asks "wo bist du?" ("where art thou?"), the weight of the phrase falls on the verb, "bist," and the register shift into the third register begins to accentuate the verbal action of creativity associated with the promised land. In the second line, the transformation continues with the progression from "gesucht" ("sought") to "geahnt" ("portended"), rising from the second to the third register, again equating transformation with verbal action.

Figure 7.11 Verdi, "Oh de' verd' anni miei" from *Ernani,* Act III, Scene 1, at C=256



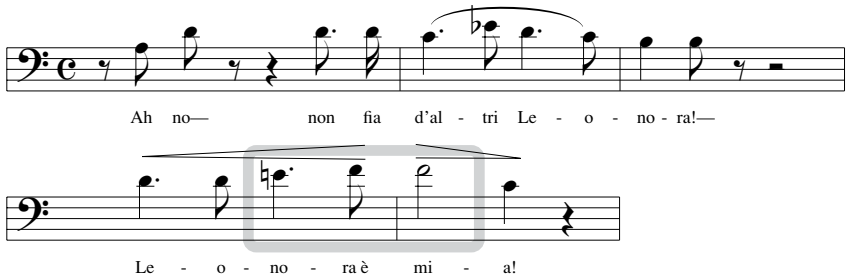
With the great operas of Verdi, the baritone voice found its most extensive expression in the bel canto literature. This example shows that shifts of register can also be inappropriate, and that some bel canto "long lines" in the voice must remain in a single register in order to be coherent. Here, Charles V's major aria has such an opening statement, with two E-flats sitting just below the high register shift. This pattern occurs many more times throughout the aria. At C=256, the baritone is able to maintain all these notes in the second register, as Verdi wanted.

Figure 7.12 Verdi, "Oh de' verd' anni miei" from *Ernani,* Act III, Scene 1, at A=440



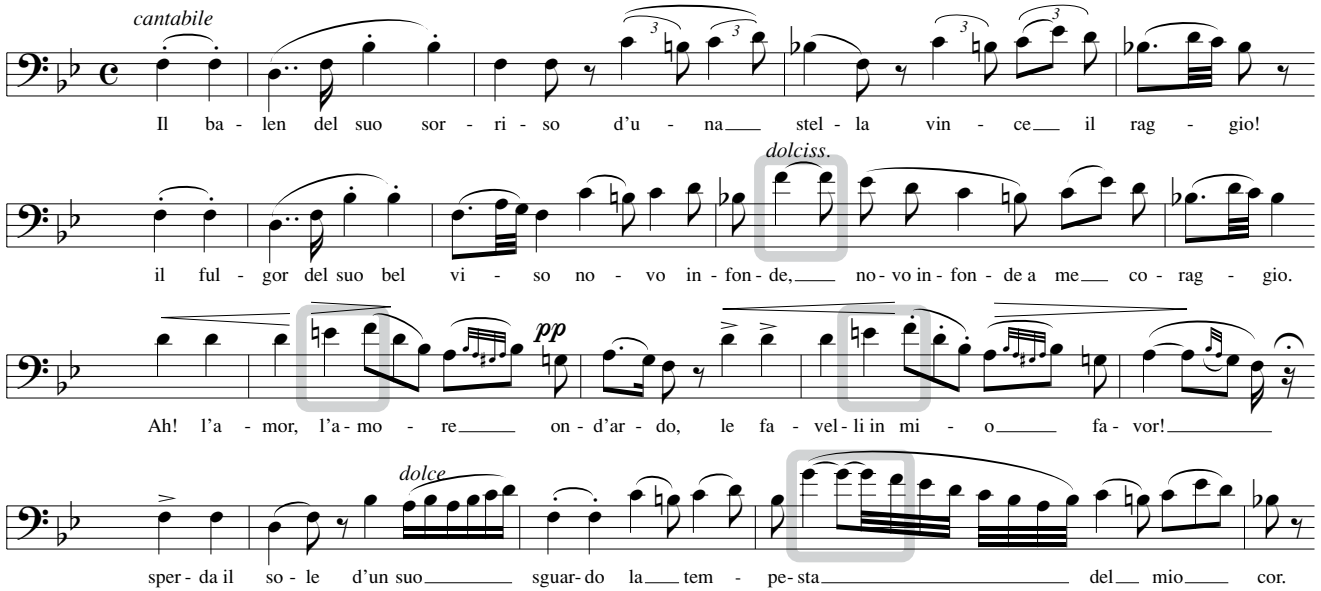
At A=440 tuning, the baritone is forced to prematurely "pop" the E-flats up into the third register, which makes the aria sound foolish, since they are incidental notes which become blown out of all proportion, breaking up the mellifluous line. This example was the first one used by the Italian baritone Piero Cappuccilli at conference of the Schiller Institute on April 9, 1988 in Milan, Italy, which launched the international effort to reestablish scientific tuning.

FIGURE 7.13 Verdi, "Il balen del suo sorriso" from *Il Trovatore,* Act II, Scene 2, No. 12



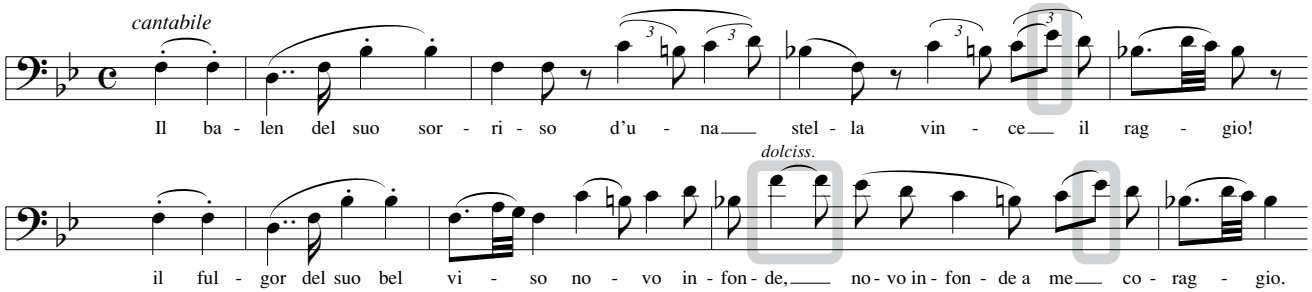
In Verdi's *Il Trovatore,* the major decisions taken by both the gypsy Azucena, a mezzosoprano, and the Count, a baritone, cause much of the tragedy of the opera to revolve around the mezzosoprano and baritone, who both shift registers between E-flat and E-natural. In Figure 4.42, the mezzosoprano Azucena reveals one of the turning points of the tragedy, at which she sings her high E register shift when relating that she killed her own son. Here, somewhat later, the Count is obsessed with the heroine Leonora, who is about to enter a convent. In his recitative, he vows that she shall not belong to another ("d'altri"), even to God, singing in the second register, with the E's flatted. He then makes the decision to abduct her from the convent, exclaiming in the third register on E-natural, as Azucena did, in the echoing phrase: "Leonora è mia!"

FIGURE 7.14 Verdi, "Il balen del suo sorriso" from *Il Trovatore,* Act II, Scene 2, No. 12, at C=256



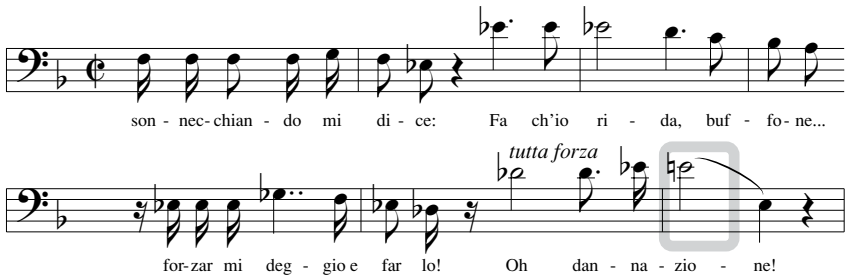
The Count's ensuing aria is a *tour de force* of the use of the baritone register shifts. Each line in the figure above represents a poetic couplet. The first couplet, in which E's are flat, simply describes Leonora's beauty, and does not rise into the third register. The next couplet shifts, to relate the effect of this upon the singer, and the vocal line moves into the third register. In the third couplet, Verdi changes the key momentarily, in order to assert the E-natural, so that the third-register voice enters near the beginning of the couplet's first line.

FIGURE 7.15 Verdi, "Il balen del suo sorriso" from *Il Trovatore,* Act II, Scene 2, No. 12, at A=440



At A=440, the baritone is forced to put all the E-flats up into the third register, throwing many incidental notes into the dramatic third register; or, the baritone shouts in an effort to maintain the E-flats in the second register.

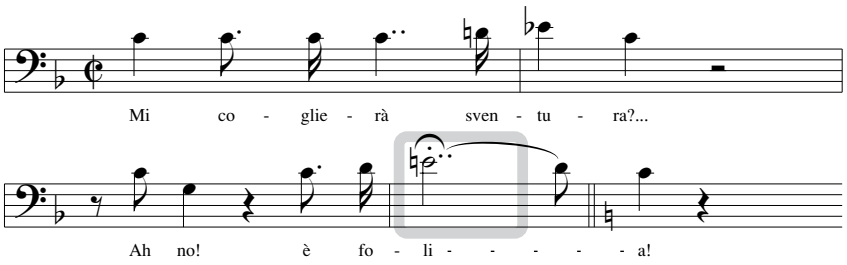
Figure 7.16 Verdi, "Pari siamo" from *Rigoletto,* Act I, Scene 2, No. 7



Verdi uses this same dramatic shift of the baritone voice again and again for the *punctum saliens* in his operas. This famous monologue ("We're similar"), in which the jester, a baritone, compares himself to an assassin, pivots the fatal decisions of the opera around the E-natural register shift.

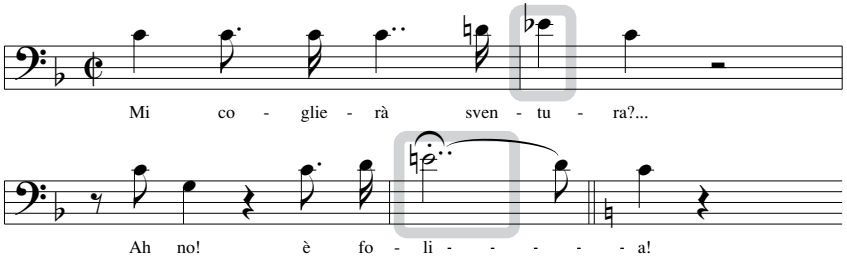
Rigoletto describes his existence as the toady whom the Duke commands, "Make me laugh, fool," singing in the second register, with rising intensity to the top of the register. At the sudden emotional shift into disgust, "Oh dannazione!" ("Oh, damnation!"), he shifts into the third register.

Figure 7.17 Verdi, "Pari siamo" from *Rigoletto,* Act I, Scene 2, No. 7, at C=256



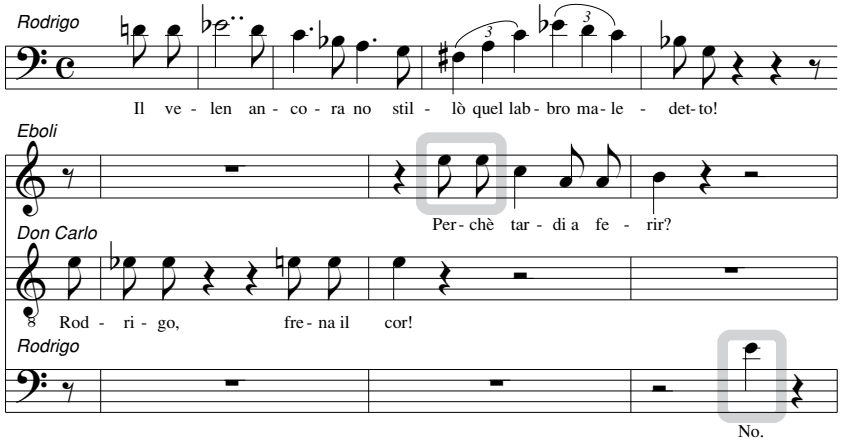
At the conclusion of the monologue, Rigoletto still lacks the moral strength to make the right decision and break with the court, even after being cursed by Monterone for his complicity in the Count's orgies. "Should I heed this warning and change my life?" he asks, in the first line of this example, straining to the top of the second register at E-flat. Then, he "flips" psychologically, shifting hysterically into the third register, and lies to himself: "Ah, no, it is folly" to be worried. His decision here to blind himself leads inevitably to the opera's tragic conclusion.

Figure 7.18 Verdi, "Pari siamo" from *Rigoletto,* Act I, Scene 2, No. 7, at A=440



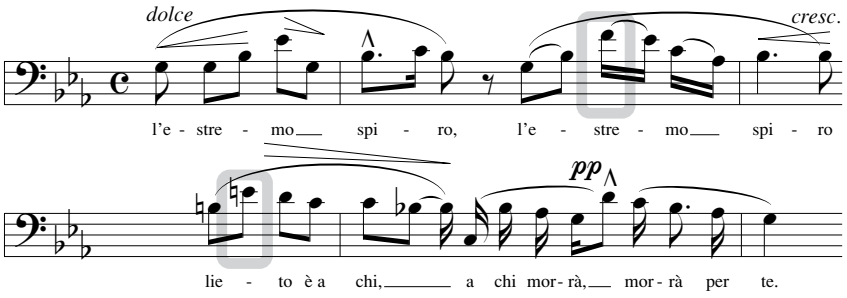
At the higher tuning, all differentiation between before and after the fatal decision is lost, since both parts of the example would reach into the third register.

Figure 7.19 Verdi, "Ah per mia fè!" from *Don Carlo,* Act II, Scene 1



Fatal decisions made by the baritone Rodrigo and the mezzosoprano Princess Eboli in Verdi's setting of Schiller's play, are often indicated through their register shifts. Here, Eboli has discovered that Don Carlo loves the Queen, and Rodrigo hastily concludes that he must kill Eboli, in a phrase which reaches the top of the second register, but does not rise above it. Eboli calls out "Perchè tardi?" ("Why hesitate?") in her own third register. Rodrigo abruptly changes his mind, and his "No" likewise rises to the third register. In Verdi's opera, Rodrigo's decision here marks the point of no return in the failure of his grand scheme to reform the Spanish Hapsburg empire.

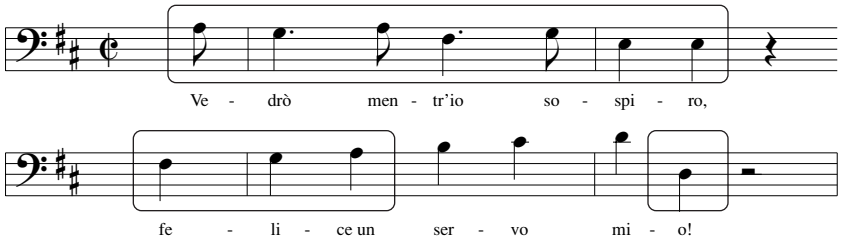
Figure 7.20 Verdi, "Per me giunto" from *Don Carlo,* Act III, Scene 2



Rodrigo decides to sacrifice his own life for Carlo. Here, he repeats "l'estremo spiro" ("the final breath") twice, in a straightforward musical setting in E-flat major. In the repetition, one high note touches on the third register, as the emotional quality shifts away from sorrow. Then, as he continues, "lieto è a chi" ("will be joyful for him") there is a sudden shift in the tonality with the introduction of the B-natural, followed by the register shift into the third register on the equally unexpected E-natural, at the the climax of the phrase, and held twice as long as previously. Finally, the second couplet sinks back into the lower registers as Rodrigo finishes, "a chi morrà per te" ("for the one who dies for thee").

The Baritone First-to-Second Register Shift

Figure 7.21 Mozart, "Vedrò, mentr'io sospiro" from *Le nozze di Figaro,* Act III, Scene 4, No. 17

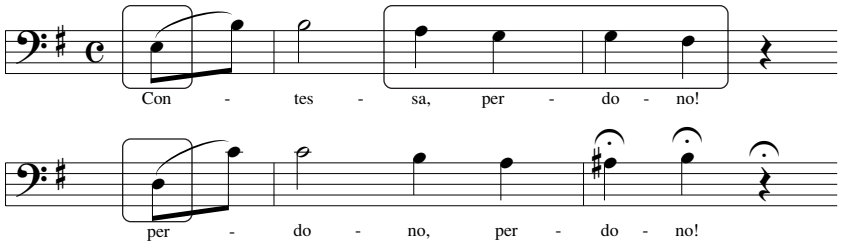


The baritone voice also has a secondary shift, from first to second register, between the A and B-flat below middle C. This secondary shift occurs at the half-way point of the E–E octave defined by the primary shift. Thus, the structure of the register shifts in the baritone voice is coherent with that of all other known types of human voices, where secondary shifts can occur only on the octave and the augmented fourth defined by the primary shift.[1]

Mozart's first use of the baritone voice in the Count in *Le nozze di Figaro* shows as clear an understanding of the lower register shift, as of the high shift on E-natural (Figures 7.2–7.3). The opening theme of the Count's only aria makes a statement in the first register about his anger at Figaro, then rises into the second register as his rage grows, on the words "un servo mio," that a mere servant should challenge his *droit du seigneur*.

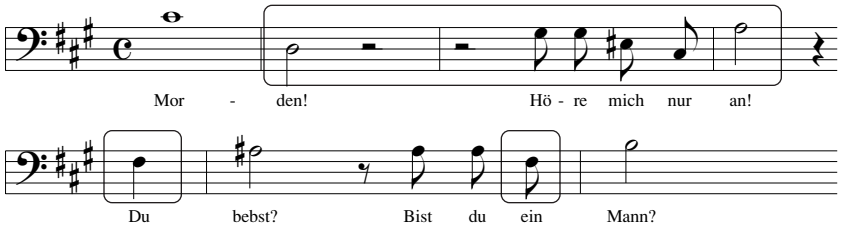
[1] For ease of reading, a slightly different convention is used to indicate the first register in the male voices. Instead of the shaded box used for the soprano, mezzosoprano, and contralto first register, male first-register notes are indicated by an unshaded, solid-outlined box.

Figure 7.22 Mozart, "Contessa, perdono!" from *Le nozze di Figaro,* Act IV, Scene 15, No. 28



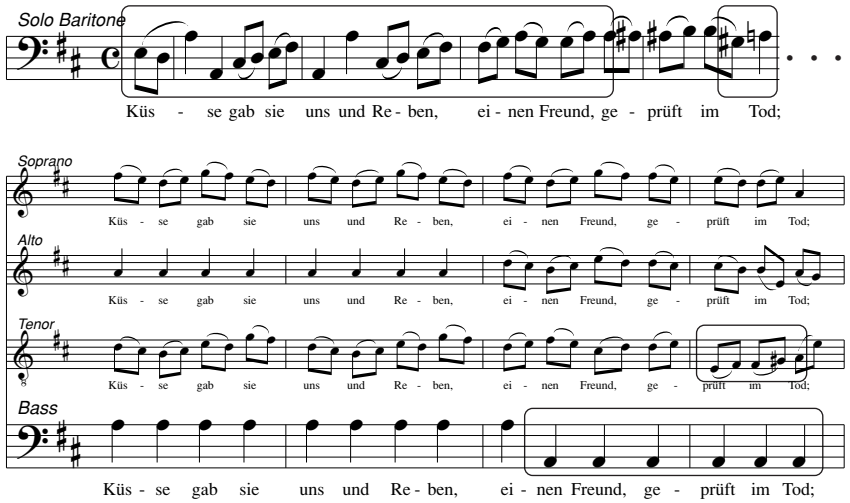
The Marriage of Figaro is a Classical comedy, in which the ending is happy because the characters learn something, and change. The *punctum saliens* comes here, at the finale. Using their wits, the servants Figaro and Susanna have made a fool of the Count in front of his wife, and here, the Count realizes it. The Count initially begs forgiveness in the first register. Then, to emphasize that this is a real emotional shift, Mozart has the Count sing an A-sharp on the third cry of "perdono!" at the baritone's register shift.

Figure 7.23 Beethoven, "Jetzt, Alter" from *Fidelio,* Act I, Scene 5, No. 8



Beethoven uses the intense effect of a shift from first to second register through the addition of an accidental on A. In this example, Pizarro, the prison overseer, first falls into the first register when ordering the jailer Rocco to murder his prisoner Florestan. Then, in order to impart tension to his demand, the unexpected A-sharp lifts his voice into the second register.

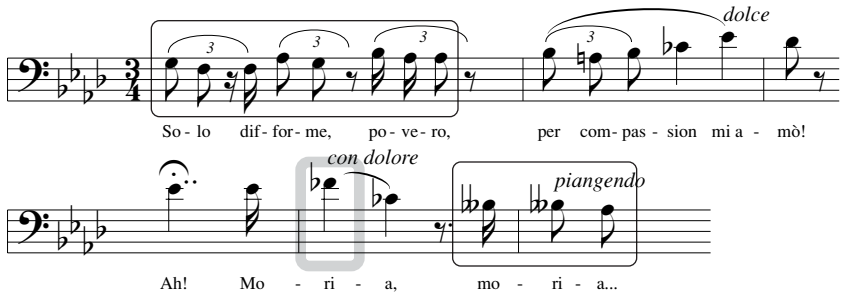
FIGURE 7.24 Beethoven, *Symphony No. 9,* Op. 125, Fourth Movement



This passage is dramatic evidence that Beethoven and other great composers set great store by the registral distinction among voice types. The soloist is a baritone, while the lowest choral voices are basses, and so the same poetic line is given different registral characteristics. In the first line here, the soloist moves from A-natural to A-sharp, from first to second register, to the line's conclusion on the A-natural on "Tod."

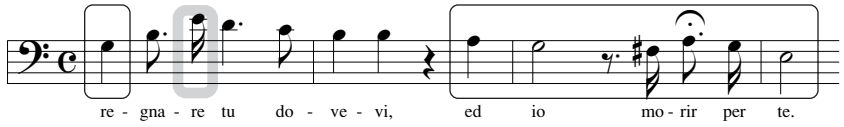
The bass line in the corresponding full choral section substitutes a pedal-point A, and no A-sharp appears.

FIGURE 7.25 Verdi, "Deh non parlare del misero" from *Rigoletto,* Act I, Scene 2, No. 7



Verdi uses all three registers within a single musical line here to emphasize the emotional shifts. The line begins in the first register as Rigoletto describes his miserable condition, moves into the second as he recounts his wife's compassion for him, then into the third register as he recalls her death, but then falls immediately into the first register again as the recollection of her death makes him relapse into self-pity. To a musically literate audience, the use of the unusual B-double-flat, which changes the register to the first, unlike a B or even a B-flat, would have emphasized the collapse even more than just the color of the voice.

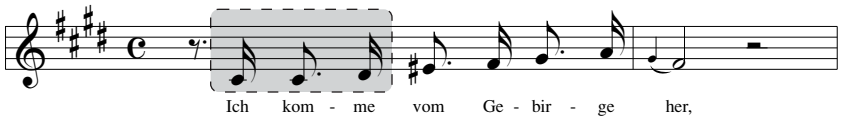
FIGURE 7.26 Verdi, *Don Carlo,* Act III, Scene 2



At the end of the opera, Rodrigo is shot. His last words contrast his duty with that of Carlo. The first part of the phrase, "Regnare tu dovevi" ("Thy duty is to reign") lies mainly in the second register; the second section, "ed io morir per te" ("and mine to die for thee") lies in the darker first register.

The Baritone 'Childhood' Register Shift

Figure 7.27 Schubert, *Der Wanderer,* Op. 4, No. 1



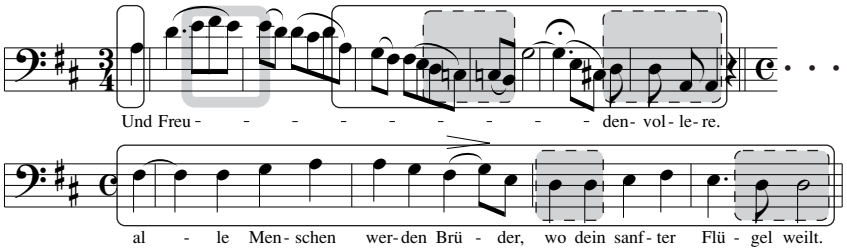
As discussed in the previous chapter under Figure 6.27, the great classical composers often utilize the soprano and mezzosoprano first-to-second register shifts at F-sharp and at E-natural respectively, in all the singing and instrumental voices, including adult male voices.[2]

In the opening of *Der Wanderer,* this implicit shift defines the phrasing of the vocal line, the piano instrumental line, and the song as a whole. The theme of the poem, the phrase on the first three notes "Ich komme," would have been declaimed by a literate German of Schubert's day as one voice, distinct from the remainder of the poetic line. This can be seen from Schubert's meter alone, which places "*kom*me" on the strongest beat of the measure. Then, the poet would create a change of voice, a new idea, for the remainder of the phrase, "vom Gebirge her." Thus, Schubert set the opening phrase in the childhood first register, with a shift to the next-higher register (E-natural and above) on the E-sharp of "vom."

The keyboard accompaniment (not shown) opens with a parallel phrase derived from this opening phrase of the poem. The first two measures of the accompaniment give the low C-sharp and D-sharp of the mezzosoprano first register, and the next four measures rise to E-sharp and above, shifting the right hand of the piano into the second register.

[2] The convention for the tenor childhood first register is a shaded box similar to that of the soprano, but with a dotted outline to indicate its metaphorical nature.

Figure 7.28 Beethoven, *Symphony No. 9,* Op. 125, Fourth Movement, Baritone Solo

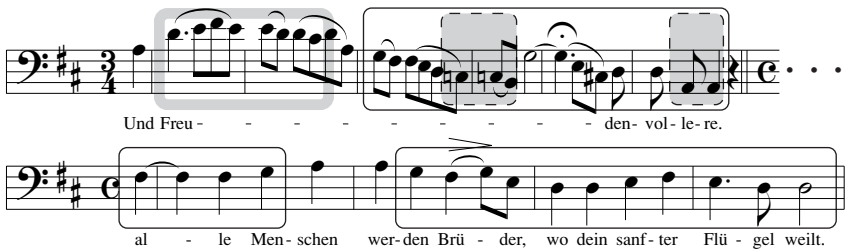


The baritone soloist's second-to-third register shift defines the opening theme of this movement (see Figures 7.7 and 7.8). The baritone's lower-register qualities give an additional reason why Beethoven wanted a baritone, and not a bass soloist, for a composition resolving to D major as this one does.

The second line of this example is the last line of the opening stanza of the poem, which ends "wo dein sanfter Flügel weilt," returning to the tonic low D. Here a mezzosoprano would be heard to shift downward into the first register, at the end of the line, just below her low E, resolving into the first register. The baritone may likewise be "heard" to resolve down, too, into his lowest, metaphorical, register.

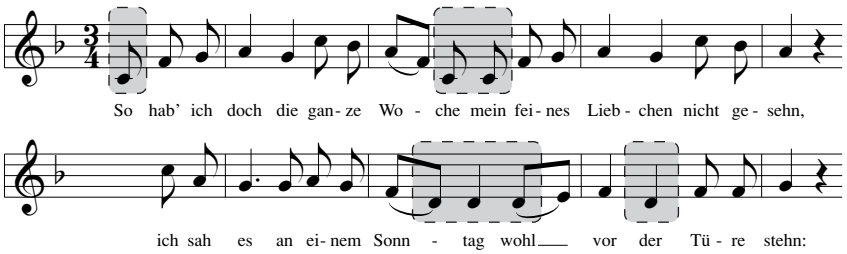
This idea, carried throughout the baritone solo, contrapuntally differentiates the solo line into four different qualities of voice—an effect which is typical of Beethoven's poetic dialogue. The last four notes of the opening melismatic passage on "Freudenvollere" resolve into the baritone's lowest reflected register.

FIGURE 7.29 Beethoven, *Symphony No. 9,* Op. 125, Fourth Movement, Baritone Solo, Sung by Bass



If the solo were sung by a bass, the register shifts in the first line down to the first register, and those down to the reflected register, show little pattern, while the primary shifts become arbitrary. The second line of this example (the last line of the poem's first stanza) no longer ends on the soloist's lowest, reflected register, but remains on D, above the reflected register shift.

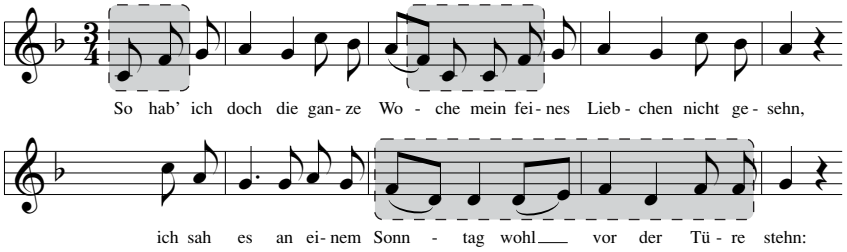
FIGURE 7.30 Brahms, *Sonntag,* Op. 47, No. 3



Brahms's *Volkslieder* are published as *Hausmusik,* usually in the treble clef. Ascertaining the voice species which Brahms desired is a very useful exercise in the study of the vocal registers. The poem here is for a man, singing of his "feines Liebchen;" but is it for tenor, and not for baritone, merely because of the clef? Knowledge of the imaginary childhood reflected register is often the best way to identify which male voice is intended.

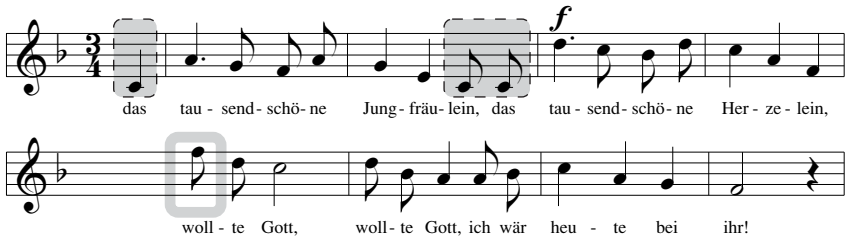
Here the first two lines of the song are given with mezzosoprano registers, which a baritone would use as a reflected register shift. Assuming this E shift, only the C and D are in the first register, so that use of the first register is confined to the dominant of F (i.e., C) and the strong references to D minor.

FIGURE 7.31 Brahms, *Sonntag,* Op. 47, No. 3, Sung by Tenor



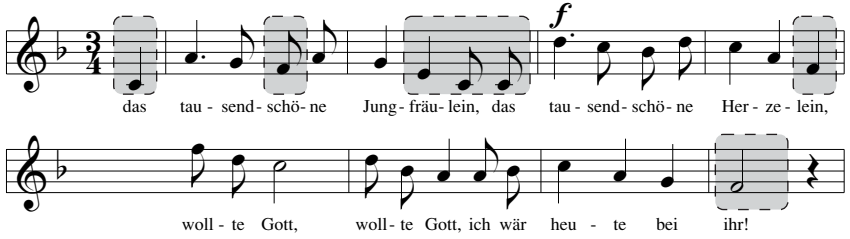
If tenor or soprano registers are assumed, about 50 percent of the opening two couplets would lie in the first register, which now includes F. This undue emphasis on F tends to end the song as soon as it begins.

Figure 7.32 Brahms, *Sonntag*, Op. 47, No. 3



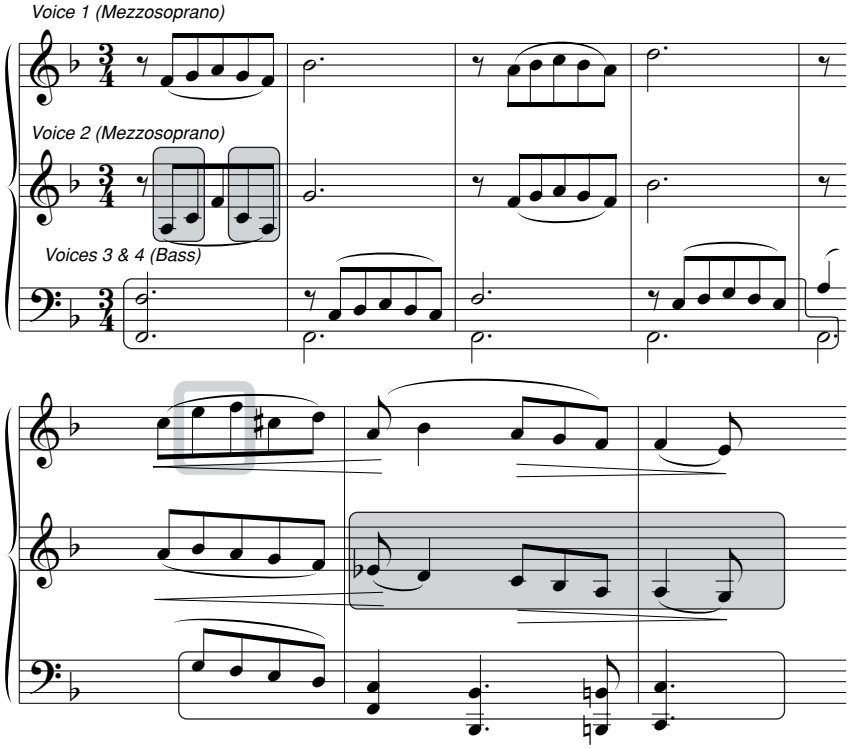
Here are the final two lines of the song's vocal line. With the baritone voice, there is proper use of the first-register notes as a kind of pedal-point on the low C. This projection down into the first register is reflected at the climax of the verse in a mirror-image projection into the third register on F-natural on the exclamation "wollte Gott" ("would to God").

Figure 7.33 Brahms, *Sonntag,* Op. 47, No. 3, Sung by Tenor



If the same passage is performed with tenor register shifts, the song becomes bottom-heavy with each repetition of F, and there is no shift into the third register, resulting in the entire song being performed in only two registers instead of three.

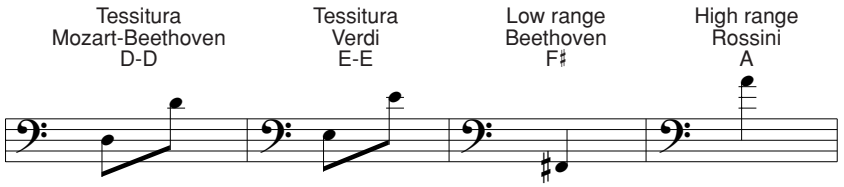
Figure 7.34 Brahms, *Sonntag,* Op. 47, No. 3



Sonntag is one of the most tightly composed pieces based exclusively on the registers of the baritone and mezzosoprano. The keyboard postlude clinches the composer's point. Voice 1, a mezzosoprano voice in the piano's right hand, sings a long phrase repeating the six-note postlude figure three times—twice in the second register, and then rising into the third register as the voice had done earlier. Voice 2 in the right hand, also a mezzosoprano, sings the same figure, first in its lowest register, then in the second register. In the sixth measure, Brahms introduces a low E-flat in order to bring this voice back into the mezzosoprano first register.

The bass of the piano left hand is coherent with these mezzosoprano singing voices. After Voice 2 rises into its second register in the second measure, the bass voice answers, rising into its second register at A on the downbeat of the fifth measure.

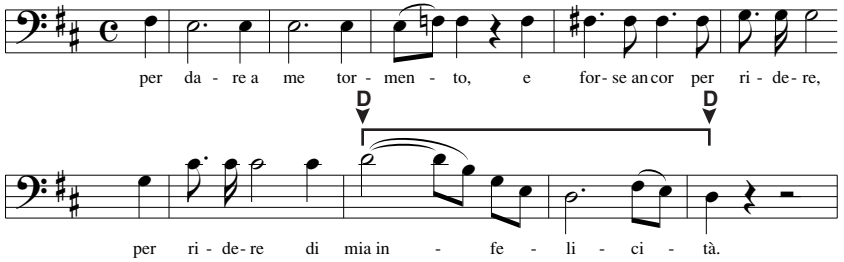
FIGURE 7.35 Secondary Characteristics of the Baritone Voice



Just as they placed the baritone's register shift one step below that of the bass, Mozart and Beethoven generally located the tessitura of the baritone around the central octave D–D—one whole step higher than the standard bass central octave. Verdi, who was intent on extending the tessitura of both the bass and the tenor, raised the center of gravity of his average baritone line somewhat higher, to the octave E–E.

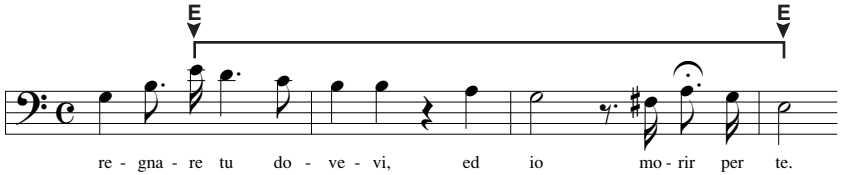
The range of the baritone extends from a low F-sharp, in the baritone solo part in Beethoven's Ninth Symphony, to the high A of Rossini's character Figaro.

FIGURE 7.36 Mozart, "Vedrò mentr'io sospiro" from *Le nozze di Figaro,* Act III, Scene 4, No. 17



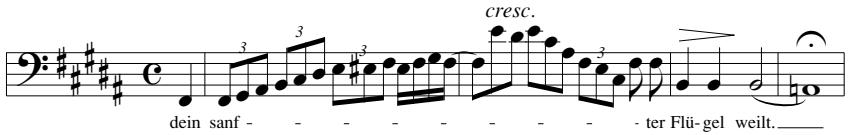
The Count's main aria illustrates the standard Mozart baritone tessitura of D–D.

FIGURE 7.37 Verdi, *Don Carlo,* Act III, Scene 2



Rodrigo's final aria illustrates the higher Verdi baritone tessitura of E–E.

FIGURE 7.38 Beethoven, *Symphony No. 9,* Op. 125, Fourth Movement



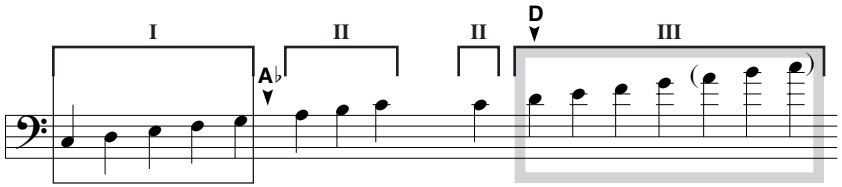
This passage from the baritone soloist's line illustrates the lowest range of the standard classical baritone.

For the baritone's use of the extreme high A, see Figure 7.5. This same A, although Verdi did not write it, is often sung at the conclusion of the baritone monologue "Pari siamo" in Verdi's *Rigoletto;* on the final note of the baritone aria "Oh de' verd' anni miei" in Verdi's *Ernani;* and in the climaxes of several other Verdi arias.

CHAPTER 8

The Bass Voice

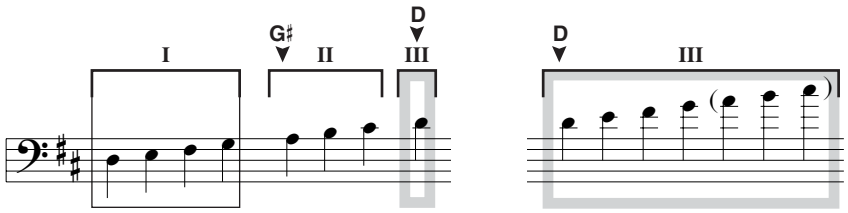
FIGURE 8.1 Bass Division of the C Major Scale



The bass voice is the lowest of the six species of human voice. It is characterized by a shift from the second to the third register between C-sharp above C=256 and D immediately above.

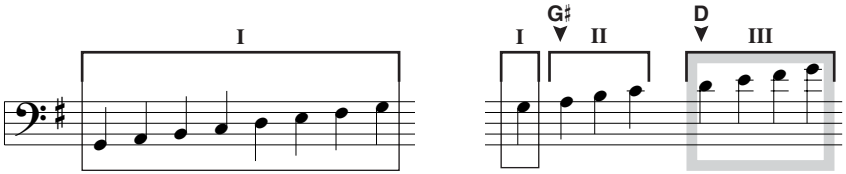
The bass also has a secondary shift, from first to second register, between G and A-flat below C=256. As in the tenor and baritone voice, this shift occurs at the half-way point of the octave defined by the primary shift, since A-flat is a diminished fifth below D.

FIGURE 8.2 Bass Division of the D Major Scale



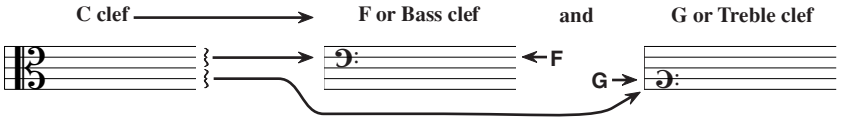
Many great Classical bass arias and choral compositions, especially J.S. Bach's choruses, are set in D major or D minor. One reason is that the key is supremely suited to human vocal registral development. Both sopranos and tenors have a register shift on the fourth above D (i.e., G), and basses have their most dramatic shift on the D itself.

FIGURE 8.3 Bass Division of the G Major Scale



For the same reasons as cited under Figure 8.2, the key of G is the second-most frequently used key for Classical polyphonic choral composition. Here, the bass register shift on the high D divides the G major scale above C=256, on the right, precisely in half, just as the soprano and tenor register shifts divide the C major scale in half.

FIGURE 8.4 Genesis of the Bass Clef

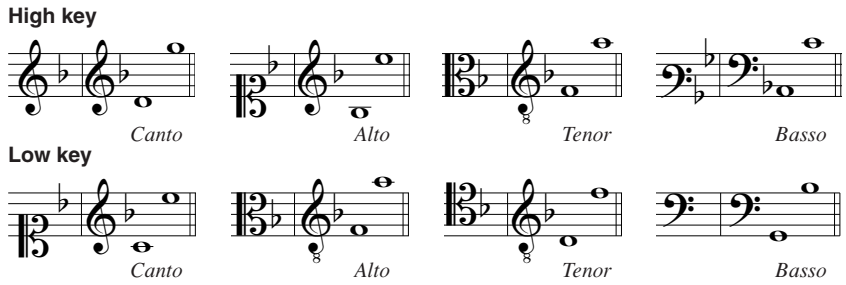


Of all the six voice species, the bass voice has remained the most remarkably consistent throughout history, and is therefore one of the best demonstrations that rigorous Classical composition has always proceeded at, or tended toward, C=256. In the Renaissance, the bass voice was one of the three known species (see Figure 4.4).

The modern bass clef is derived from the Renaissance C clef, and is thus intrinsically related to the idea of C=256 as the home key for musical composition.

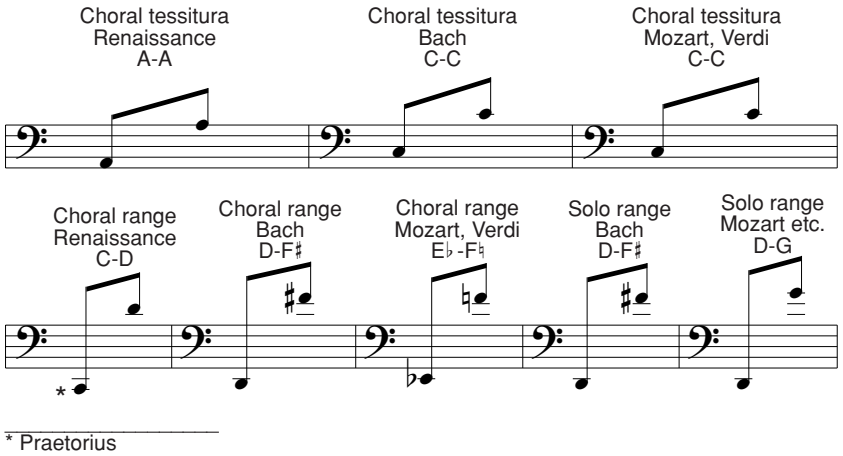
Between 1400 and the end of the eighteenth century, the soprano's role changed dramatically; the mezzosoprano and baritone voices took 300 years to become recognized, and the tenor came in two varieties (tenor and alto-tenor). The bass, however, after about 1436, was a constant as the "lowest" voice, and thus defines certain lower-limit parameters for vocal composition.

FIGURE 8.5 Thomas Morley's Compass of Voices



Thomas Morley in his 1597 book *A Plaine & Easie Introduction to Practicall Musicke* shows a range for the bass voice consistent with that used by Mozart, Beethoven, and Brahms. Morley shows modern usage of the bass in both what he calls "high keys" and "low keys"—that is, in all the common usages of composition.

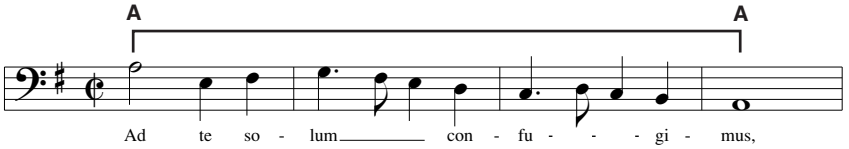
FIGURE 8.6 Secondary Characteristics of the Bass Voice



* Praetorius

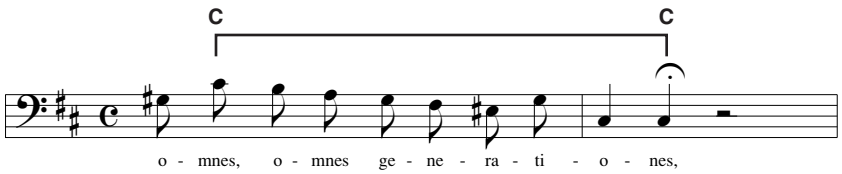
The literature for bass, both solo and choral, shows a remarkable consistency of tessitura, range, and other uses of the voice. The choral tessitura of the bass voice was in the octave A–A in the Renaissance, shifted upwards to center on the octave C–C by the time of J.S. Bach, and remained there throughout the classical period. The range has remained the same, from low D to a high F or G above C=256.

FIGURE 8.7 Josquin des Prez, *Tu solus dominus*



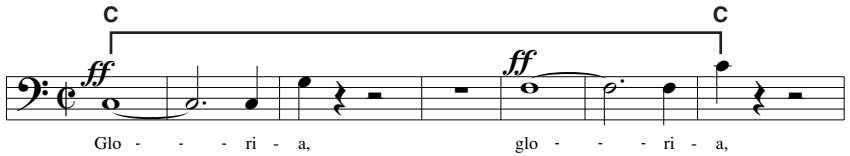
This shows a typical Renaissance tessitura for the bass voice.

FIGURE 8.8 J.S. Bach, "Omnes generationes" from *Magnificat,* BWV 243



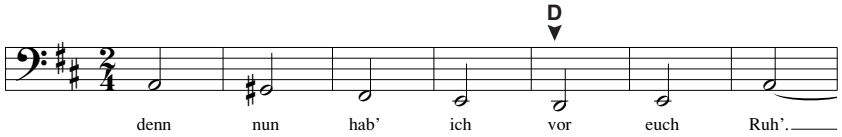
J.S. Bach raised tessitura of all choral voices, including the bass, which he moved to center on the octave C–C.

FIGURE 8.9 Beethoven, "Gloria" from *Mass in C Major,* Op. 86



Mozart and Beethoven continued J.S. Bach's treatment of the bass tessitura.

FIGURE 8.10 Mozart, "O, wie will ich triumphieren" from *Die Entführung aus dem Serail,* Act III, Scene 5, No. 19

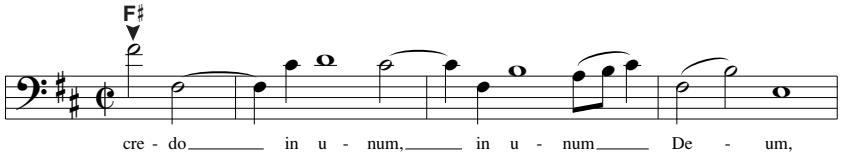


The extreme low range of the bass has also been remarkably consistent over the centuries. Here we see the lowest note composed for bass by not only Mozart but also Beethoven and Verdi.

This same low D was frequently used by J.S. Bach and Handel in the same fashion, and not only for advanced soloists such as in Mozart's aria for Osmin here, but for choral bass sections (see Figure 4.24).

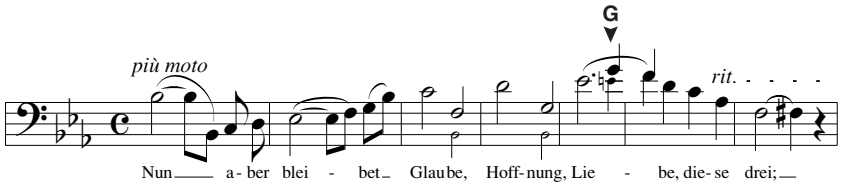
Despite claims by followers of Helmholtz such as A. J. Ellis that J.S. Bach and Handel composed for pitches as low as A=415 and sometimes even A=392, Bach utilized the same lowest notes as were used in Mozart and Beethoven's day, and therefore could not have used a pitch lower than C=256. Low-pitched instruments would play in upward transposition in order to accommodate to the voices.

FIGURE 8.11 J.S. Bach, "Credo" from *Mass in B Minor,* BWV 232



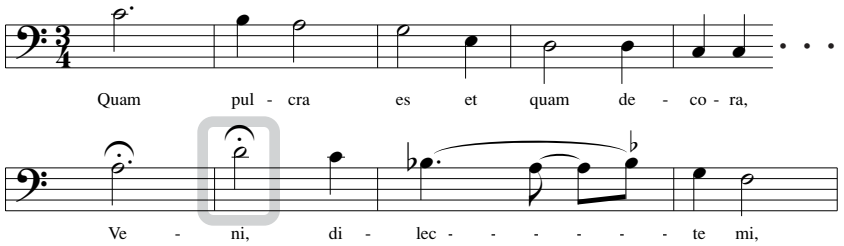
Bach had choral sections of basses singing the same high notes which are considered the extreme high for a bass voice today.

FIGURE 8.12 Brahms, *Vier ernste Gesänge,* Op. 131, No. 4



Brahms and Verdi extended the bass soloist's high range to G above the staff.

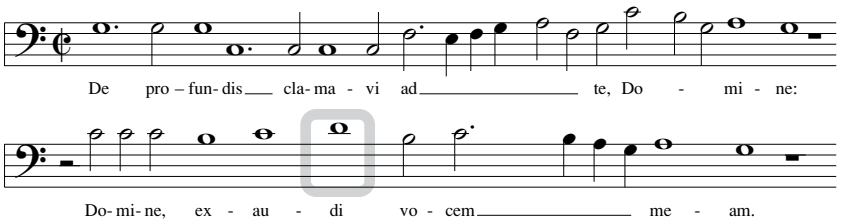
FIGURE 8.13 Dunstable, *Quam pulcra es*



Dunstable's three-part motet shows the bass choral line making its opening statement "Quam pulcra es" at the top of the second register, and continuing in the lower registers (as do the other voices) through the opening section, during which the poet objectively describes the beloved.

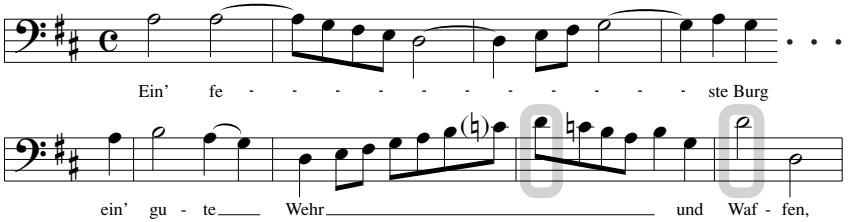
At the turning point of the piece, when the poet shifts to the imperative "Veni!" ("Come!"), the bass shifts into the third register.

FIGURE 8.14 Josquin des Prez, *De profundis*



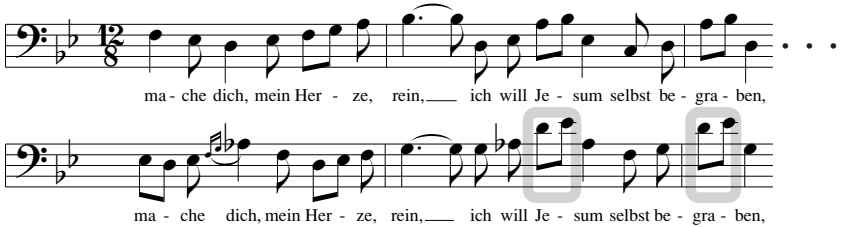
Josquin des Prez shows the use of two contrasting ideas in different registers. The first phrase, "Out of the depths have I cried unto thee, O Lord," remains in the lower registers. In the second phrase, "Lord, heed my voice," the heightened urgency is emphasized by a shift to high D.

FIGURE 8.15 J.S. Bach, "Ein' feste Burg" from Cantata No. 80, BWV 80



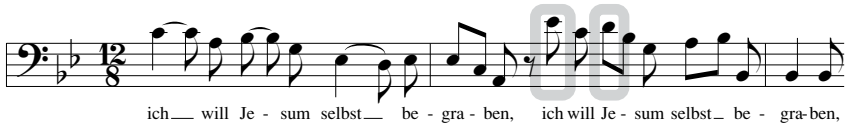
J.S. Bach frequently uses the bass third register shift in this fashion. Here, the opening theme, "A mighty fortress is our God," is stated in the basses' lower registers. The idea is then developed by shifting into the third register.

Figure 8.16 J.S. Bach, "Mache dich, mein Herze, rein" from *St. Matthew Passion,* BWV 244, Part II, No. 65



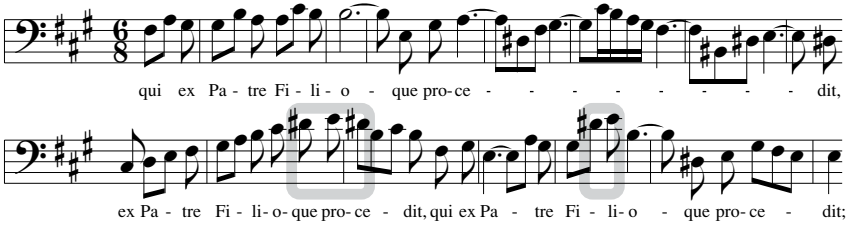
In this final aria of the oratorio, Bach chooses the bass voice for the citizen who buries Christ. The soloist admonishes himself, "Make thyself clean, my heart," constructing the poetic dialogue between the soul and Christ, the soul speaking of itself in the second register, and then of Jesus in the third register.

Figure 8.17 J.S. Bach, "Mache dich, mein Herze, rein" from *St. Matthew Passion,* BWV 244, Part II, No. 65



The aria continues, repeating the same words, always setting the reference to the soul in the second register, and reserving the few third-register references for Jesus. In this passage in the development section, Bach shows the "I" ("ich") of the soul transformed by the commitment to Christ, such that the "ich" likewise rises into the third register.

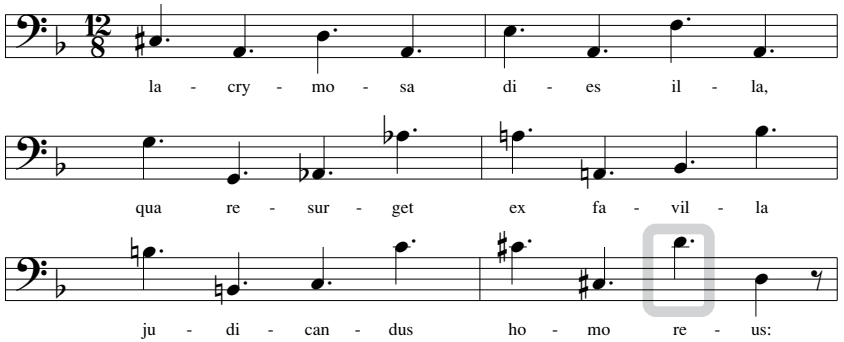
Figure 8.18 J.S. Bach, "Et in Spiritum sanctum" from *Mass in B Minor,* BWV 232



The great Classical composers often used the bass voice, which was thought to be the most profound and thus closest to the voice of God, to represent especially sacred ideas. The bass third-register shift was also often used to create a poetic transformation on words of particular theological (and epistemological) significance.

In this solo, Bach uses a series of register shifts to emphasize the central idea of Christianity, the concept that the Holy Spirit proceeds from both the Father *and the Son* ("Filioque"). These words are repeated three times, first without any passage into the third register. A dramatic shift into the third register, at which Bach introduces an accidental D-sharp, occurs at the repetition of "que" ("and"), and then, in the last repetition, on "Filio" ("the Son").

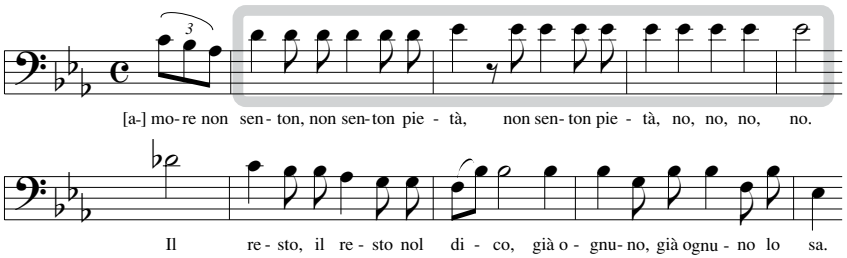
Figure 8.19 Mozart, "Lacrymosa" from *Requiem,* K. 626



Mozart's *Requiem* in D minor frequently uses the bass high register shift to create a "long line" of development across the entire piece, with the high D marking the composition's turning point. This figure shows the bass line ascending very slowly, across a long phrase from low G to high D.

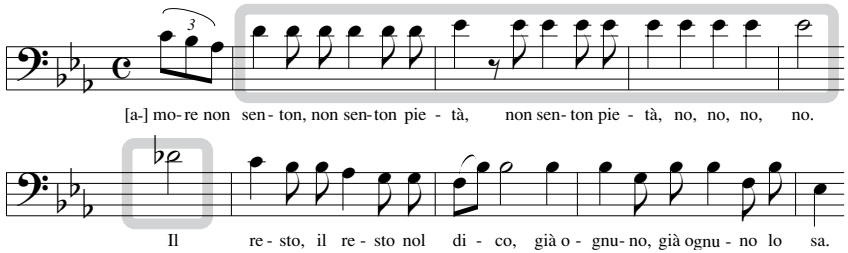
The passage is a poetic answer to the movement's opening phrase (see Figure 4.12). The theme is the phrase "qua resurget ex favilla," in which the soprano, mezzosoprano, and tenor rise from the low D minor chord into their higher registers. In the passage shown here, the bass completes that action.

Figure 8.20 Mozart, "Aprite un po' quegl'occhi" from *Le nozze di Figaro,* Act IV, Scene 8, No. 26, at C=256



Mozart often plays with the bass register shift with such humor that he designs entire arias around it. Here the bass Figaro first sings that women feel neither love nor pity ("amore non senton, non senton pietà"), an emotional outburst rising to a loud sustained E-flat in the third register, which is supposed to be humorously drawn out. Then, the singer is to suddenly change his comportment from rage to humor, and the voice drops back into the second register on D-flat, singing, "I need not say more, since everyone knows it."

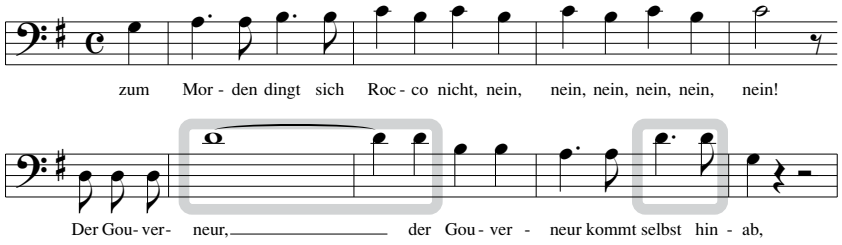
Figure 8.21 Mozart, "Aprite un po' quegl'occhi" from *Le nozze di Figaro,* Act IV, Scene 8, No. 26, at A=440



At A=440 the aria is ruined, implicitly spoiling the entire opera, which centers on Mozart's characterization of Figaro as a republican type who is superior to the Count because of his wit and humor. At A=440, the ironical D-flat is forced up into the third register, so that in the final line Figaro continues to rant like an angry peasant with no plan of action.

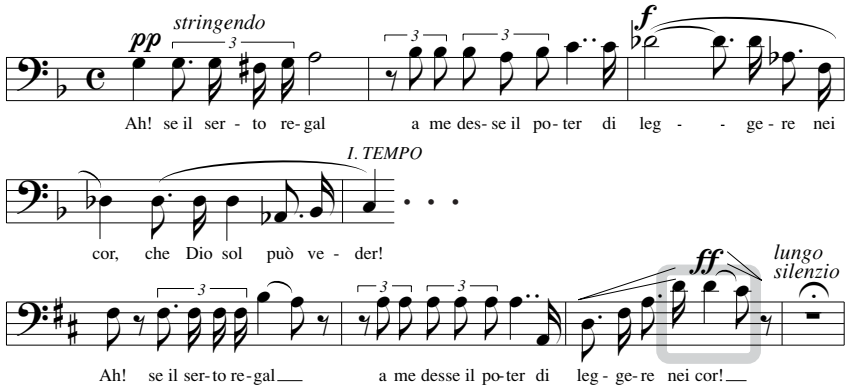
The Metropolitan Opera in New York, the leading institution defending A=440 tuning in the United States, has recently popularized a staging of the opera in which Figaro is portrayed as an enraged "macho." And indeed, at A=440 Figaro sounds rather more like the tragic clown Pagliacci, than Mozart's witty hero.

Figure 8.22 Beethoven, "Nun sprecht, wie ging's?" from *Fidelio,* Act I, Scene 10, No. 10



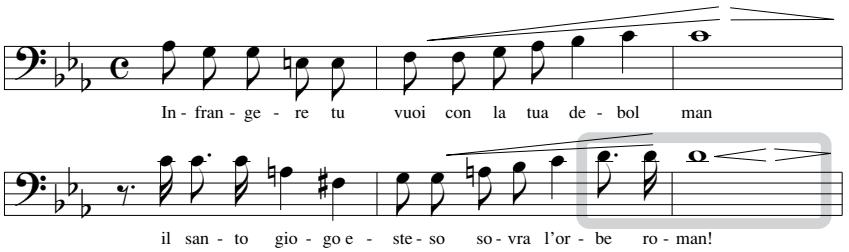
Beethoven frequently structured his bass material around the high D register shift. The jailer Rocco states that he will not commit a murder, singing at the top of the second register. But in apposition, the overseer ("der Gouverneur") will indeed do so himself, and the register is shifted on his name, and again on "selbst" ("himself").

FIGURE 8.23 Verdi, "Ella giammai m'amò!" from *Don Carlo,* Act III, Scene 1



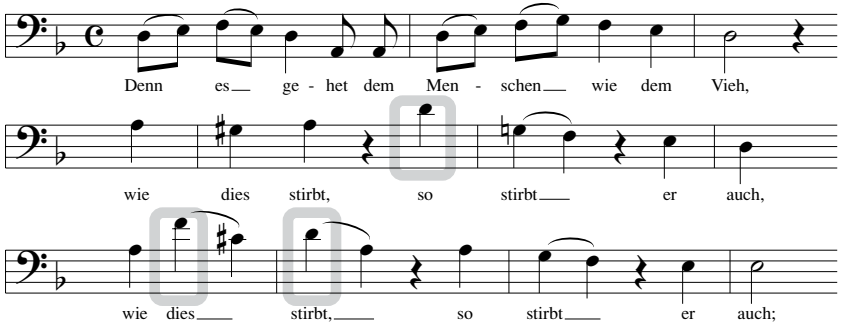
Much of the great writing for basses in opera comes from Verdi, all of it rigorously structured around its registration. King Philip's great aria provides many examples. He sings first, in the subjunctive, "would that the royal mantle could give me the power to read inside hearts, where God alone can see," in the lower registers, rising to the top of the second register at D-flat. Later in the aria, he repeats this but then breaks into a *fortissimo* high D, transforming the phrase "nei cor!" ("into hearts") into a cry of anguish.

FIGURE 8.24 Verdi, "Il Grand'Inquisitor!" from *Don Carlo,* Act III, Scene 1



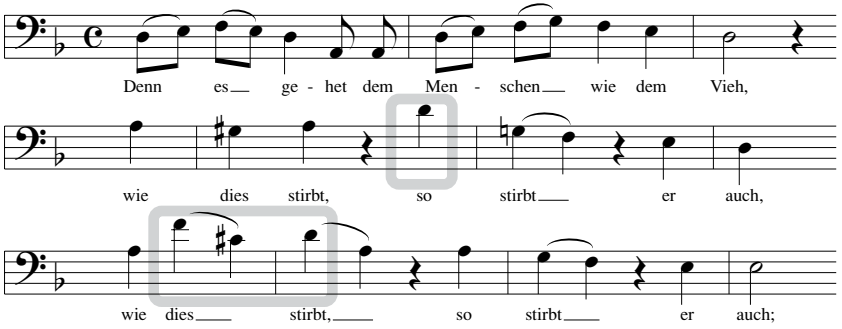
The remarkable bass-bass duet between King Philip and the Grand Inquisitor makes constant use of the bass registers. Here the scornful Inquisitor contrasts the mere temporal power of the King, "la tua debol man" ("thy weak hand"), which Verdi sets at the top of the second register, with the mighty power of the Papal Inquisition extended over "the Roman sphere" ("l'orbe roman"), which rises to a sustained high D.

FIGURE 8.25 Brahms, *Vier ernste Gesänge,* Op. 121, No. 1, at C=256



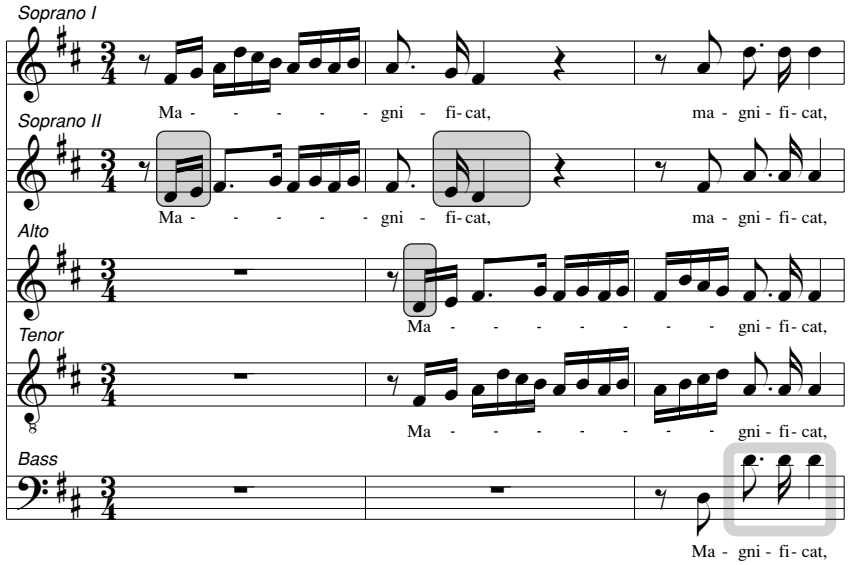
The song cycle begins with the somber words of Ecclesiastes: "For that which befalleth the sons of men, befalleth beasts: as the one dieth, so dieth the other" ("wie dies stirbt, so stirbt er auch"). The first entry into the third register occurs on the word "so," emphasizing the comparison. In the following phrase, dwelling further on the similarity of the deaths of men and beasts, the emphasis created by the shift is moved to "dies stirbt," where a shift from the third to the second register occurs within both words. One could say that the third-register voice sings the words "so . . . dies stirbt" across the two separate phrases.

FIGURE 8.26 Brahms, *Vier ernste Gesänge,* Op. 121, No. 1, at A=440



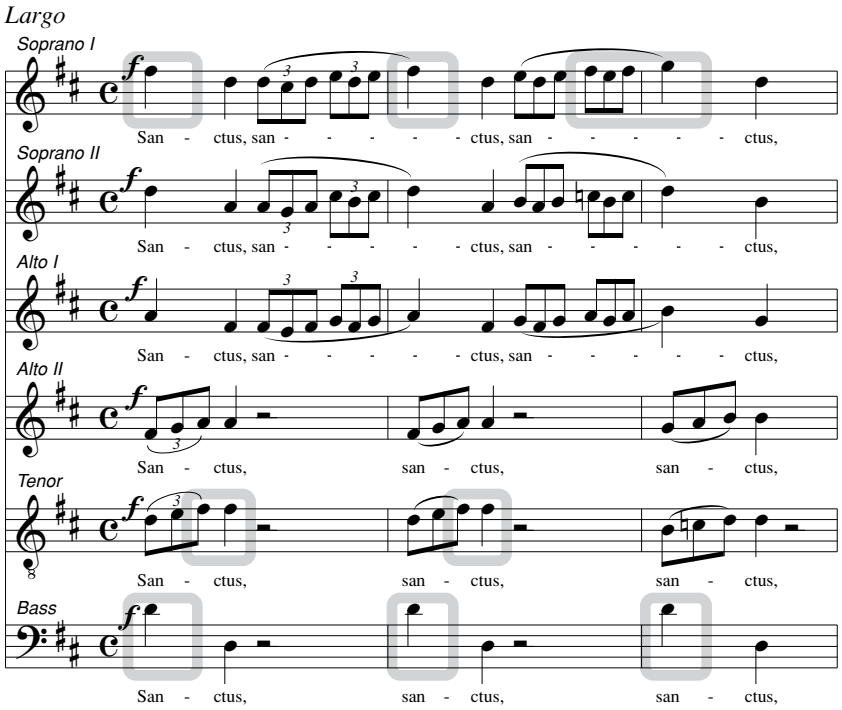
This is a vivid example of the harmful effects of higher tuning on phrasing. If the C-sharp is sung in the third register, as it would be at A=440 or above, the repeated descents into the second register would be lost. Since this is the theme of the four songs, the cycle is rendered unintelligible.

FIGURE 8.27 J.S. Bach, "Magnificat" from *Magnificat,* BWV 243



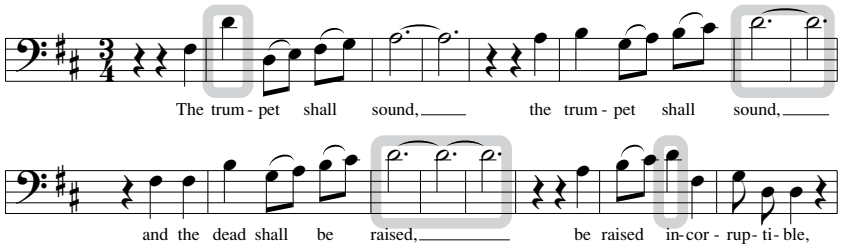
J.S. Bach and others frequently use a repeated bass high D as a way of underlining the festive key of D major. In the opening measures, the upper voices open with a melismatic figure, while the first entrance of the bass voice is a simple octave leap from D–D, into the third register.

FIGURE 8.28 J.S. Bach, "Sanctus" from *Mass in B Minor,* BWV 232



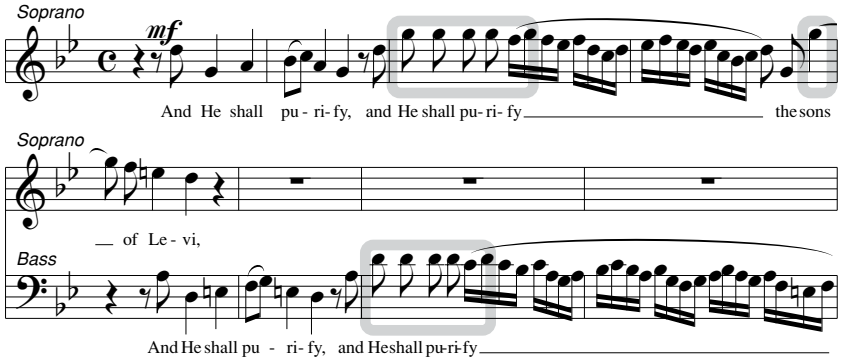
The motion of the five upper voices is unified by the regular shifts of the bass from their third-register high D's to the octave below.

FIGURE 8.29 Handel, "The Trumpet Shall Sound" from *Messiah,* Part III, No. 48



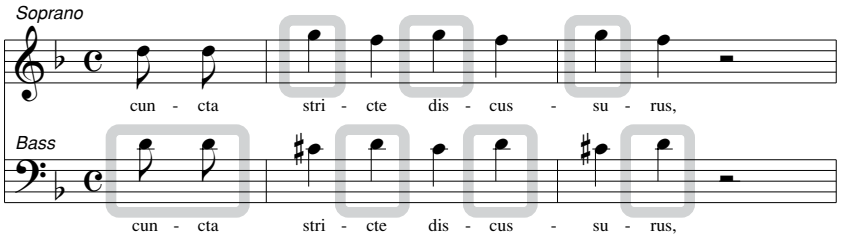
A typical use of the bass soloist in Classical sacred music is in a duet with a trumpet or other brass instrument denoting the trumpet of the Last Judgment. Here, as above, the piece is set in D. The opening vocal line shows the repeated use of the third-register D for three notes, more extended in each phrase than in the previous one—a hint of the three blasts on a ram's horn from the Jewish Rosh Hashanah.

FIGURE 8.30 Handel, "And He Shall Purify" from *Messiah,* Part I, No. 7



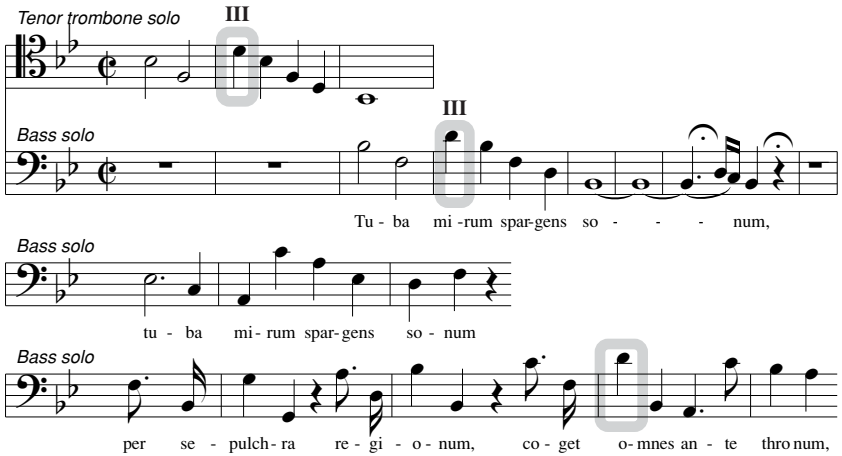
The bass register shift is often used to answer a shift in the other voices. In this chorus which contains much imitation, Handel used the bass shift on high D to answer the soprano register shift on high G, at the same relative point in the vocal line. The two voices' respective register shifts, which lie a major tenth apart, are used here to create a cross-voice.

FIGURE 8.31 Mozart, "Dies iræ" from *Requiem,* K. 626



Mozart sets the turmoil of the Day of Wrath here by limiting all motion to the intense alternation between two neighboring notes. The contrary motion of the sopranos is heightened by their contrary alternation of registers.

FIGURE 8.32 Mozart, "Tuba mirum" from *Requiem,* K. 626



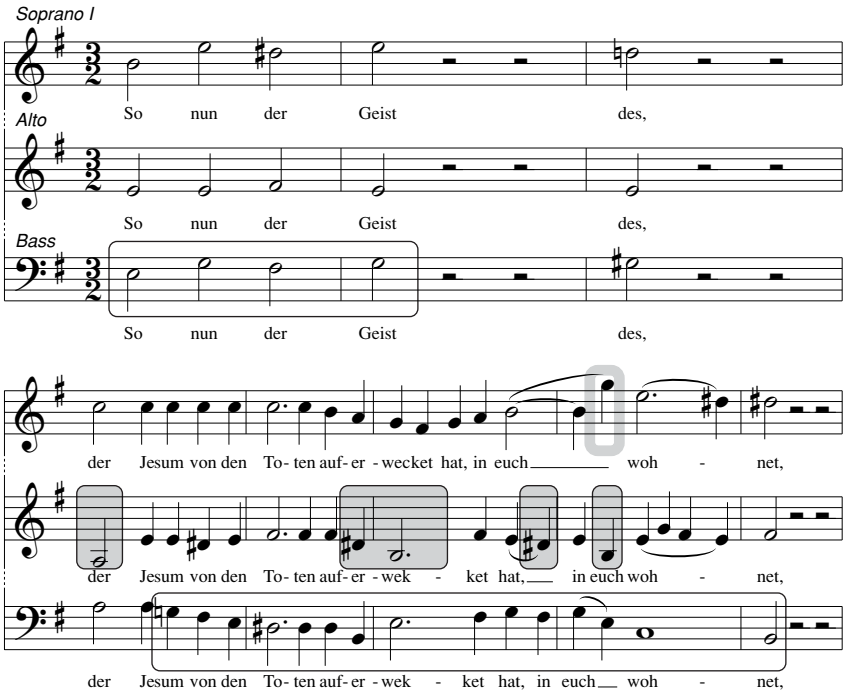
The bass solo which immediately follows the "Dies iræ" uses the bass register shift in a cross-voice relation with the tenor trombone's third-register shift (see Figure 6.21). The bass echoes the Judgment Day trumpet in the opening trombone solo by shifting into the third register on "mirum" ("wondrous") (see also Figure 8.41).

The bass develops the theme in the lower registers, and at the climax of the solo, makes a more extended rise into the third register on the idea that the trumpet will "call all" ("coget omnes") before God's throne.

[1] For ease of reading, a slightly different convention is used to indicate the first register in the male voices. Instead of the shaded box used for the soprano, mezzosoprano, and contralto first register, male first-register notes are indicated by an unshaded, solid-outlined box.

The Bass First-to-Second Register Shift

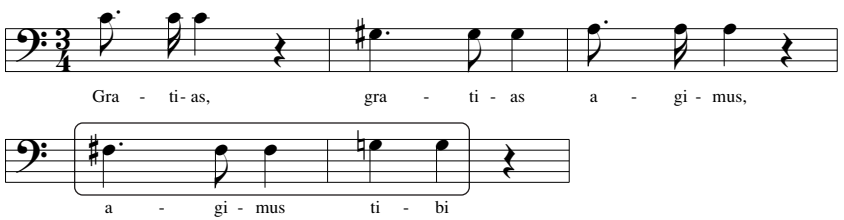
FIGURE 8.33 J.S. Bach, "So nun der Geist" from *Jesu, meine Freude,* BWV 227



The bass has a secondary shift, from first to second register, between G and A-flat below C=256. As in the tenor and baritone voices, this shift occurs at the half-way point of the D–D octave defined by the primary D shift.

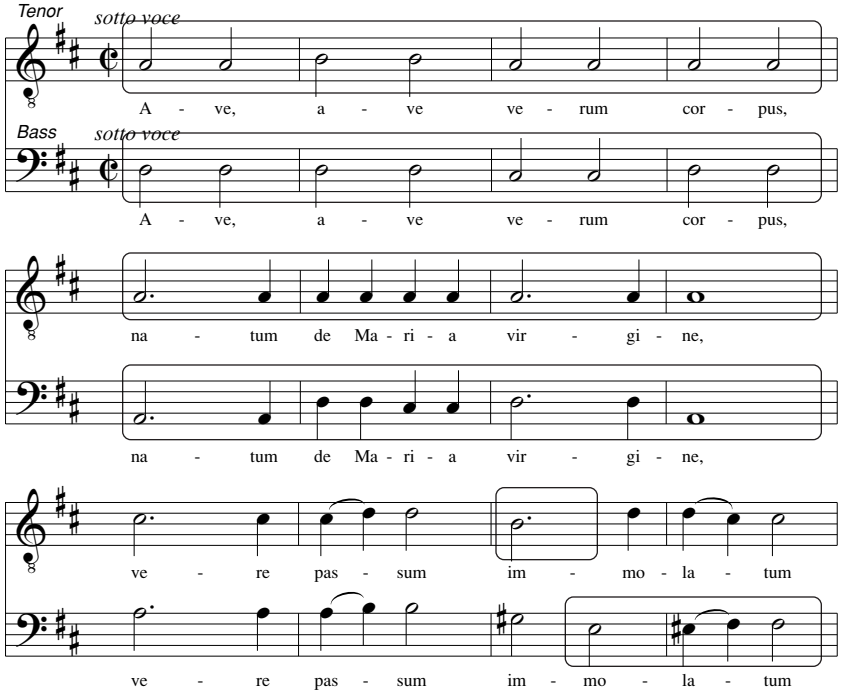
J.S. Bach often highlighted this shift between the dark quality of the first register and the somewhat brighter second register, in order to contrast changes between minor and major in the key of E. Here, this shift occurs at the start of the chorus as part of the movement from E to the dominant B.[1]

FIGURE 8.34 "Gloria" from *Mass in C Major ("Coronation"),* K. 317



Mozart used the contrast between first and second register quality in the choral bass section in a number of pieces. In this mass, the glorification of God is referenced in the first register, while the statement of gratitude shown here introduces a new voice, in the second register; the continuation returns to the previous voice. At A=440 tuning, which would place the shift between F-sharp and G, the distinction would be blurred by a shift back into the second register on "tibi."

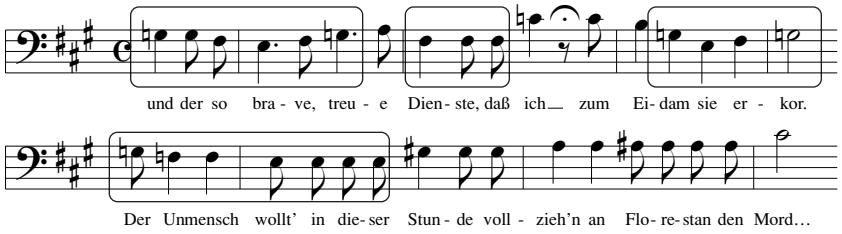
FIGURE 8.35 Mozart, *Ave verum corpus,* K. 618



Mozart often coordinated the first-to-second register shift of the choral tenors and basses in order enhance the introduction of a new idea. (See also Figure 6.23.)

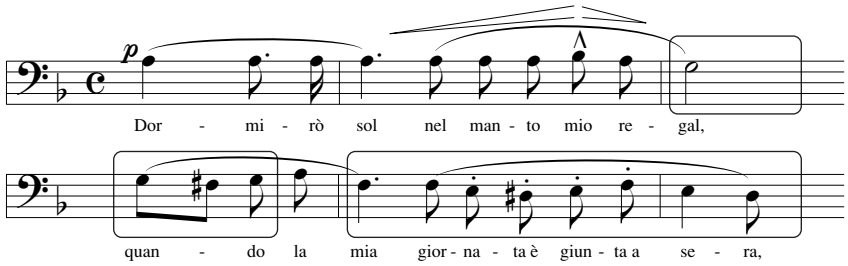
As the piece opens, the sopranos and altos (not shown) pass in and out of the first register in dialogue, while the tenors and basses remain in the first register. In the second couplet (here, the third system), both male voices shift simultaneously into the second register on "vere passum," which initiates a modulation from D to A.

FIGURE 8.36 Beethoven, "Wohlan, so helfet!" from *Fidelio,* Act II, Scene 8, No. 16



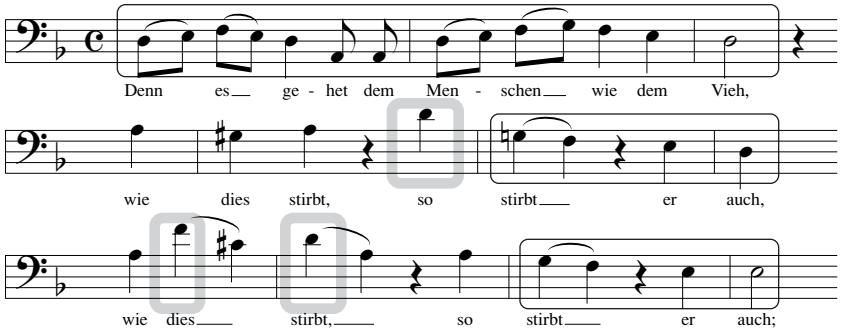
Near the end of the opera, after Fidelio's true identity as Leonore has been revealed and her husband Florestan has been saved, the jailer Rocco describes Leonore's service as Fidelio in a section in which all G's are natural, and hence in the first register. Rocco then plucks up the courage to accuse the overseer Pizarro of attempted murder, and the G's shift to G-sharp in the second register.

FIGURE 8.37 Verdi, "Ella giammai m'amò" from *Don Carlo,* Act III, Scene 1



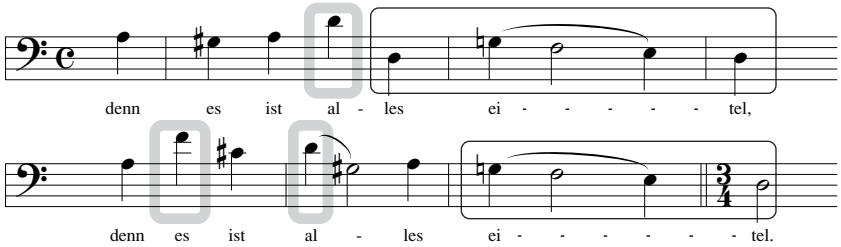
The aria's opening line, after hovering in the low part of the bass second register, dips into the darker first register on the ironically expressed "regal" ("royal"). The second line of the couplet sinks down into the first register on the words "when my days are done."

FIGURE 8.38 Brahms, *Vier ernste Gesänge,* Op. 121, No. 1



Brahms was equally rigorous with this register shift. The first phrase states the idea of the likeness of man and beast, and remains in the first register; the next begins in the second register, with the accidental G-sharp on "wie dies stirbt" ("as the one dieth") in the second register, and the first entry into the third register on "so," followed by a drop back into the first register as G-natural is reinstated. (See also Fig. 8.25.)

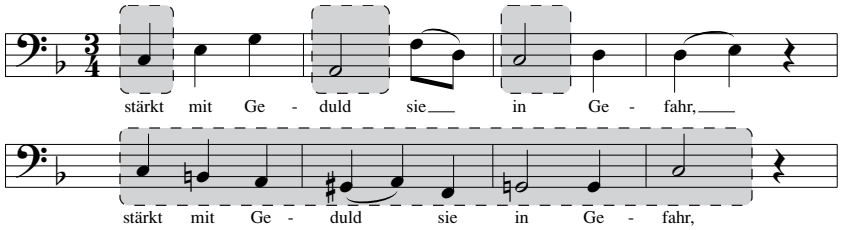
FIGURE 8.39 Brahms, *Vier ernste Gesänge,* Op. 121, No. 1



At the conclusion of the first stanza of the same song, Brahms has the bass rise into the third register, and then sink back into the first register to complete the thought.

The Bass 'Childhood' Register Shift

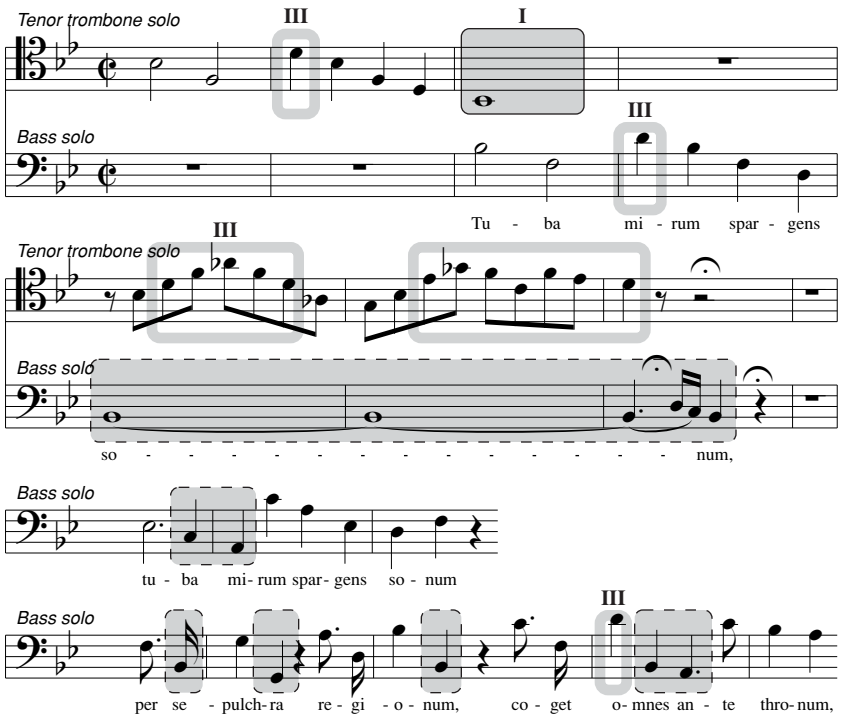
FIGURE 8.40 Mozart, "O Isis und Osiris" from *Die Zauberflöte,* Act II, Scene 1, No. 10



The great Classical polyphonic composers often use shifts at F-sharp, E, and D an octave below the male third register shift, to emphasize a new poetic voice, even though the adult male has no such physical register shift (see Figures 6.27–6.31 and 7.27–7.33). These shifts recall the fundamental geometry of the shifts around C=256, but are reflected into other octaves of musical space.

Mozart's Sarastro never sings in the third register throughout *The Magic Flute,* but instead emphasizes the lower registers. Here, at the conclusion of his first aria, the bass soloist sings the conclusion twice, initially in the first and second registers, and then resolving downward into the lowest range of the voice.[2]

FIGURE 8.41 Mozart, "Tuba mirum" from *Requiem,* K. 626

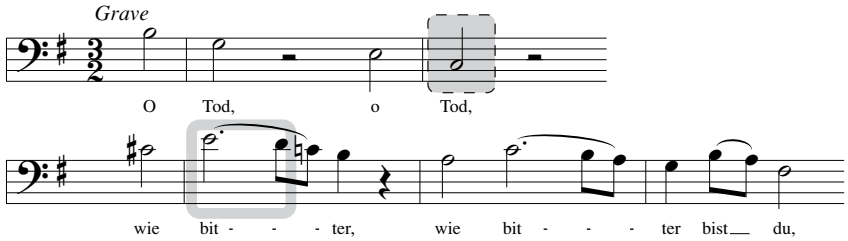


Compare this figure with Figure 8.32. The registers of the tenor trombone shift at every C, such that the trombone's opening phrase ends on a low sustained B-flat in the first register. Mozart has picked the tenor trombone so as to coordinate these register shifts with the bass soloist. The bass enters, and registrally mimics what the trombone has done.

This reflected lower register shift also creates a three-voice counterpoint within the rest of the bass solo in the bottom two lines of this example, with the alternation betweeen the first and second registers, and finally the third register.

[2] The convention for the bass childhood first register is a shaded box similar to that of the soprano, but with a dotted outline to indicate its metaphorical nature.

FIGURE 8.42 Brahms, *Vier ernste gesänge,* Op. 121, No. 3



The third of Brahms's four songs opens with stark words from Ecclesiasticus 41:1, "O death, how bitter is the remembrance of thee." It was Brahms, and not Jesus Sirach, who chose to repeat the opening exclamation twice. Since no contrapuntal composer would ever mean such a phrase to be sung the same way twice in succession, Brahms evidently wanted the second "Tod" sung in quite a different voice than the first. This is only possible with the bass lower reflected register shift, here between E and C.

The requirement for such a shift is brought out by the succeeding line, which contains a shift up into, and then down from, the third register, while the repetition contains a shift from the second to the first register.

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PART

III

COMPOSING THE LIED

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CHAPTER 9

Principles of Bel Canto

Introduction

Significant numbers of professional musicians have produced short improvisations which audiences might recognize as parodies of Mozart, Beethoven, or Schubert. Yet none of them could have produced a composition which might be confused with an actual work of those or other Classical composers. Thus, the ability to compose artistic statements in the literate language of music common to all classical composers, is virtually as lost today as the ancient Egyptian was lost until the discovery of the Rosetta Stone. Fortunately, the lost language of Classical composition can be reconstructed.

Music derives from three orderings of *natural beauty* in the physical universe: bel canto vocalization, voice registration, and C=256 tuning. True classical music not only has a *triply-connected* geometry, but also requires man's creation of new ideas from these elements. It is thus at least *quadruply-connected,* i.e., it must account for four or more series of changing values.

The root of music is the bel canto vocalization of classical poetry. As early as Vedic hymns, located by included solar-astronomical evidence to no later than 4,000 B.C., it was known that any classical poem is also a musical score. Human speech itself has pitch, and is a form of song, within a narrow (and lower) range. The vowels and consonant-inflected vowels themselves create an inherent series of physical pitches. Thus, any "spoken" poem, composed in an ordered combination of vowels and consonants coherent with human thought, is a map for musical composition.

A second degree of connectivity, also natural in that it is God-given, is the series of registral voices which develop in the trained bel canto singer (see Chapters 2–8). A third degree of connectivity, found in the physical universe, is the series of 24 keys of the well-tempered scale. The self-similar octave upon C=256 geometrically generates specific keys and pedal-point series (see Chapter 1), within which music may lawfully be written, much as the solar system generates planetary orbits only at specific intervals.

All three are principles of *natural beauty*. The bel canto, polyphonic *vocalization of Classical poetry* is uniquely the origin of the tonal construction of the well-tempered musical scale, and of the metrical structure of musical composition. (The attribution of the metrical structure of music to an origin in the dance, as Richard Wagner insisted, is based upon the false Romantic dogma tracing the origins of music to the eroticism of the cult of Dionysos.)

The 'Parmenides' Problem

In true musical art, however, there is a fourth, quadruply-connected requirement which makes it human: *artistic beauty*. This is the synthesis of new ideas from natural "raw material," something uniquely human: the exercise of the creative powers of the human mind. True music is the human *transformation* of the elements of natural beauty.

Classically this problem was posed by Plato in the *Parmenides* dialogue, as that of the *unit-transformation*: the transformation of the *Many*, into the *One*. Every genuinely new creative conception, comes into existence in the individual human mind, in a way which solves the central paradox of Plato's *Parmenides* dialogue.[1] As Lyndon LaRouche summarizes in the Foreword (*supra,* p. xii): "Many pieces, each individual, indivisible ideas, enter the mind, and are transformed from a *many* into a new, valid, combined but single and non-indivisible new unit conception. There is nothing of the new idea in any part of those many ideas which appear to have stimulated its generation. They are the *Many;* the new unit conception is *the indivisible One*."

The generation of this *One,* establishes a *unit-transformation*—the *One*—as the identity of the composition, rather than as a divisible aggregation of parts. In musical terms, the *many* natural features of vocal polyphony and the bel canto voice, the *many* particulars of a poem, or theme, are transformed into the *One* of a musical work of art.

This "Parmenides paradox," as it is known, is the central problem which the student of music must solve, in order to master composition. Classical music is the science of using the laws of nature to create, in the medium of musical sound, a new scientific discovery, in the same way as the rigorous Classical physical scientist may make such a discovery.

[1] Lyndon H. LaRouche, Jr., "In Defense of Common Sense," and "Project A," in: *The Science of Christian Economy and Other Prison Writings,* Washington, D.C.: Schiller Institute, 1991.

This creative process, furthermore, may be taught; it is susceptible of intelligible representation.

The motivation for men and women to compose great music proceeds from precisely that emotion which caused Prometheus to give fire to man, the historical poetic metaphor for scientific discovery. The creative individual, experiencing the profound joy of creative activity, composes, in the desire to show audiences, sometimes audiences of future generations, how his own mind works. He or she composes, in order to make the working of the creative mind itself, susceptible of intelligible representation.

To the naive observer, the new creation, the *One*, simply appears, as if magically. For the unit-transformation of creative art to be intelligible, the question must be answered: *How* is this done? By what principle? Plato supplies a general identification of the answer: the principle of *change*. He presents a series of demonstrable fallacies which arise from efforts to show the relationship between the Many and the One, if the question of *change* is left out of account. Plato's *change* is the non-linear transformation, from an outside observer's uninformed standpoint (or from a linear, logical-deductive standpoint) of one axiomatic principle, to another.

In modern terms, the unit-transformation of the Many into One was proven by Georg Cantor in the 1870s, to be the demonstrable mathematical principle of *transfinite ordering,* a transfinite ordering of transfinite orderings.

In the transfinite ordering principle, an initial set of given axioms and postulates, a deductive hereditary system, is questioned, by means of a crucial experiment, which demonstrates the falsity of one or more of these basic axioms. That one crucial experiment overturns the entire mathematics of the initial axiomatic system. This forces the human mind to generate a new mathematical system, by solving and overcoming the discrepancy. The new system holds up to experiment more broadly, but is then subsequently shown to be similarly inadequate by other, additional crucial experiment, and so on.

Take a series, *A, B, C,* a series defined by such discontinuities. Each of *A, B, C,* represents a deductive set of axioms and postulates with an internally consistent hereditary principle. Each corresponds, implicitly, to a distinct system of mathematics and mathematical physics—for example, the standard system of mathematics in the Middle Ages, versus that in the Renaissance.

A theorem in system *A* is overthrown by a crucial experiment. If this is rigorously pursued, it then requires an overthrow of the entire set of axioms and postulates corresponding to the set *A* in which the theorem occurs. This requires a new integral set *B* of axioms and postulates, to such effect that no theorem of the new set *B* will be consistent with any theorem of the old set *A*. Thus, between *A* and *B,* since there is no bridging deductive schema between the two, we have what appears to the logical-deductive mind as a pure mathematical discontinuity.

To the rigorous Classical mind of the school of Plato, Cusa, and Leibniz, however, this "discontinuity" is really a singularity, a branching point from one system to the next. A rigorous thinker will not accept the simple inability to reach from *A* to *B*, but will define a new process of actually reaching *B* from *A*. This implies the necessary *generation* of *B* (as opposed to the more passive simple *existence* of *B*).

The succession of transformations so defined, represents a *principle of change*; and if that process of transformation is properly, rigorously ordered, the process of change so represented, is a unity, a transfinite unit-transformation. That unitary concept, as a concept, is indivisible; it is thus a true *One,* an indivisible *One*. It stands in respect to a *Many,* and a *Many* of *Manys*.

That is, if the *A, B, C,* are ordered, to the effect that moving along this pathway in mathematics and mathematical physics, results in an increase in progress for the human species, then this is an ordered principle consistent with the laws of the universe. The ordering of the discontinuities between *A*→*B, B*→*C,* and so forth, is an ordered principle. Such an *A*→*B*→*C transformation,* if it is an ordered principle, can be reduced to the notion of a *One*—that is an indivisible, transfinite *One, Oneness, One*. (See also the discussion under Figures 11.4, 11.5, and 12.12.)

That is the scientific basis for the emotionally compelling unity, the "long line," in a work of art.

Principles of the Bel Canto Human Singing Voice

Bel canto, literally, "beautiful song," was developed in Flanders and Italy during the fourteenth- and fifteenth-century Renaissance as the standard for singing and music, but is heard today only from a handful of operatic specialists.

The most familiar example of bel canto is the seemingly impossible phenomenon of the opera singer, with unassisted voice, filling a hall of 4,000 seats or even an amphitheater of 15,000 seats, without microphones, amplifiers, or other equipment. By contrast, the average popular singer today can scarcely fill a living room without the assistance of an electronic amplifier.

Bel canto has been proven, by human history, to be a superior science of singing. The Classical image for the phenomenon, known in physics as a "weak force," is the Renaissance teaching method of placing a candle before a student's mouth. If the student succeeds in producing a bel canto tone, the flame does not flicker, despite the volume of sound produced. "Weak force" refers to the principle that with a minuscule amount of energy, precisely directed, the singer is able to do a seemingly miraculous amount of physical work, without wasting energy in percussive impact on surrounding air molecules. (See Figure F on p. xxix.)

"The voice impresses itself through the air *without* displacement of air, and strikes upon the objects . . ." as Leonardo da Vinci wrote (*Codex Atlanticus,* 360 r.a.).

Bel canto voices are routinely reported to remain strong and flexible from early training at the age of five, to the age of 85. Voices trained in bel canto have been shown since the Renaissance uniquely to be those capable of singing a range of a full three octaves, with grace, speed, and agility, known as coloratura, in all the ranges.

The bel canto voice may be thought of as that trained voice which has dominion over all possible defects of the untrained voice. Only the trained bel canto voice is capable of imitating all other possible, defective human voices, such as the throatiness of many popular singers, or the exaggerated nasality of country crooners. The untrained or mistrained singer, however, is incapable of consistently imitating a trained bel canto singer.

The basic elements of true Florentine bel canto training are *elevation, roundness of sound, vibrato,* and *clear registration.* Today, this Florentine *method* has been almost entirely driven out of conservatories and singing-schools, and has has suffered heavy attacks from the currently hegemonic British school of voice-teaching. A few schools in Italy still teach some aspects of the old Florentine tradition; but even there, the full method is rarely taught as a unified concept. The revival and re-assertion of this Florentine method is therefore indispensable to reviving Classical musical composition today.

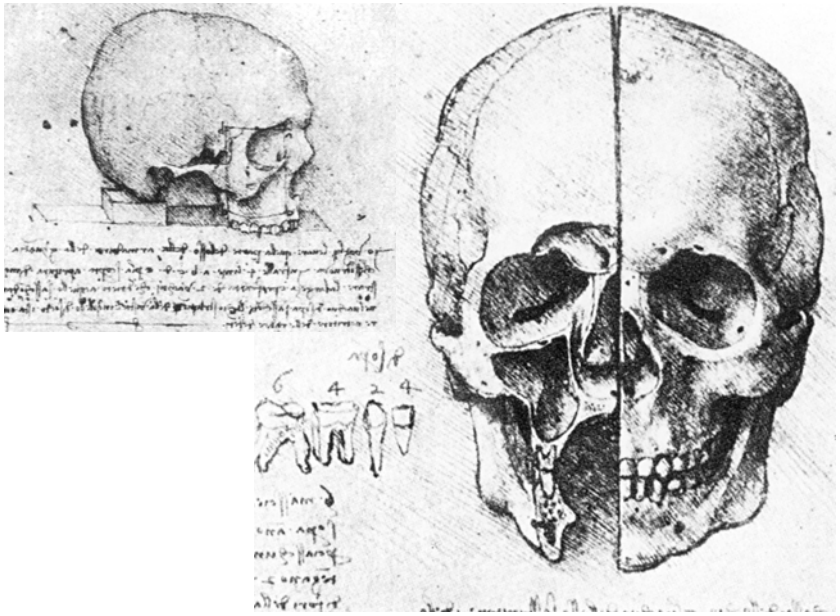
Elevation

Elevation, known classically as "singing in the mask," refers to the concious placement of the focus of the voice in the head, rather than in the throat. As a teaching device, the student is asked to "sing nasally," even though the voice is not produced in the nasal region. Any bel canto singer can demonstrate by singing, and then holding the nose, that the fleshy part of the nose is irrelevant: the sound quality is constant whether or not the nose is held closed.

The Italian "mask" ("la maschera") refers rather to the bones and sinus cavities of the area above and around the eyes, including the bridge of the nose, covered by the Greek drama mask. Placed here, the voice is most easily governed by the mind.

Bel canto training was classically begun by age 5 or earlier, an age when training can proceed easily, because the voice is naturally elevated in the head (as the nasal carrying power of the baby's cry attests). Elevated singing, thus, is natural, but as with speech, it must also be consciously trained, for children also come to shout in the throat if left untaught. As with any language, singing is thus a highly social process.

Figure 9.1 Skull with Sinuses, from Leonardo Windsor Castle Notebooks (19057)



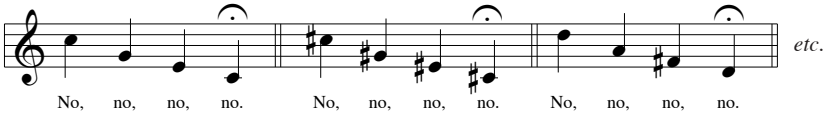
That sinus resonance is integral to the amazing amplification of the bel canto voice, was known as early as the work of Leonardo da Vinci, who drew the major sinus cavities of the human skull. His writings on singing describe the "fluid" of the air from the vocal cords flowing up into the head to interact with the "fluid" in the sinuses.

Precisely because every major text on vocal physiology of the now-hegemonic British school of science insists that there is no such thing as sinus resonance, it is very important to insist upon this.[2] All modern "scientific" schools of voice assume, that what they can not see, cannot exist. The investigators and their instruments cannot see any resonance in the head sinus cavities; therefore it must not exist.

In fact, it is impossible that the fleshy parts of the mouth and throat alone can create the tremendous "work" done by the bel canto voice. The analogy is between the hard bones of the sinuses and the hard wood of the violin body, which are tuned in a certain way, such that the cavity creates a resonance. There is a magnetic impulse between the bones and mucous membranes of the sinuses, and the air surface, which creates an *electromagnetic* effect, creating a shock wave around the singer which renders the air and the entire neighborhood of the singing transparent to the propagation of an essentially electromagnetic tone, much as a magnet polarizes metal around it.

The most elementary demonstration of the efficient existence of head resonance, comes from what any bel canto singer with sinus congestion rapidly learns, namely, that the same tone which can be sustained without harming the voice, will so resonate the sinus cavities as to actually drain any fluid in the sinuses. Conversely, whenever sinus congestion or sinus fluid blockage exists, unless the voice precisely so resonates in the head as to drain the sinus cavities, the singer will experience vocal cord exhaustion within a very short time.

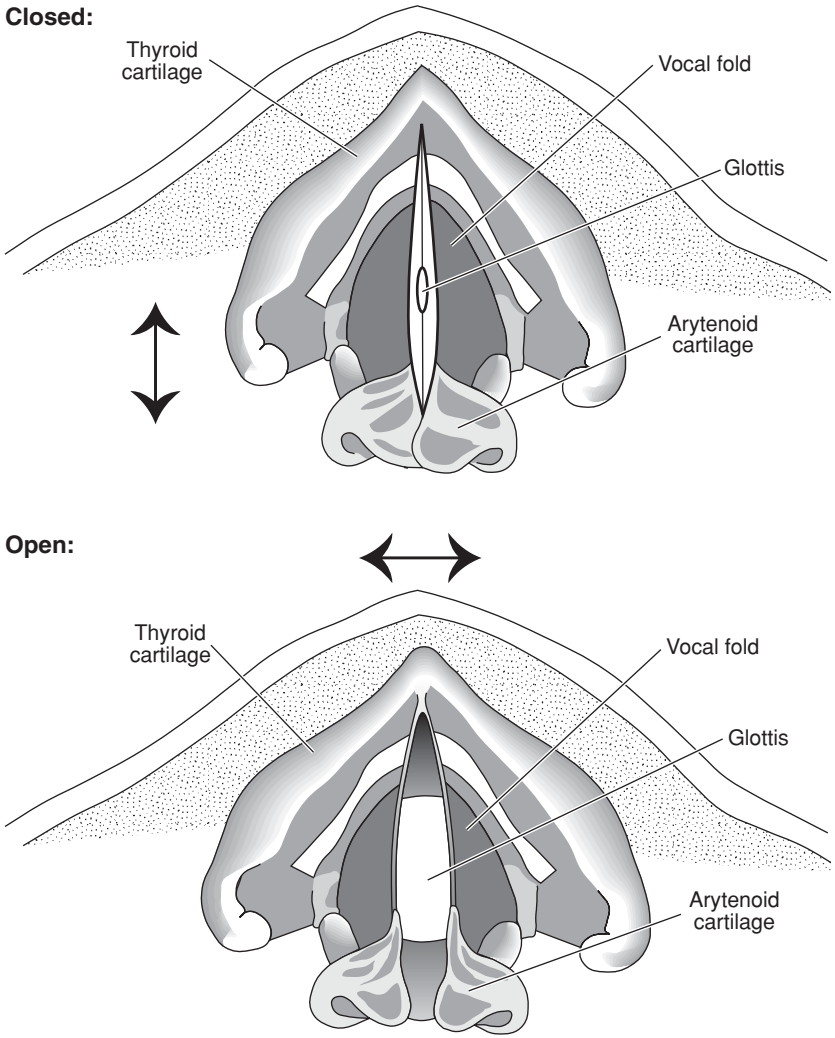
Figure 9.2 Basic Arpeggio for Voice Elevation



Above is a basic exercise for elevating the voice. Beginning the attack on each tone with the dental consonant /n/, which is a more purely nasal sound than the labial /m/, helps focus the following vowel /o/ into the mask.

[2] Standard texts denying sinus resonance include: West, James, "The Nature of Vowel Sounds," *Quarterly Journal of Speech Education* 12:3, June 1926; Russell, G.O., "Speech and Voice," New York: Macmillan & Co., 1931; Muckey, Floyd, "The Natural Method of Voice Production in Speech and Song," New York: C. Scribners' Sons, 1913.

FIGURE 9.3 Focused and Unfocused Vocal Cords



While it is crucial that the student think only of the head and *never* about the throat when singing, an important physical result of elevation is that the vocal cords close more completely when the student feels the sound focused in the mask, as shown at the top of this figure.

This accounts for the *lasing* effect of the bel canto tone—the unperturbed candle flame—for in the best notes, almost no air escapes the vocal cords. Only a tiny elliptical opening at the center of the cords is visible. The emitted sound is tuned, as light is tuned in a laser, into coherent frequencies whose energy is tremendously focused.

This occurs because focusing the sound in the mask bolsters the muscles in the front and rear of the vocal cords sufficiently to support the action of the cords. In bel canto tone production, the muscles of the arytenoid cartilage bring the arytenoids together at the rear of the cords, *before* the cords begin to vibrate. The muscles in the front (at the thyroid cartilage) and the rear (at the arytenoid cartilage) close the cords from both ends symmetrically, providing balanced tension on the cords. The cords vibrate longitudinally and grow stronger and more healthy, also accounting for the vocal longevity. This is the reason for the telephone operator's use of the nasal /n/ in "Number, please!" during the first decades of telephone communication; it allowed a full day of forceful speaking with protected, closed vocal cords.

In the unelevated tone, however (bottom of Figure 9.3), the cords close incompletely, usually at one end only. This releases excess air, accounting for the wavering candle, and the hoarse, throaty sound of the average untrained adult voice. The cords are not supported and abrade each other laterally, eventually causing callouses (nodes) at the points of repeated impact, leading to laryngitis, and, with time, loss of voice, redressable only by surgical removal.

Round Sound

The *round sound* is the second *sine qua non* of bel canto vocalization, required under the "Golden Rule" "aperto, ma coperto" (open, yet covered). The tone of song proceeds not on consonants such as /n/, which are only an impetus for focus, but on *vowels* ("vocal" in Italian).

In beginning instruction, the round vowel /o/ is used to place the entire voice, as shown in Figure 9.2. In bel canto training, only the five pure Italian vowels /u/, /o/, /a/, /e/, and /i/ are used, with the qualification that the closed vowels /o/ and /e/ have both "open" and "closed" variants, represented by /ɔ/ and /ɛ/ respectively. (For examples of pronunciation, see Figure 10.1.)

On the vowel /o/, the space inside the mouth is egg-shaped. The

mouth is open in a rounded shape, as shown in Luca della Robbia's Cantoria sculptures (see Figure 2.1). The powerful muscles of the jaw, and those of the throat and thorax, must be relaxed and "open," not constricted. This obliges the larynx to drop to its lowest comfortable position, the position at which the larynx and vocal cords have the most flexibility. At the same time, however, care is taken to preserve and enhance the elevation typified by the nasal telephone operator cited above.

The sound must never be "uncovered"—shouted, harmonically disorganized, produced in the throat, releasing air like an uncovered soda bottle. Rather, this entire rich, broad tone must be focused into the head, such that it is open, but "covered" by the lasing focus of the mask. The student is asked to repeat this elevated but rounded sound "no, no, no, no" until the sound is both free and focused.

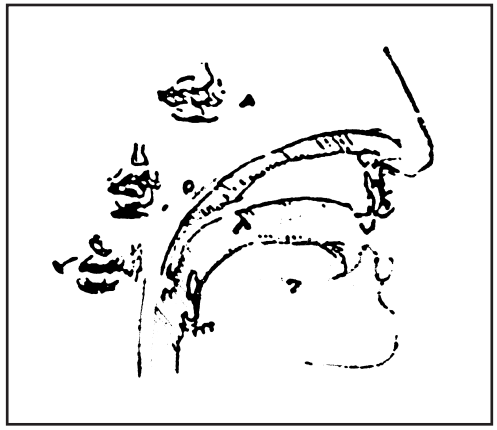
The Florentine method of training on the closed vowel /o/ is the element of bel canto most disputed by the modern British school. Most conservatories in Europe and the United States today teach on the open vowel /a/; however, the fifteenth-century art of the Cathedral of Florence gives no evidence of the use of /a/ in Renaissance vocal training (see Chapter 2).

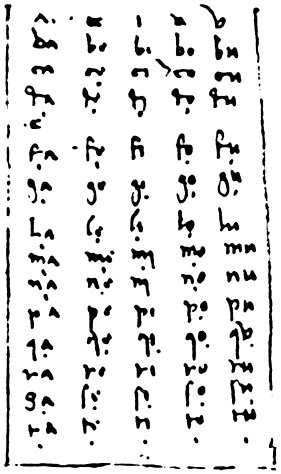
Some argue that the /a/ is "natural," since it is the sound made by a baby crying, or when smiling. Indeed, /a/ is the Italian vowel most uninfluenced by human speech. Its sound is close to the neutral "schwa" sound /ə/ as in "fun" (see Figure 10.1), which is the sound emitted when there is no use of the mind to form language with the vocal tract.

In contrast, the Italian school demands that vocal training be an education into mastery of a new technology. It teaches that /a/ is in fact the most "dangerous" vowel for beginners, because it is apt to fall into the throat.

The Italian school's highest form is the "voce impostata" or well-placed voice, in which there is a single coherent wave of resonance passing through the singer's entire body as a unified musical instrument, amplifying and focusing the tone. This "impostazione" or "connessione"—the full and ordered participation of all resonating cavities in the production of tone—is often described as having "a trace of /o/ and /u/ in all the vowels." The spreading of the vocal tract to form /a/ can easily produce interference with this wave pattern, unless the voice is trained to avoid this danger by concentrating first on perfecting the production of the round vowels.

FIGURE 9.4 Leonardo da Vinci's Chart of the Vowels

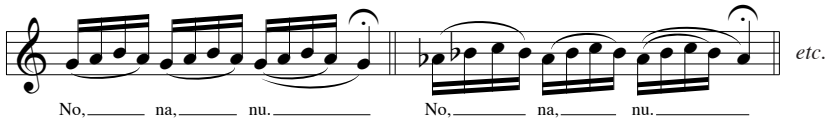




a	e	i	o	u
ba	be	bi	bo	bu
ca	ce	ci	co	cu
da	de	di	do	du
e				
fa	fe	fi	fo	fu
ga	ge	gi	go	gu
la	le	li	lo	lu
ma	me	mi	mo	mu
na	ne	ni	no	nu
pa	pe	pi	po	pu
qa	qe	qi	qo	qu
ra	re	ri	ro	ru
sa	se	si	so	su
ta	te	ti	to	tu

This basic "aperto ma coperto" principle of vocalization, the singing of basic vocal exercises on the round vowel /o/, has been known since the Renaissance. Leonardo, in his "Anatomy Manuscripts," studied how human language reflects the natural beauty of the universe. The master's drawing of a human head shows his concept of where the vowels are physically produced. He locates the /o/ in the center of the voice, at the roof of the mouth, with the /a/ further forward toward the nose, and the /u/ further back at the base of the throat.

FIGURE 9.5 Prototypical Bel Canto Vocal Exercise



In bel canto training, first the entire voice is placed on the pure /o/, and then other vowels are trained. The aim is absolute smoothness of round tone, a consistency of sound quality across all the different pure vowel sounds. The transition from /o/ to /a/, for example, must not alter the underlying distribution of overtones so as to permit unpleasant nasal "twang." Similarly, in the transition from /o/ to /u/, the voice must not be allowed to fall too far back into the throat.

Vibrato

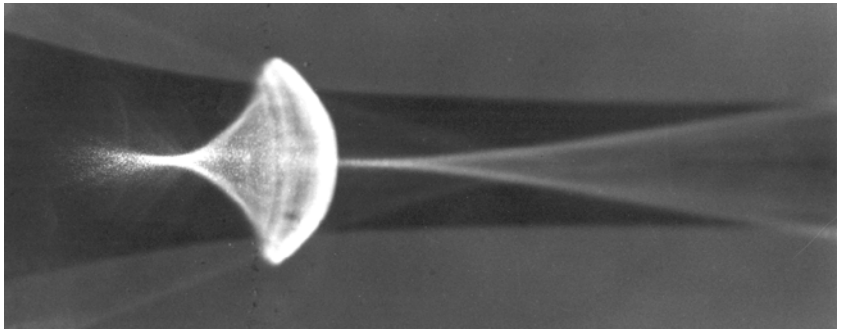
Vibrato, if not naturally present in the voice, must be deliberately cultivated from the outset, along with elevation and roundness.

Even the oldest organs from the Middle Ages possess a "vox humana" stop, characterized by each note being produced by two pipes, each of which was tuned slightly differently, producing interference patterns or "beats" simulating the effect of a human vibrato. This evidence alone shatters the mythology of an alleged lack of vibrato in Renaissance and Baroque polyphony, both choral and orchestral.

Vibrato is indispensable for the singer's ability to sing "in between the notes," such that even in extremely rapid passages, tones and registers succeed each other with great clarity, while nevertheless each note and register seems to grow organically from what has gone before. The analogous approach in Classical Italian Renaissance painting is the *sfumato* technique developed by Leonardo, in which transitions from one object to the next are slightly "blurred" in such a way as to increase the viewer's comprehension of the relationship between the various figures and elements in the composition.

Vibrato, therefore, is associated achieving the maximum *potential* of the human voice. Far being being an "add-on" or mere expressive device (as it has come to be used in modern popular singing), vibrato is integral to all vocal health and vocal beauty. One single cycle of a singer's vibrato represents a kind of "unit of vocal action," defining the limit of that voice's potential to meet the requirements of moving from note to note and register to register. In rapid passages, only those voices which vibrate at least as quickly as one tone succeeds the next, are capable of meeting those requirements. A rapid vibrato should therefore be cultivated for all voice species.

FIGURE 9.6 Caustic Produced by Light Shone Through a Wineglass



Philip Ulanowsky

Not only the speed, but also the amplitude of the vibrato has more than mere technical importance. The notes of the well-tempered system are not scalar values representable by a point on a line; rather, each note-value can be thought of as a delimited region of negative curvature, similar to what a caustic is to light. The photo above shows such a caustic produced by a parallel beam of light as it interacts with the curved surface of a wineglass. The "focus" on the left is not a point, but a well-defined region. Ideally, the vibrato references the upper and lower boundaries of such regions of negative curvature.

The constantly vibrated voice has been especially attacked by most British and British-influenced singing-schools, which instead encourage a "white," unvibrated voice. Efforts to suppress the use of vibrato—especially in choruses—or even to eliminate it entirely, stem from either of the following two causes, or from a combination of both. 1) The vocal pedagogue is hostile to the scientific and cultural world-view which bel canto singing exemplifies, and eschews vibrato because it disrupts the Aristotelian calm of the "dead," unvibrated sound. 2) The vocal peda-

gogue acknowledges the desirability of vibrato in solo singers, but fails to develop it to the degree that it becomes an integral part of the voice. For example, the voice teacher will instruct a student who is having difficulty executing a rapid *fioritura* passage to sing it with no vibrato whatsoever. Although the passage can then be sung "up to speed," the resulting loss of the bel canto "position" in such passages destroys the ability to properly execute register changes, and undermines the beauty of the voice. Or, the voice teacher will encourage vibrato in solo singers, while discouraging it in choruses.

Once the voice begins to attain elevation, roundness, and consistent vibrato, we begin to hear "connection" of the voice.

Vocalization: The Physical Pitch of Human Speech

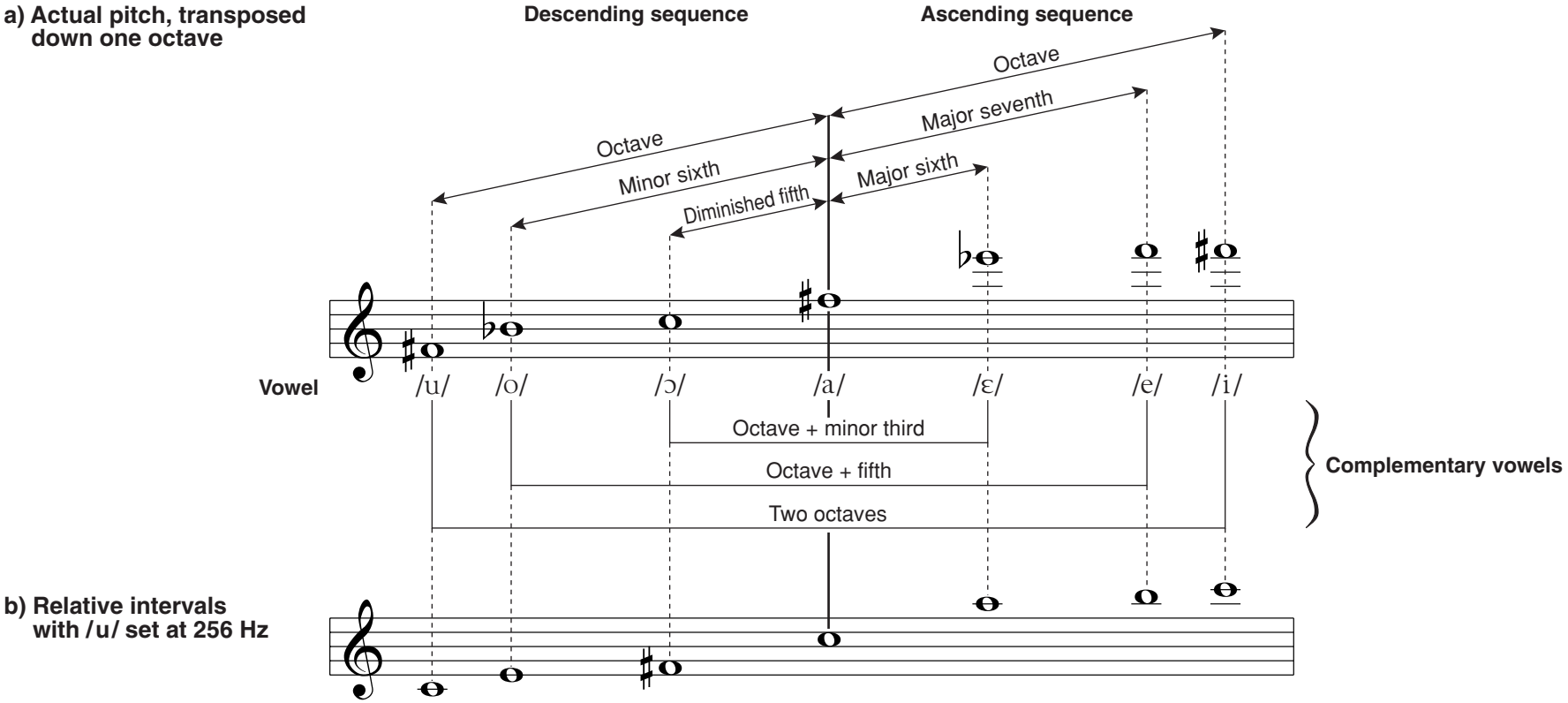
Leonardo and other founders of the universal bel canto method were also the first to document the inherent physical pitch of human language, and especially of the vocalization of bel canto vowels. The Italian term for "vowel" is "vocale;" "to vocalize" therefore strictly means "to sing on the vowels." The vowels of human speech form a regular geometrical series of pitch intervals, in just the way that Kepler described the regular and precise orbits of the planets in his *Harmonici Mundi* (see Part I). These vowel pitches, like the planets, are in harmony with the underlying geometrical laws of the universe. ("Harmony" here, as elsewhere in this manual, does not refer to the modern reductionist's of vertical or chordal "harmony," but rather indicates Keplerian harmonic *ordering*.)

Modern laboratories have measured a *relative* difference in pitch, from low to high, from the /u/ at the throat of Leonardo's diagram (Figure 9.4) to the /a/ at top. In fact, there is a continuum of relative pitch from the lowest or darkest vowel /u/, through the spectrum of the Italian vowels up to the highest or brightest vowel /i/.

That is, there is a natural scientific basis for the time-honored method of bel canto which actually can give certain pitch patterns for music itself, the basis of a science of musical composition.

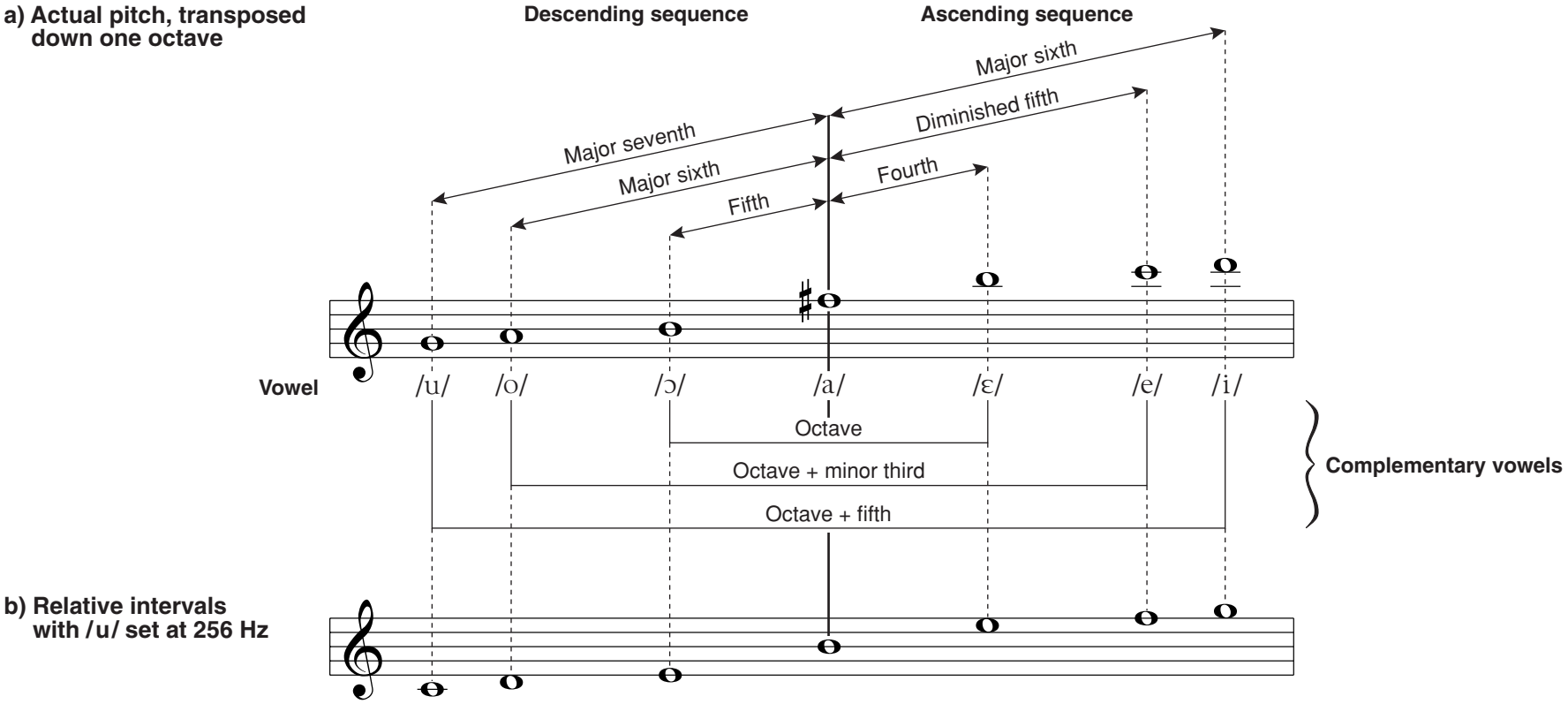
The musical intervals formed in the human vocal tract in vocalizing the seven pure Italian vowels, including the two open vowels, are shown in the following two figures.

FIGURE 9.7 Vocalization of the Italian Soprano Voice



The diagram represents the universal soprano voice by utilizing data for adult female and child speakers. The musical notes shown at the top of the chart as "actual pitch," are components of the sound of normal speech. These values emerge from laboratory measurements of frequencies (in Herz) of the second of two primary resonance peaks, called *formants,* associated with the vowel quality of each spoken vowel. This second resonance peak or formant is usually labelled F_2, and in combination with a first resonance peak F_1 (not shown), it creates the unique qualities by which we distinguish one vowel sound from another. (For the first formant, see Figure 9.12). Surprisingly, the frequency values of these formants are absolute for each vowel, regardless of the fundamental pitch, called F_0, at which a vowel is spoken or sung. Regardless of whether a female speaks the syllable "du" of the word "duro" in a low-pitched voice at a fundamental tone of 240 Hz, or in a higher tone of voice at 270 Hz, the resonance peaks above that fundamental tone—the formants F_1, F_2, and beyond—remain roughly the same. In composition, however, what is to be emphasized is not the absolute laboratory measurement of formants, since real music of course uses many more than the seven notes shown here. In music, we hear most strikingly the intervals formed by the seven pure Italian vowels *relative to each other*. The vowels form a series of rising intervals from /u/—the darkest vowel quality—to the brightest, /i/. Although the formants themselves are absolute, we have transposed the laboratory values downward such that /u/ corresponds to C=256 Hz, in order to illustrate the way in which the intervals between the vowels are heard relative to each other, when a musical composition changes pedal point or key.

FIGURE 9.8 Vocalization of the Italian Male Voice

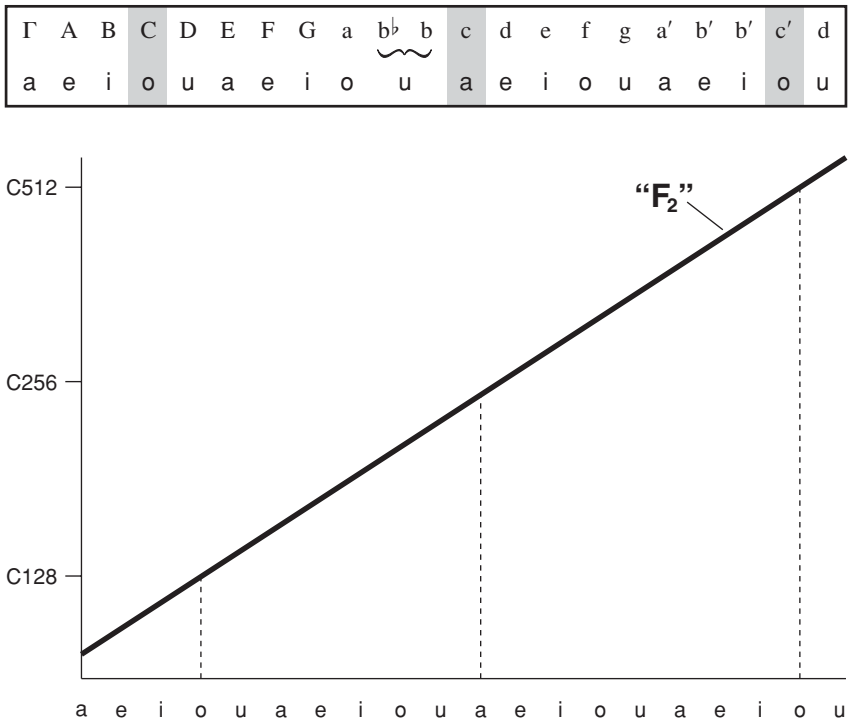


This is the same chart, developed from slightly different data for adult Italian male speakers from a 1975 study by F.E. Ferrero.[3] The male data were distinct enough from the soprano data, that both are given. The similarities also demonstrate that the basic principle of harmonic intervals between vowels is consistent for all human voices.

Both charts are based upon Italian speech, because since the Renaissance, Italian has been the international language standard for teaching of bel canto, and also for teaching of drama and poetry in the great acting schools of Europe.

[3] F.E. Ferrero, *et al.,* "Some Acoustic Characteristics of the Italian Vowels," *Journal of Italian Linguistics* 3:1, 1978. Research Paper presented at the Eighth International Congress of Phonetic Sciences, Leeds, England, August 1975.

FIGURE 9.9 Guido d'Arezzo's Vowel Monochord

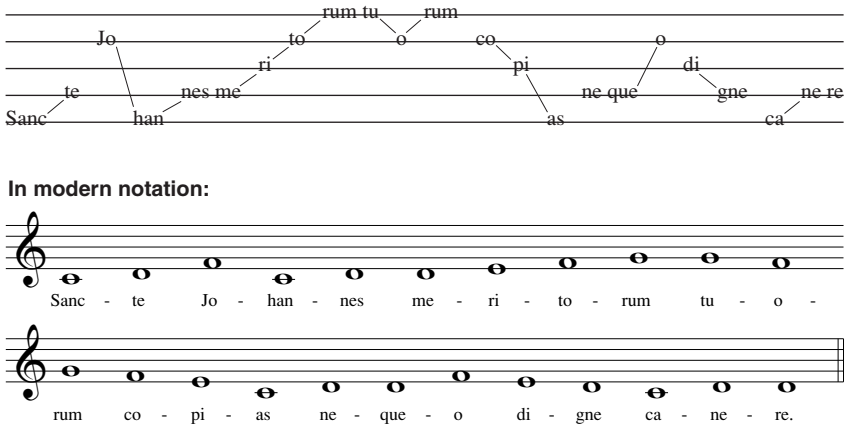


Well before the Renaissance, this basic principle of musicality inherent in the spoken human voice was known. The Christian-humanist music teacher Guido d'Arezzo asserted in the ninth century that some texts may be set to music precisely from vocalization of the pitches of the vowels, and that the harmonic relationship among the vowels implies a principle of *vowel melody*.

Guido's data were slightly incorrect, but his approach was sound. He called for the vowels to be placed under the scale of his monochord, as shown at the top of the figure.

That is, Guido believed there existed a physical phenomenon similar to what we call the second formant, a resonance peak in the voice which was audible and rose continuously in pitch across a spectrum of vowels. The bottom of the figure gives a graph of the "F_2" implied by his monochord. Guido's hypothetical "F_2" for the Italian vowels rose in a progression /a/, /e/, /i/, /o/, /u/.[4]

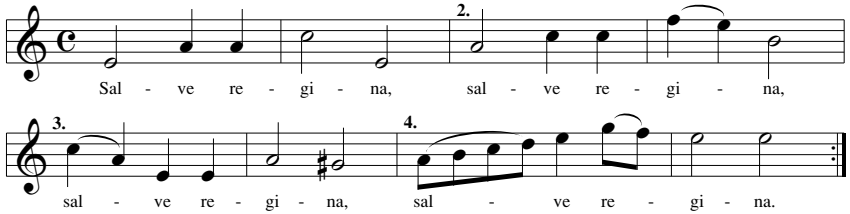
FIGURE 9.10 Guido d'Arezzo, "Sancte Johannes"



Guido gave an illustration, selecting the group of tones from C=256 to the G above it for the setting of his chant, as shown at the top of this figure. The bottom of the figure shows how the chant would look in modern notation.

[4] Compare this with the graph of modern F_2 values in Figure 9.12; note that actual second formants would be an octave higher than Guido's "F_2" here.

FIGURE 9.11 Canon Based on Vowel Harmony of "Salve Regina"



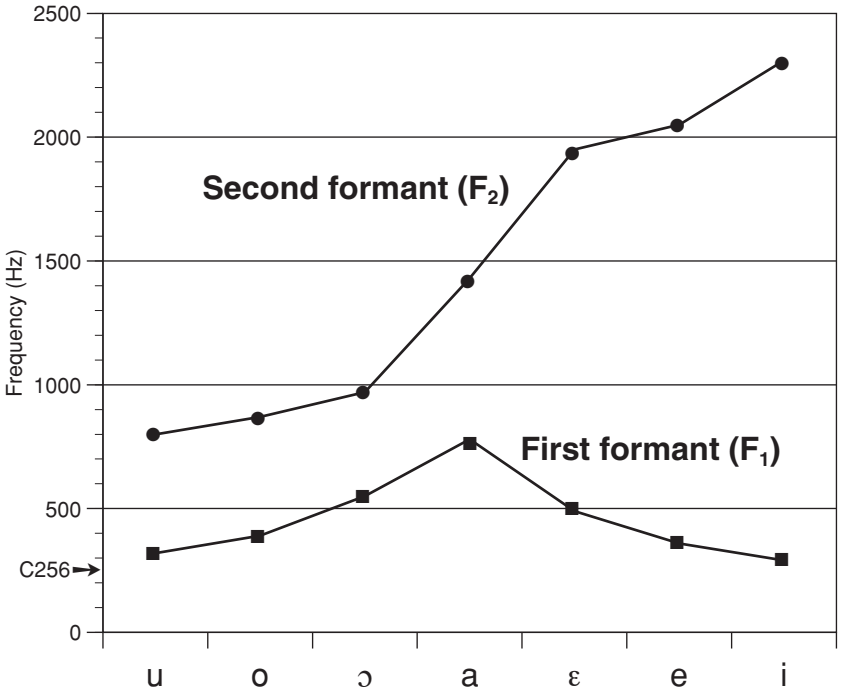
On the simplest level, the vowel harmonies in Figures 9.7 and 9.8 can be drawn upon directly in the vocalization of a poetic line. To demonstrate the principle, one of this manual's authors has constructed a four-part canon for Soprano, Alto, Tenor I and Tenor II, on the phrase "Salve regina," following the intervallic progression /a/–/e/–/i/–/a/ as shown in Figure 9.8. The third and fourth measures are a variation of the first two measures, the fifth and sixth are a free inversion, and the last two introduce the third register for the first time. Note also, that with the entrance of each new voice, the registration changes, thereby shifting the poetic emphasis in the phrase: The soprano's first register emphasizes the first syllable *Sal*ve, the mezzosoprano entrance becomes ambiguous with the absence of the register shift, whereas the tenor entrance puts emphasis on Re*gi*na with his shift from first to second register on C.

Kinesthetic Image

While singing, singers never hear themselves as others do, because their ears are located behind the target of the vocal "lasing." The voice teacher's main job is therefore to guide and correct the bel canto student in developing a *kinesthetic image* of the physical placement of the tone, a muscular memory of how proper placement feels physically.

This is done by first placing the voice on /ɔ/. Then, to create each different vowel, the mouth, tongue and so on *change* the basic /ɔ/ wave pattern, so that each vowel has its own specific, harmonically related wave pattern.

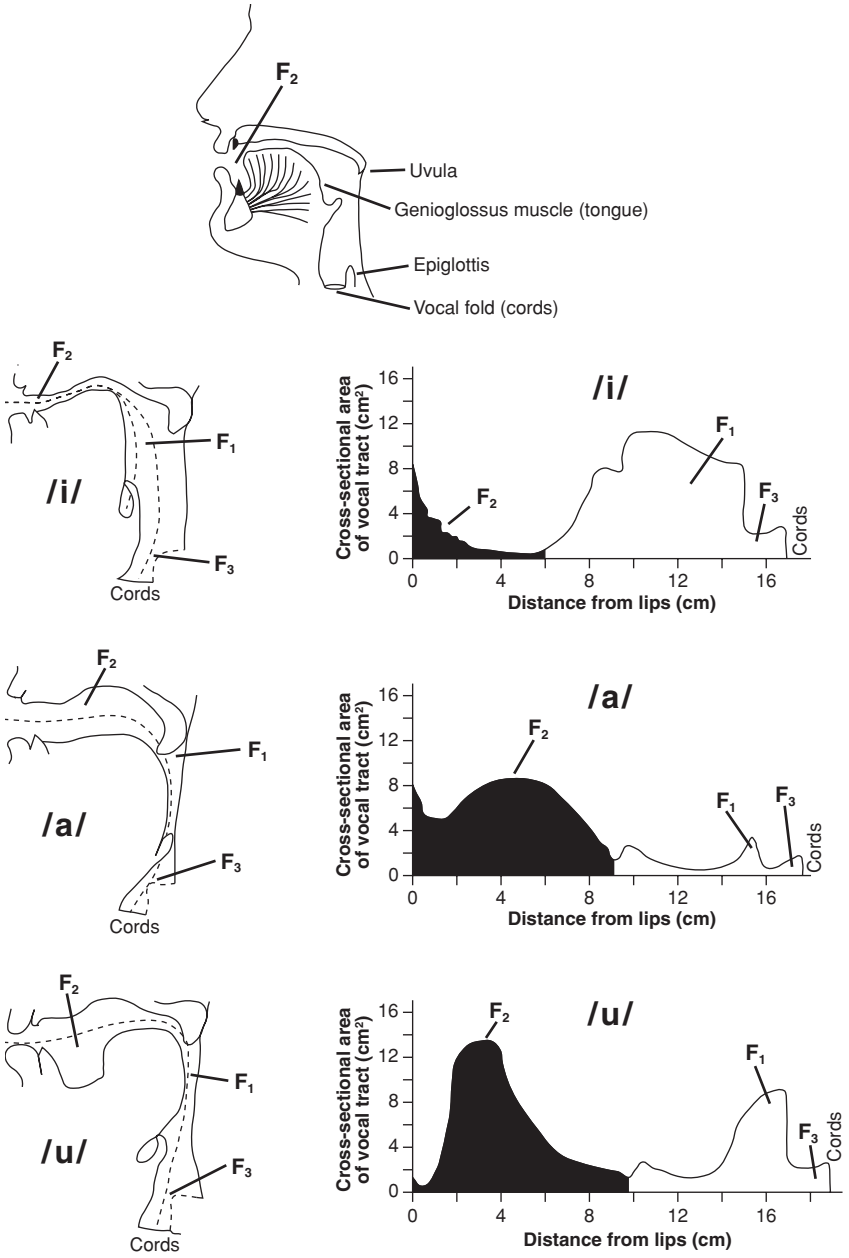
FIGURE 9.12 Harmonic Changes between the Vowels



The vibrations of F_1 and F_2 can be measured in the silent human vocal tract, with no fundamental sound (F_0) generated from the vocal cords. The chart shows that the lowest-pitched wave peak F_1, when compared among different vowels, rises in pitch from /u/ to /a/, and then falls again. It is for this reason that we say that "a" is in the center of the vocal "scale." Leonardo's chart reflects some knowledge of this formant.

The second, higher-pitched wave peak, F_2, rises continuously from /u/ through /a/ in the center of the scale, and then continues to rise upward to /e/ and /i/. Still there is a symmetry around the /a/, which is the center of the seven Italian vowels. F_1 and F_2 are the most audible formants in normal speech and song.

FIGURE 9.13 Placement of F_2 in Mouth for Spoken /i/, /a/, and /u/



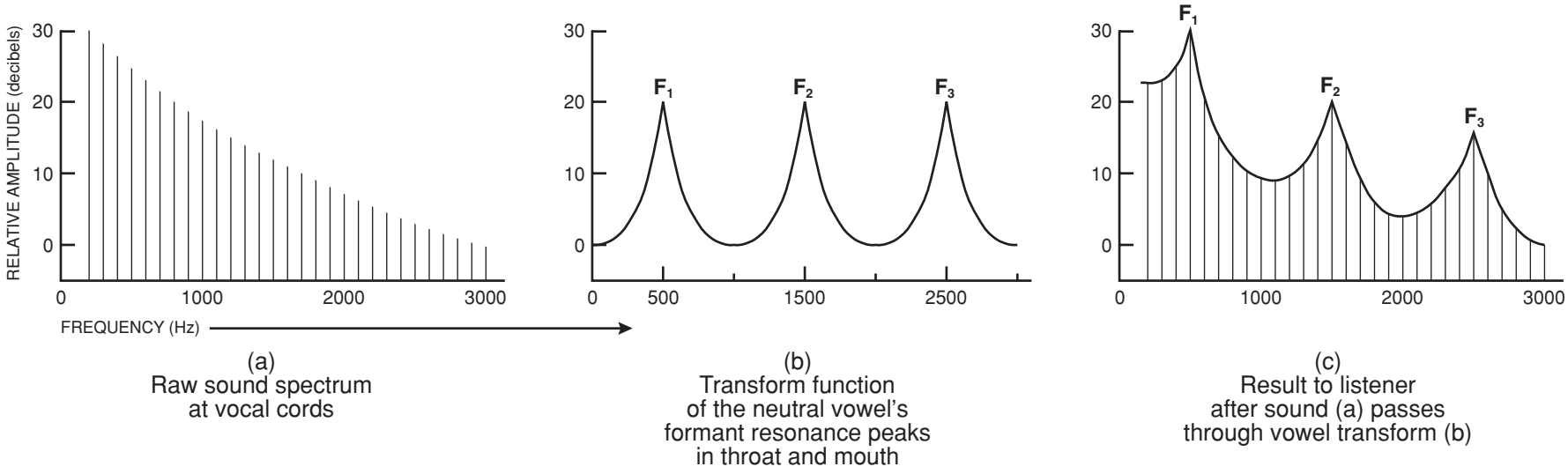
A properly vocalized /o/ is felt to be focused where its second formant is actually produced, in the center of the mouth. Thus, the /o/ of the Italian syllable "no" is used in the earliest training to center the entire voice properly. This F_2 or second formant is very tangibly felt by the singer on every vowel, as a moving focal point of energy which changes from vowel to vowel.

After /o/, the kinesthetic placement of the other vowels may be learned. A properly sung /u/ focuses just behind /o/. A properly sung /a/ or /i/ focuses further toward the front of the mask.

The student is asked to learn to consciously redirect and control the column of air in his vocal tract. The three very distinct formant configurations of /i/, /a/, and /u/ are shown in Figure 9.13; the pointers show where each formant is produced inside the mouth and throat. The volume and shape of the resonating cavity is different for each vowel.

On the left of the figure are simple schematic diagrams of the changes in the tongue with different vowels. On the right are mathematical functions. The volume of F_2, the most audible formant, is highlighted in black. The F_2 of the most highly-pitched vowel /i/ is created in a tightly-focused, forward space; that of the /a/ further back, in a broader space; and that of the /u/ even further back, in a very different space.

FIGURE 9.14 Vowels as Transforms



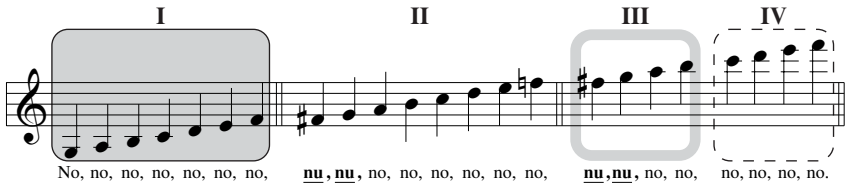
The varying quality of the vowels is a type of *transform*, a physical function which acts upon other physical forces to preserve a specific characteristic for transformation. One familiar transform is the colored light filter, which acts upon other wave functions to preseve a certain characteristic. Just as *any* color of light (within limits) passing through a red filter, will come out with a recognizably red hue, so *any* pitch (within limits) initiated at the vocal cords, will enter the vocal tract, held in an /a/ position, and emerge as a recognizable /a/.

As shown in the figure, the frequency range of the raw sound is organized into a sequence of fixed formant resonance peaks, labeled F_1, F_2, and F_3, in addition to the fundamental frequency F_0. It is the presence of these characteristic resonance peaks which makes a vowel sound more or less the same, no matter what its fundamental pitch. The vocalization of Italian, and of other languages, derives from the lawful geometry that governs the absolute values characterizing these vowel singularities in the spectrum of human speech.

Registration

The role of registration in the human bel canto singing voice has been demonstrated in Chapters 2–8. As the voice changes pitch, it shifts among three or four different *registers*—just as the three vowels shift placement in the mouth at any constant pitch. The bel canto teacher Manuel Garcia (1805–1906) defined register as "a continuous series of succeeding sounds of equal quality on a scale from low to high, produced by the same physical principle, which differs from another series of sounds produced by a new physical principle."

FIGURE 9.15 The Four Registers of the Soprano Voice



The vocalizations based on the central vowel /o/ given so far are used first to train the "central" register of the voice, or center of the voice. For the soprano, this is the area from the F-sharp above C=256, to the high F at the top of the staff.

Once the voice is trained, rounded, and placed in the mask, it becomes capable of singing much lower and much higher, while still maintaining bel canto quality. The voice develops its lower octave, the first register, the center is seen to be a second register, and a higher octave develops as the third and fourth registers.

Precisely because of its central location, the second register is the initial focus of training efforts, although this by no means excludes extensive forays into the other registers. This is in keeping with the fact that the tessitura of most bel canto compositions revolve around the central register, as opposed to the chest register, which is the register of reference for most popular singing.

History demonstrates that only those voices which learn to conciously shift registers when singing above or below certain notes, are able to professionally sing the Classical repertoire for more than a few years.

The ability to consciously shift registers is trained, using the same kinesthetic principle. As with the central register, all the registers are trained to orient toward the central vowel, /o/.

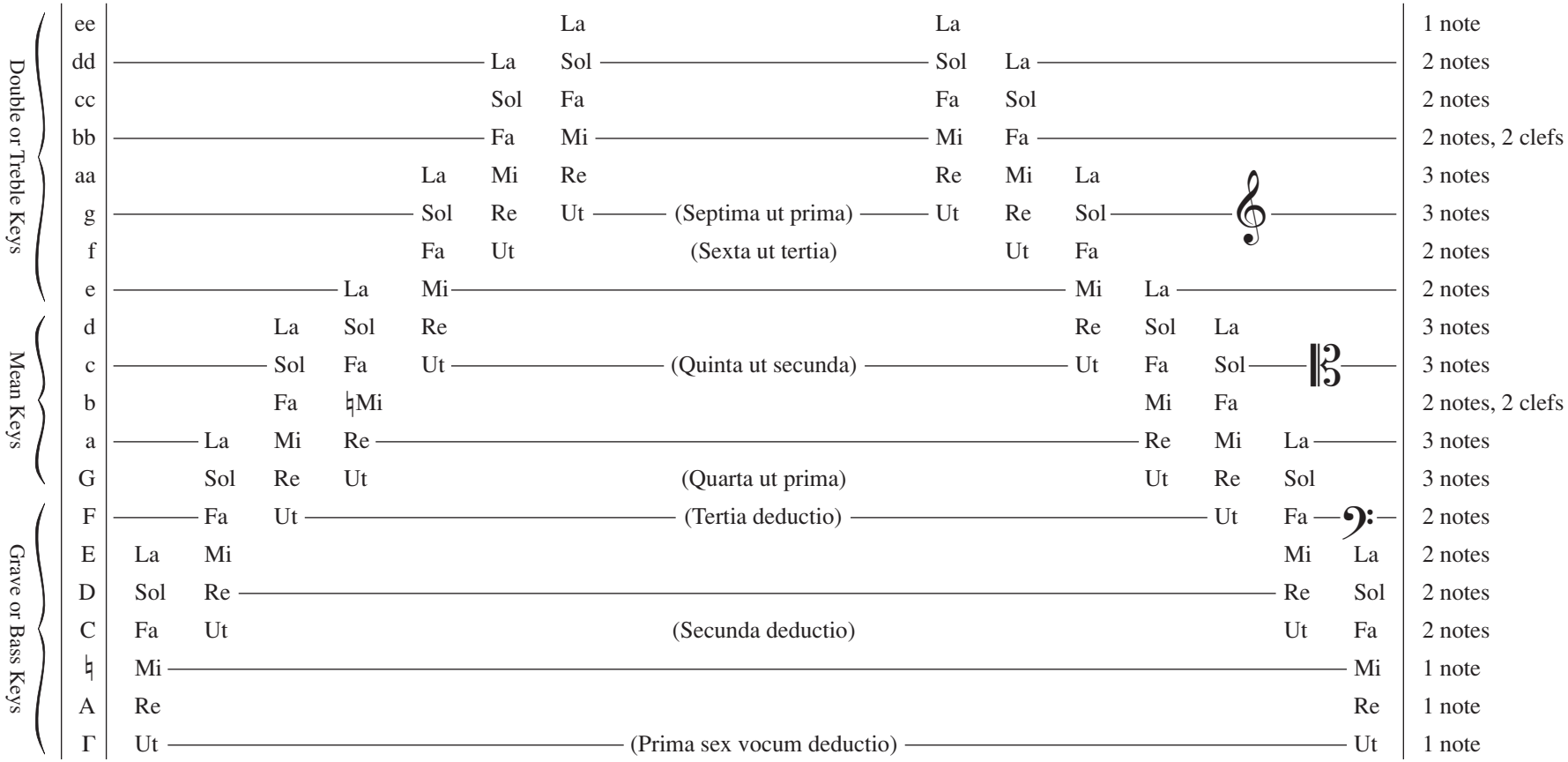
In order to encourage the shift from one register to the next higher register, it is useful to associate this with a corresponding shift in vowel. In singing a rising scale, at the point of a shift from the top of one register to lowest note of the next, the bel canto vocalization excercise will shift the vowel to /u/ (Figure 9.15). This effects a qualitative singularity, shifting the kinesthetic physical image of the singer to a new focal point within the mouth, coherent with the fact that the vowel /u/ has the lowest vowel pitch.

Physiologically, the shift to /u/ also obliges the larynx to drop to a lower position, thereby freeing the larynx sufficiently to execute the register shift.[5] The drop in laryngeal position is especially crucial in executing the shift from second to third register.

Only once this kinesthetic image of the register shift is thoroughly assimilated, can the singer proceed to learn how to execute the register shift on any vowel or combination of vowels.

[5] In female singers, the shift to /u/ is most useful in the first-to-second and second-to-third register shift. In male singers, it is most useful for the second-to-third register shift, and less so for the more subtle first-to-second shift. Also, shifting to /u/ is not recommended for the soprano and tenor's shift into the "super-high" fourth register.

FIGURE 9.16 Guido's Hexachord System



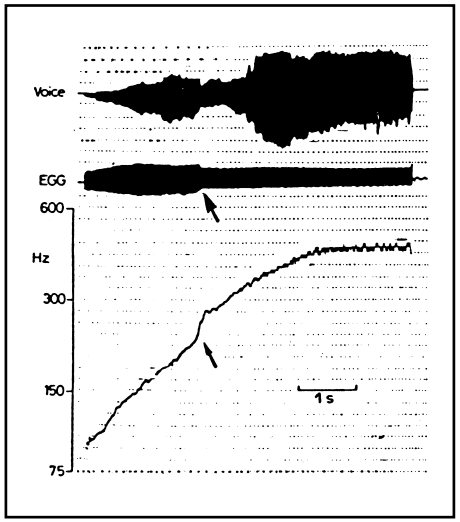
This role of /u/ in register shifts has been known at least from the time of the invention of solfege by Guido d'Arezzo in the ninth century, made famous by his system of hexachords. The chart is taken from Thomas Morley's 1597 *A Plaine & Easie Introduction to Practicall Musicke*. (The term "keys" at far left means, simply, "notes").

The lowest notes of the C=256 scale, those in the first register, were sung beginning with the /u/ of "ut," the "quinta ut secunda." Precisely at the point of the register shift to the bottom of the second register on G above C=256, the hexachord was moved such that the "ut" of the "septima ut prima" began again at G; and so on.

So much is Classical poetry based upon singing, and singing based upon poetry, that Guido fashioned his poem for precisely this vocal consideration. The syllables "ut, re, mi . . ." are each the beginning of a line of a poem created by Guido for the hexachord:

Ut queant laxis, *Re*sonare fibris. . . .

FIGURE 9.17 Electroglottogram of Baritone Register Shift



The singularity represented by the shift from one register to the next can be measured as a physical phenomenon in many ways. To produce the figure above, a trained bel canto baritone was asked to sing a *glissando*—that is, to begin in the lower range of the voice, and continuously raise the pitch, sliding from note to note. The top curve in the figure represents the amplitude of sound as measured at a certain distance from the singer. The middle curve is produced by an electroglottogram, a device with sensitive electrodes which, when held to the singer's neck, measure changes in muscular tension working on the vocal cords. The electroglottogram shows that at a certain frequency, indicated by the arrows, tension on the vocal cords is suddenly reduced at the moment of the register shift. The amplitude is momentarily reduced, but then increases greatly, showing that, by shifting into the new register, the singer is able to obtain a much more intense tone with relatively less physical effort.

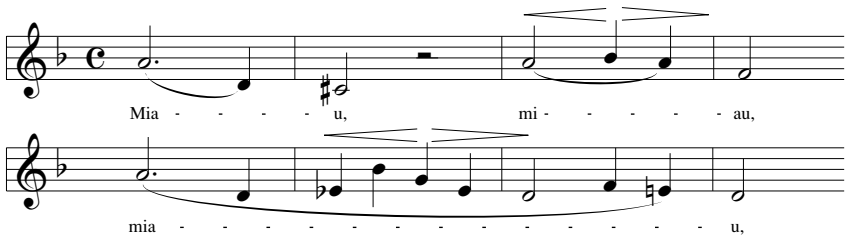
Other laboratory measurements have shown that at the moment of the shift, such a discontinuous change occurs in the overall configuration of the vocal cords, throat muscles, turbulent air flows inside the vocal tract, and vibrations of the head cavities.

Registers are related directly to the pure Italian vowels of Classical poetry. Refer back to Figure 9.7, which is primarily based on adult female Italian speakers. The Italian vowels' second-formant values clearly correspond to the characteristic register shifts for the various species of human singing voices. Most notable are the frequencies of the basic three pure vowels /u/, /a/, and /i/, all of which fall upon various octave values for the critical F-sharp soprano register shift. The open "o" sound /ɔ/ also falls on the tenor's second register shift at C, and the open "e" sound /ɛ/ upon the mezzosoprano and baritone pre-shift note of E-flat.

Data for children's voices (not given separately) exhibit the same phenomenon, with /u/, /a/, and /i/ all falling upon the same values of F-sharp. Other childrens' vowels also fall in the mezzosoprano/baritone register shift area of E-flat–E. This is significant because it demonstrates that the register shifts are correlated with the geometrical harmony of the Italian language itself, to such an extent, that not only the childhood F-sharp register shift, but even register shifts appearing only after puberty such as the mezzosoprano/baritone E-flat–E shift, are embedded in certain vowels of the childhood voice.

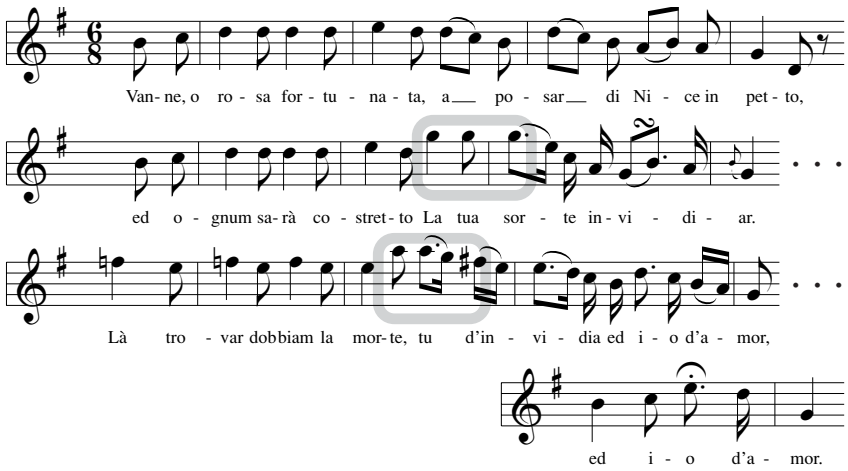
The bel canto vocalization of the vowels of poetry gives us the basis for all musical composition. Just as Leonardo da Vinci knew of the vowels' pitch in the head, Italian composers since the Renaissance have based compositions on these principles.

Figure 9.18 Rossini, *Duetto di due gatti*



This excerpt from *Sins of My Old Age* by Giacomo Rossini (1792–1868), shows a humorous but surprisingly accurate parody of the cat's meow, emphasizing the second formant, F_2. (This formant is not unique to the human vocal tract; feline formants have been measured in the laboratory.) The opening "miau" is composed of three notes: the /i/, which is the highest note A; the /a/, upon which the singer must execute a *portamento* slide down to the D; and the /u/ at the lowest note, C-sharp. In the second "miau," the relation is made even clearer, by changing the phrase such that the last syllable is not /u/, but rather /a/–/u/. Since the more high-pitched /a/ is involved, this note, F, is a bit higher than the C-sharp to which the pure /u/ fell in the first "miau."

Figure 9.19 Bellini, "Vanne, o rosa fortunata"



Vincenzo Bellini (1801–1835) is famous not only for his operas, but also for his art songs for voice and piano, earning him the epithet "the Italian Schubert." Giuseppe Verdi also composed such Italian "*Lieder*."

Here, rather than set each vowel sound one by one, Bellini grasped the inherent prosody of the most significant vowel pitches across the long line of the song as a whole, based on the playful vowel inversion of the poem from the opening phrase, "o rosa fortunata" ("O fortunate rose"), to "amor" ("love"), which the poet has saved for the end:

o, ro-sa	for-(tu)-nata . . .	a-mor.
/ɔ/ → /a/,	/o/ → /a/ . . .	/a/ → /o/

The first line ("Go, fortunate rose, rest on Nice's breast") presents the ascending theme from /o/ to /a/, from the fifth, D, on "o *ro*sa," to the sixth, E on "fortu*na*ta." The second line develops this, rising from the /o/ and /u/ of "ognum" again on the fifth, up to the high G octave on /a/ of "*la* tu*a* sorte."

By the third stanza, the third line in the example above, Bellini is repeating his playful joke by inverting the same idea. Instead of rising from /o/ to /a/, now he repeats three times a falling figure from /a/ to /o/, from F to E, as the poem inverts from /a/ to /o/:

Là tro- / *var* dob- / *biam la* mor-(te)

That repeated second-register figure serves as a takeoff point for the transformation to the third register on the brightest vowels of the entire poem, the /e/ of morte ("shall find . . . death!") and the repeated /i/ of "tu d'invidia ed io. . . ." Bellini thus reserves the high point of the third register for the /e/ and /i/ of "morte . . . tu d'invidia . . . ed io. . . ."

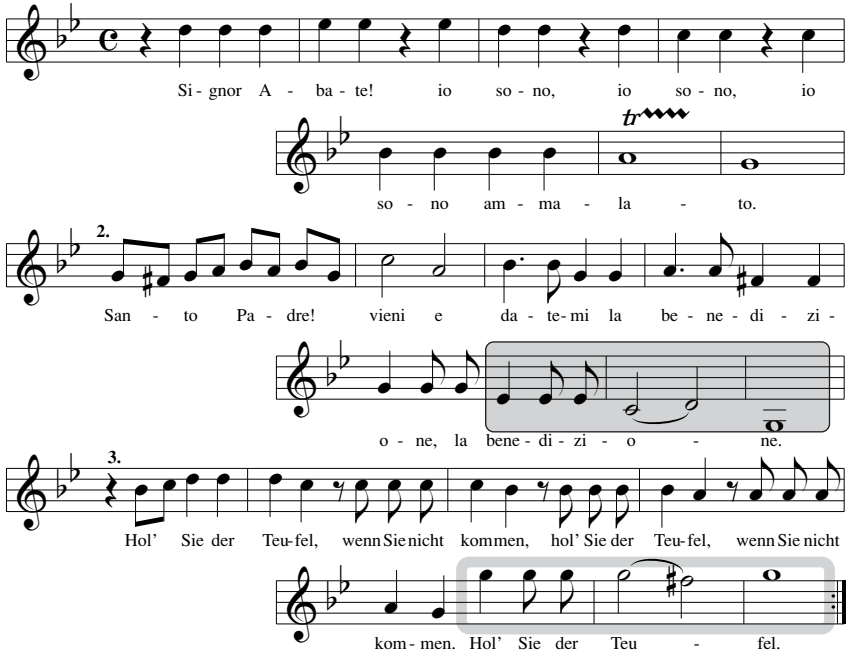
This is the turning point of the poem, where the singer reveals that both he and the rose will die upon the beloved's breast—but differently: thou, from envy ("Tu d'invidia") and I from love ("ed io d'amor"). Bellini completes the inversion as the poem makes its final drop from /a/ to /o/ on the punchline, "d'amor." "D'amor" is repeated four times at the end, on a figure which drops further each time, falling the fifth from D to G on the final "d'amor."

Vocalization and Polyphony

The principles of bel canto vocalization give not only a simple melodic line, but create the basis of all polyphonic composition.

Most profoundly, bel canto training creates six completely distinct *species* of human voices (see Chapter 2), each of which is different by virtue of its distinctly different register shifts. Since the Renaissance, this had led great composers to create polyphonic compositions by the obvious step of using three to four different species on distinct musical lines. What is distinct about these lines is not just that the soprano and the mezzosoprano, for example, may sing the opening line of a fugue at different times or pitches, but that each sings the entire fugue in a distinct registral mode and thus a distinct vocal color.

FIGURE 9.20 Beethoven, Canon "Abbé Stadler"



Many of the rules of tonality and compositional intervals, such as the fugue and canon at the fifth, stem from the bel canto vocalization of the vowels of poetry. Beethoven's joke canon "Abbé Stadler" is one example. Seeing that the first line abounds in accents on the high vowel /i/ ("Signor . . . io"), Beethoven set the first voice, beginning with /i/, at the fifth (D), falling to the tonic G on the lower sustained /o/ of "ammalat*o*."

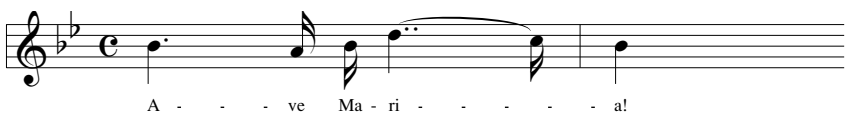
The second line concentrates upon this /a/ ("*San*to *Pa*dre . . . d*a*te"), entering at the tonic G, a fifth below the first voice's entrance. It then falls to the subdominant C, and finally the low octave G, on the lower vowel /o/ of "benedizi*o*ne."

Beethoven completes the pun by moving into German, so as to be able to *return* to the /i/ of the first line, on "Hol' *Sie* der Teufel!" (instead of the accented /o/ of the Italian "Voi"). The third line enters again on the D as in the first line. To accent this, Beethoven rises to the high G octave on the German dipthong /oi/ of "Teufel."

See Chapter 10 for the relation of German to Italian vowels.

Many four-voice fugues on the words "Kyrie eleison" of the Catholic mass follow this same principle, beginning at the fifth above on the higher vowel /i/ of "*kyri*e," undergoing development at the lower /e/ of "kyri*e* . . . *ele*ison," and finally falling to the tonic on the lowest vowel of the three, the sustained /o/ of "elei*son*."

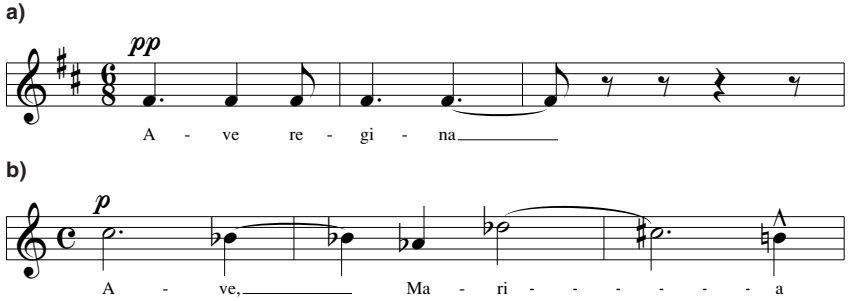
Figure 9.21 Schubert, "Ave Maria," D. 839



That the prosody of a line of poetic text provides the composer with the germ of a musical idea, becomes clear when one compares the same poetry set to music by different composers. One very simple, but illustrative case, is the prayer "Ave Maria."

Schubert opens his setting of a Walter Scott poem which has these words as its opening line, with a theme reflecting the underlying prosody of the phrase. He varies it according to the rhythm of the line, when simply spoken: *Á*ve ma*rí*a, rising from the lower /a/ on the tonic B-flat to the D above on the higher vowel /i/. Most obvious throughout, is the stress, often through greater length, on the /i/ of Mar*i*a, which is most pronounced even in simply speaking the line.

Figure 9.22 Verdi, "Ave Maria," Two Versions, Opening Lines



Verdi seized upon similar melodic ideas in several settings. The first text is taken, in Italian, from Dante's *Paradiso* book of the *Commedia,* the second from the Latin prayer itself. In his setting of Dante's poem (top), which begins with the variant "Ave regina," Verdi stresses the chanting quality of a prayer, by repeating the F-sharp, yet he varies it according to the rhythm of the line, when spoken.

In his second version (bottom), both the rhythm and the pitch differences evident in a poetic reading of the line are rendered musically. It rises from /a/ of "ave" on C, to /e/ on B-flat, /a/ on A-flat, rising to /i/ on D-flat and C-sharp, and then down to /a/ on B. Most obvious throughout, is the stress, often through greater length, on the /i/ of "Maria," as in the Schubert.

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CHAPTER 10

Synthetic Geometry of Composition

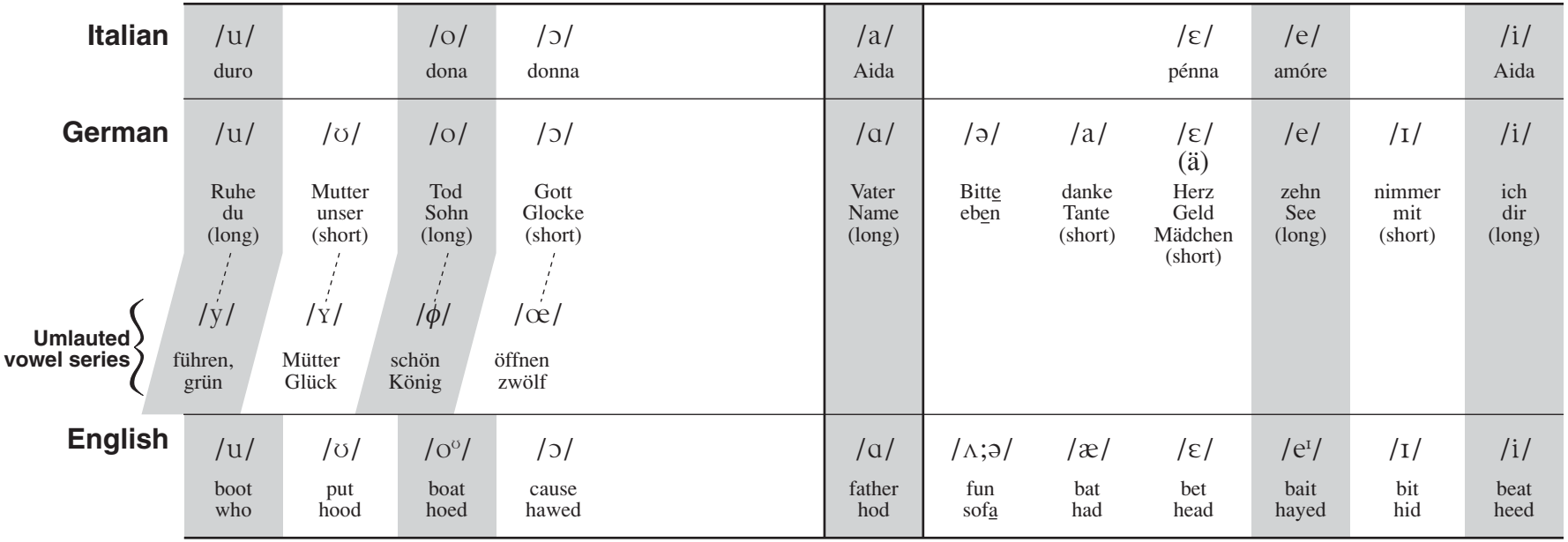
All composition references immediately three degrees of interaction or freedom, proceeding directly from the bel canto human voice, confronting us with an elementary musical domain which is, respectively, doubly- and triply-connected.

The fact that music is based on the bel canto vocalization of the vowels and consonant-inflected vowels of poetry, is the primary necessity which the composer must obey. A second interconnected consideration is the registration of the bel canto singing voice, and the third is the natural tonal system of the universe, which allows music to shift among certain specified keys related to the basic universal key of C, referred to as shifts in pedal points.

That is, a great artist writes a classical song (or any other composition) from the same standpoint as that of learning how to sing. This means that he must carefully consider which language—the original, or a translation—he will use in setting a song, since Italian, German, and English, for example, have very different vowel sounds and syntax. It follows that it is very bad practice to simply translate the text of a song originally set in one language, into another language, without reference to the composer's appreciation of the crucial vowel shifts used in his setting. Likewise, when attempting to analyze or interpret a song, it is important to determine which language the composer was using as his primary reference.

Italian, German, and English Vowels

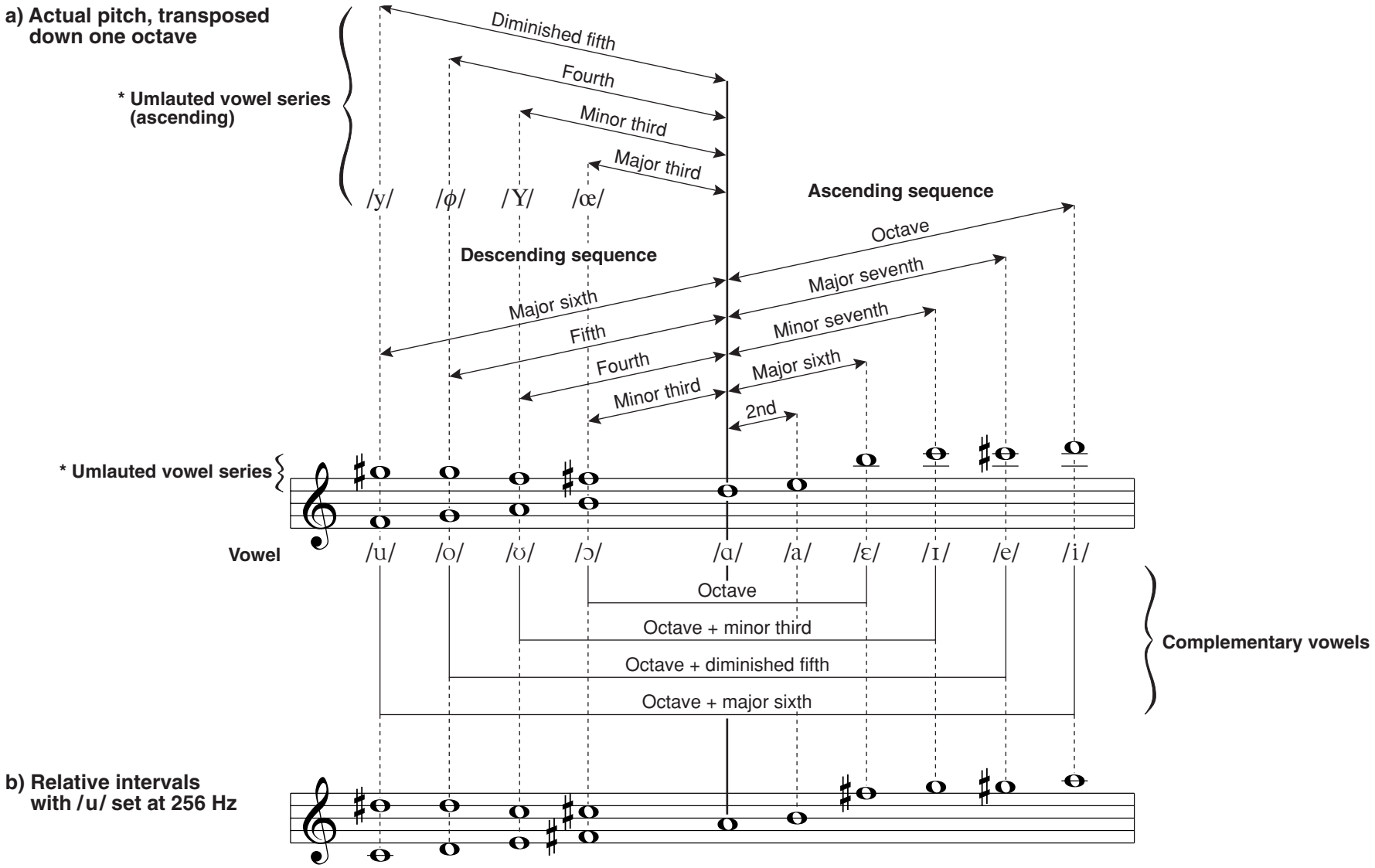
FIGURE 10.1 Vowel Sounds in Italian, German, and English



Examine the vocalization of German and English. The basic vowels of Italian, German, and English are all derived from the same Indo-European Sanskrit roots, and have universal sounds in common. While historically it was Italian which formed the basis for the modern polyphonic composition of sung poetry, as Dante Alighieri reports the development of the Italian language in his *De Vulgari Eloquentia,* other languages developed distinct poetry using additional vowels with extensive variations.

The chart uses vowel symbols developed by the International Phonetics Association (IPA). These are denoted within slashes—e.g., /o/—and are more or less consistent from language to language. The /o/ of Italian (as in "dona") is very close to the German /o/ (as in "Tod"). Examples of pronunciation are given for each language.

FIGURE 10.2 Vocalization of German Vowels in the Male Voice



Germany, which in the eighteenth century gave birth to an even greater Classical music than that of Renaissance Italy, adds to the basic seven Italian vowels, seven others, making for a total of more than 14 vowels, not including diphthongs. Above are the most common vowels of German: the seven Italian, several shorter German vowels such as /ʊ/, and /ɪ/, and the umlauted vowel series. The second formant (F_2) of each

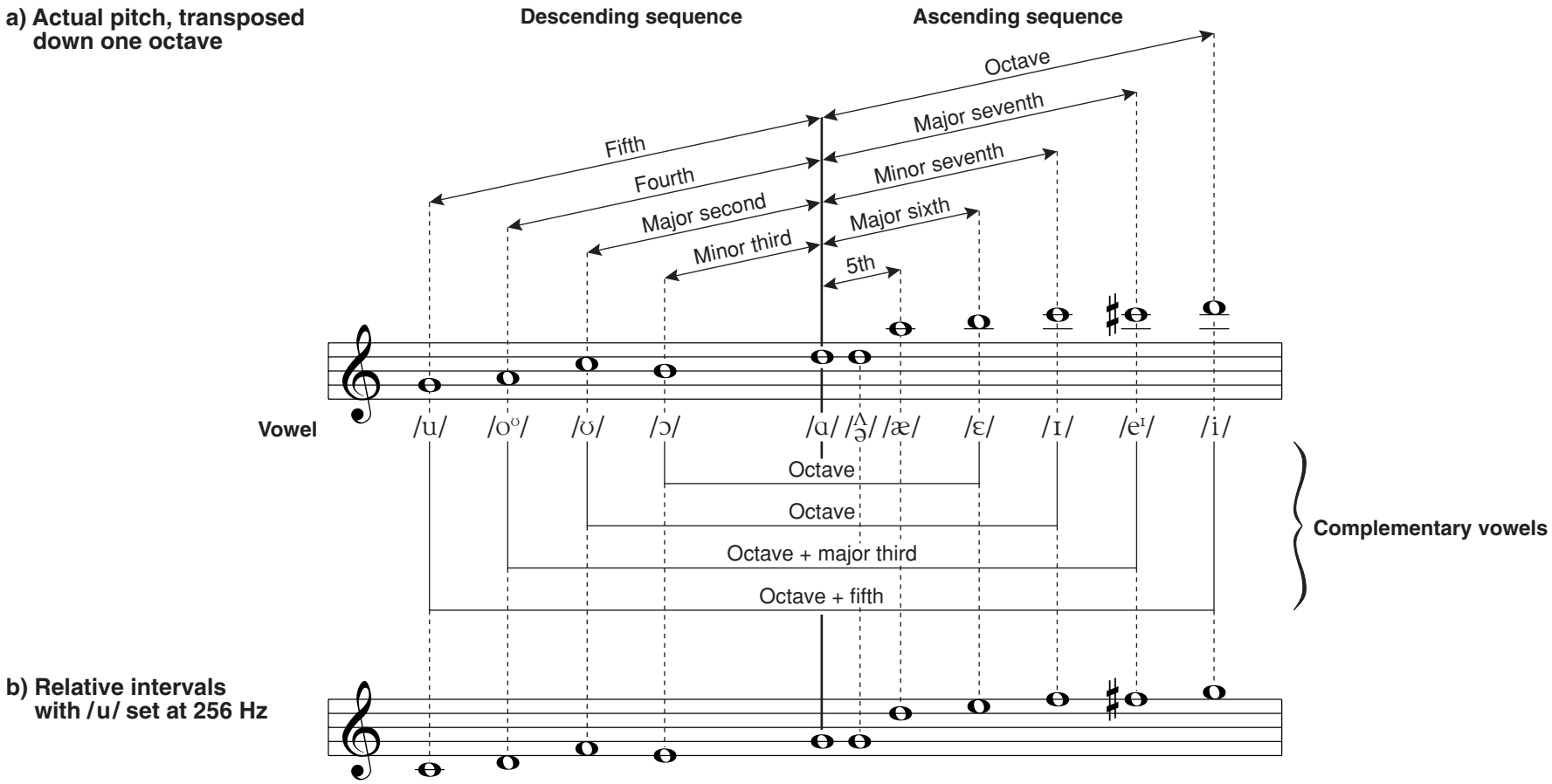
vowel was measured in Herz and placed on the scale as was done with the Italian vowels in Figures 9.7 and 9.8. Data are from a 1972 study by V.A. Rausch; only data for German men were available.[1]

While the absolute pitches vary from Italian, there is clear harmonization of the additional Germanic vowels at relative intervals with the seven Italianate vowels.[2]

[1] A. Rausch, "Untersuchungen zur Vokalartikulation," *Deutsche IPK-Forschungsberichte* 30, Hamburg, 1972.

[2] See page 197 for additional comments on umlauted vowels.

FIGURE 10.3 Vocalization of English Vowels in the Male Voice



English uses more than 17 vowel sounds, including the Italian vowels and the short vowels such as /ʊ/ and /ɪ/ as in German, as well as diphthongs (vowel combinations). English also modifies the pure closed Italian /o/ and /e/ with the glides /oʊ/ and /eɪ/; the accented first vowel of these is identical to the Italian /o/ and /e/. The chart shows the second formant (F_2) in Herz, and as transposed to /u/ = C256 for comparison with the German and Italian charts. Data are from studies of the male voice by R.S. Paget and by Peterson and Barney (1954) and others.[4]

Diphthongs add an extra dimension of musical inflection to a language. While umlauts are a single homogeneous sound, diphthongs are

[4] For American English: Gordon E. Peterson and Harold L. Barney, "Control Methods Used in a Study of the Vowels," *Journal of the Acoustical Society of America,* Vol. 24, 1952; Ilse Lehiste and Gordon E. Peterson, "Transitions, Glides, and Diphthongs," *J. Acoust. Soc. Am.* 33, 1961; Anthony Holbrook and Grant Fairbanks, "Diphthong Formants and Their Movements," *Journal of Hearing and Speech Research,* Vol. 5, No. 1, 1962; Peter Ladefoged, given as an "average of authorities" in *A Course in Phonetics,* New York, 1975.

For British English: R.S. Paget, *Vowel Resonances,* International Phonetic Association, London, 1922; J.C. Wells, "A Study of Formants of the Pure Vowels of British English," unpublished M.A. thesis, University of London, 1962.

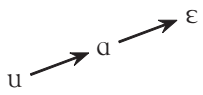
a complex of two distinct pitches, and can be resolved into their two constituent components. They are spoken largely on the first vowel, then inflected from that pitch, to the closing pitch. Glides do not resolve to a distinct second pitch, and in bel canto singing of English, the pure Italian /ɔ/ and /e/ are sung for the glides /ɔᵒ/ and /eᶦ/.

Is Schubert's "Silvia" a German or an English Song?

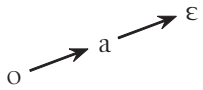
Although Schubert's "To Silvia," taken from Shakespeare's *Two Gentlemen of Verona,* is usually described as a song first written from a German translation by the Romantic Eduard von Bauernfeld, a study of the melody from the standpoint of the vocalization of German and English, demonstrates that Schubert wrote his song from the English original.

FIGURE 10.4 Shakespeare, "To Silvia," from *Two Gentleman of Verona*

Who is Silvia? ***what*** is she,
That all our swains com***mend*** her?



Holy, fair, and ***wise*** is she
The heavens such grace did ***lend*** her . . .

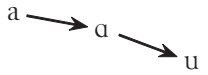


First examine Shakespeare's verses. In the Shakespeare, there is a definite thematic use in the opening couplet of the natural rising vowel melodies of the human voice.[5]

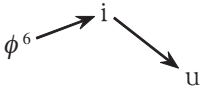
Shakespeare begins with the lowest vowel /u/ on "who," rising to the central /ɑ/ of "what," then to the higher /ɛ/ in the first couplet on "com*mend*." He repeats this direction in the second couplet, rising from /ɔ/ of the diphthong in "*ho*ly" to /ɑ/ of the dipthong in "wise," to /ɛ/ of "lend."

FIGURE 10.5 Bauernfeld, "An Silvia," translation of Shakespeare

Was ist Silvia, ***sa***get an,
Daß sie die weite ***Flur*** preist?



Schön und zart seh' ***ich*** sie nah'n;
Auf Himmels Gunst und ***Spur*** weist . . .



Bauernfeld's German rendering has no such clear structure. The first couplet falls slightly between the German /a/ and the central /ɑ/, and then falls to /u/. The second couplet starts on the higher umlauted /ϕ/ above /ɑ/, then rises to the highest vowel /i/, then falls to the low /u/.

The working question is: Which of these did Schubert utilize?

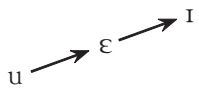
[5] The spoken pure English and German /ɑ/ as in "father," "Vater," and "what," is slightly different from the Italian /a/, which is consequently absent from the English row in Figure 10.1. In singing, the glide /ɔᵒ/ of "holy" can be thought of as an Italian /ɔ/, slightly lowered by /ʊ/. The glide /aᶦ/ of "wise" is an Italian /a/, slightly raised by /ɪ/, which would fall slightly to the right of the English /ɑ/ of "father" in Figure 10.1.

[6] See Figure 10.1 for IPA symbols for German umlauted vowels. This one is for the long "ö."

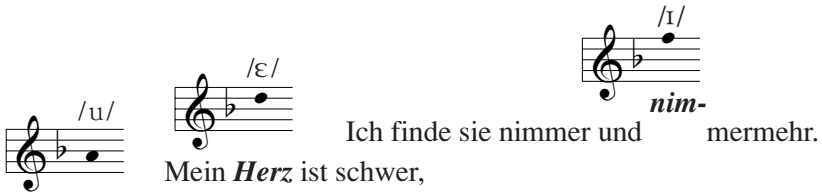
FIGURE 10.6 Schematic of Goethe, Schubert, and Löwe's "Gretchen am Spinnrade"

Goethe:

Meine ***Ruh'*** ist hin,
Mein ***Herz*** ist schwer,
Ich finde sie nimmer
Und ***nim***mermehr.

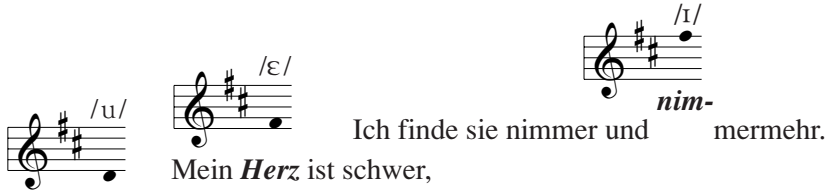


Franz Schubert, Op. 2 (1814):



Ich finde sie nimmer und mermehr.
Mein ***Herz*** ist schwer,
Meine ***Ruh'*** ist hin,

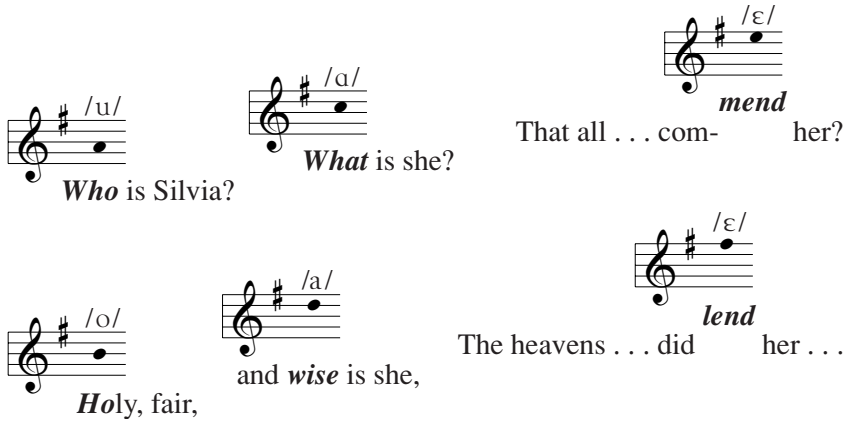
Karl Löwe, Op. 9, H. III, No. 2 (1822)



Ich finde sie nimmer und mermehr.
Mein ***Herz*** ist schwer,
Meine ***Ruh'*** ist hin,

Examine two musical settings which were indisputably taken from the German song sung by Gretchen in Goethe's epic *Faust*. Schubert's famous opening musical theme for "Gretchen am Spinnrade" is generated here by setting the rising vowel melody in Goethe's opening strophe. An approximately contemporary setting by Karl Löwe displays the identical vowel pattern.

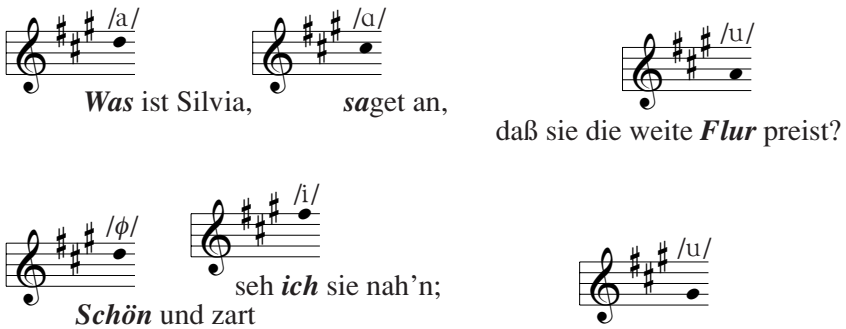
FIGURE 10.7 Vowel Pitch Schematic of Shakespeare's "To Silvia"



Who is Silvia?
What is she?
That all . . . com- her?
Holy, fair,
and ***wise*** is she,
The heavens . . . did her . . .

Return to Shakespeare's "Silvia." Examine a simple vowel pitch schema of Shakespeare's English. (Since this not Schubert's setting, imagine the Shakespeare on the two simple triads, A–C–E and B–D–F-sharp).

FIGURE 10.8 Vowel Pitch Schematic of Bauernfeld's "An Silvia"



Was ist Silvia, ***sa***get an,
daß sie die weite ***Flur*** preist?

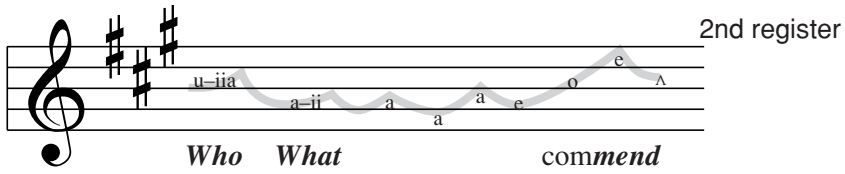
Schön und zart
seh ***ich*** sie nah'n;
Auf Himmels Gunst und ***Spur*** weist . . .

Now suppose that Schubert began with Bauernfeld's German, in the key of A major. A direct vowel-pitch setting would fall at the end of the first couplet, and would fall by an even greater interval at the end of the second.

Which of these is closer to Schubert's music? Neither is precise, but Schubert's musical line *rises* from the /u/ and /o/ of "who" and "holy" at the beginning of each couplet, to the higher /ɛ/ at "com*mend*" and "*lend*." Schubert underlines this rising melody by recapitulating it in the second couplet and then rising further, breaking through the register shift to the high F-sharp on "*lend*."

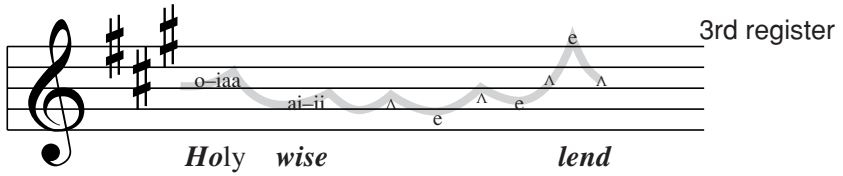
The Shakespeare rises over the course of each couplet, while the Bauernfeld falls; the Bauernfeld bears no resemblance to the musical line by Schubert.

FIGURE 10.9 Wave Graph of Schubert's "To Silvia," Op. 106, No. 4



Who ***What*** com***mend***

Who is Silvia? ***What*** is she, u (i–ia) a (i–i)
That all our swains com***mend*** her? a a a e o e ʌ



Holy ***wise*** ***lend***

Holy, fair, and ***wise*** is she; o (i–aa) a–ai (i–i)
The heavens such grace did ***lend*** her . . . ʌ e ʌ e ʌ e ʌ

[Where ʌ denotes either "uh" or the neutral schwa to be sung]

Now graph the basic skeleton of Shakespeare's vowel melody to Schubert's musical line. (For simplicity of reading, the English and German vowels in Figures 10.9 and 10.10 have all been reduced to their nearest pure closed Italian vowel equivalents.)

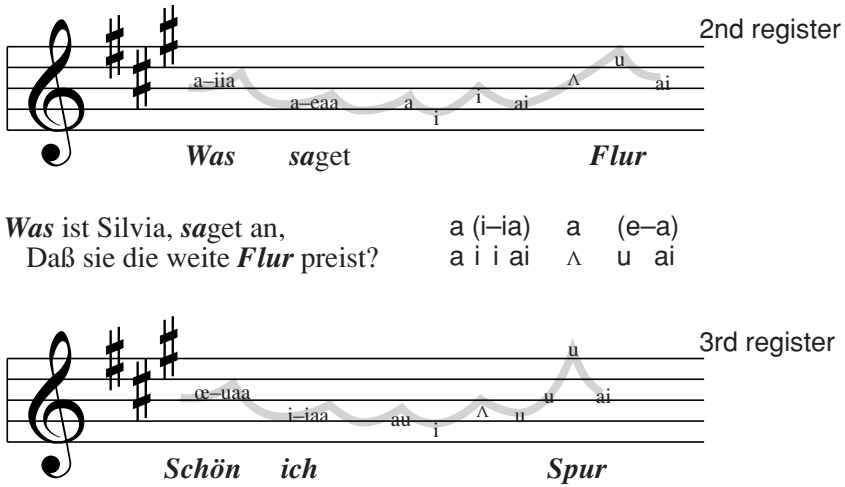
Schubert has created a variation upon the direct vowel melody setting he used in "Gretchen." Schubert uses Shakespeare's vowels not in a linear rising line, but in the form of a wave, similar to the graph made by a ball bouncing down the stairs, hitting the bottom at full speed, and rebounding.

Closer examination reveals Schubert created the motion to rise to /e/ of "com*mend*" and "*lend*" by first *inverting* the /u/ to /a/ formant relation in the opening line. His tones fall from /u/ to /a/, after which he uses the motion of that fall to swing up to /e/. The fact that he inverts what is known to be a rising interval from /u/ to /a/, performs net work against the natural rising interval which creates the energy to swing up to /e/.

Schubert also uses the repeated occurrence of /i/ in diphthongs and other unstressed syllables such as "*is Silvi . . .*" and "*is she*" to create his rising motion, even while still falling broadly in pitch from "who" to "what." The repeated unstressed /i/s each time slightly modulate the stressed vowels /u/ and /a/, and have the effect of creating a slight upward swing of vowel pitch after each stressed vowel. This also creates additional motion to the final swing up to the /e/.

The fact that all of this is repeated twice, first in the opening couplet and again in the second couplet, creates the increased potential for the rise in pitch to F-sharp in the third register on "lend." The wave crest of the second couplet is sharper than that of the opening couplet, accentuated by the singular third register.

Figure 10.10 Bauernfeld's German with Schubert's "To Silvia"



Was ist Silvia, ***sa***get an, a (i–ia) a (e–a)
Daß sie die weite ***Flur*** preist? a i i ai ʌ u ai

Schön und zart seh' ***ich*** sie nah'n; œ (u–a) e–i (i–a)
Auf Himmels Gunst und ***Spur*** weist . . . au i ʌ u u u ai

Not only is there nothing in the German to help Schubert generate such a musical line, but it is not even advisable to attempt to "curve-fit" the German to this line. Here we have graphed the vowels of the German against the graph of Schubert's musical line above.

The first line is passable, but the second, third, and fourth lines go directly against the German. Particularly incongruous are the accented /u/ of "Flur" and "Spur" at the high points, where the much higher vowel /e/ should be. Worse, the following harsh /aɪ/ of "preist" and "weist," where the soft English /ɚ/ ("er") should be, draw an unwanted accent to the final syllable of each couplet. This is almost humorous after the major register shift from E to F-sharp between "Flur" and "Spur." It is poor composition to thus undercut such a register shift.

The Determination of Key

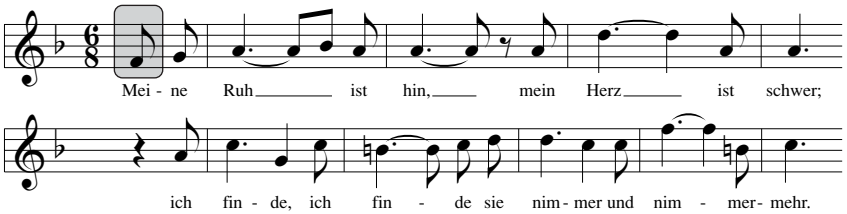
The second necessity which the composer of song must obey is registration. After the Classical composer selects a poem to set, he must next choose, in the simplest case, a definite species of male or female singing voice: soprano, tenor, and so on. Once this choice is made, the specific voice registration creates a doubly-connected function. That is, once a composer chooses a poem to set, and then a species of singing voice, he is already constrained thereby to head to certain key signature choices and treatments. He has *already determined to within a very narrow range, the few key signatures which will fit these other two degrees of freedom*. He now must choose a key signature *which divides the voice registration of the chosen species of singing voice in the manner required by the meaning and the sonority of the poem*.

The intent of the poem, as read by the composer, must be served; yet, voice-registration considerations must be superimposed upon the vocalization domain identified above. In the language of constructive geometry, the most rudimentary Classical counterpoint is already *doubly-connected*.

In constructing the song in this way, the composer does not make a line-by-line scan of the poem, but rather approaches the poem as a total composition, and sets it as a whole.

Transposition of songs, therefore generally has the effect of destroying this registral geometry. Examples of constraints imposed by both the female and the male vocal registers, demonstrate the point.

Figure 10.11 Schubert, "Gretchen am Spinnrade," Op. 2



In the woman's song "Gretchen am Spinnrade," Schubert employs voice registers to help precisely determine the key of the song. First, he forms the musical intervals of his theme by rising along with the "peaks" of the vowel geometry in Goethe's opening strophe. From the vowel /u/ ("Ruh") he rises by a fourth to /ɛ/ "Herz"), and from there to /ɪ/ ("*Nim*mermehr"), a rise of another minor third above "Herz."

While from the vowels Schubert's melody might lawfully rise, Schubert next had to decide: Upon what absolute note would he begin and end? That is, within which key would this rise occur? That would depend on how low, and how high into the different registers of his singer he wished the melody to proceed, as well as on which words of the opening theme, if any, ought to be accented by a *shift* in register.

Thus he had next to choose a soprano or a mezzosoprano voice to sing the character of Gretchen. He chose soprano, in keeping with her character as a young girl.

Schubert recognized that the opening strophe was also Goethe's theme, to which the poet returns, repeating it three times throughout the original poem.

From the outset, before writing down his theme, Schubert's unit-concept of the song called for this theme to be repeated throughout, using the repetition as a poetic device, much as Goethe had done, in order to emphasize Gretchen's repetitious, fixated state of mind. Schubert added his own fourth repetition of the theme at the end.

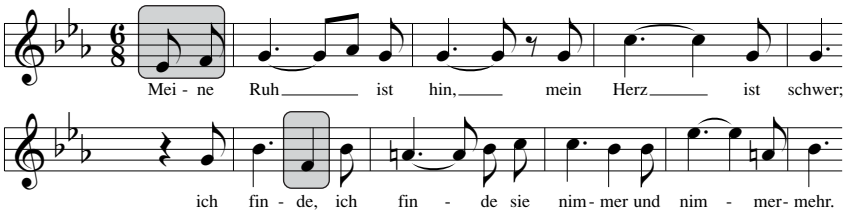
For the female or child voice, Classical composition sits largely in the second or central register of the singing voice, reserving the first and third registers for singularities—i.e., for special poetic emphasis (see Chapters 2–8). In most musical composition of poetry, it is especially important to refrain from the use of the third register in the song's opening. Schubert knew this was necessary here. If the opening theme contained the third register, not only would the third register be pre-

maturely prominent, but he would be forced to repeat the third register too frequently. This would dilute the third register's impact and remove it as a singularity toward which the song might develop.

Schubert chose to have the opening strophe rise to the high F-natural at the top of the soprano's second register, pointing toward the third register but reserving its use. He defined three peaks in the opening couplet: "Ruh," "Herz," and "*Nim*mermehr," to be the triad defining his key, with "*Nim*mermehr" on F. He also wanted to keep the triad within the second register.

He therefore had a choice between F major, with a triad of F–A–C (reordered as A–C–F), or else the relative minor, D minor, with the triad D–F–A, reordered as A–D–F. The minor was chosen as most emotionally appropriate to Gretchen's mood, not the least because in F major, having the opening theme rise to the tonic F would halt the motion at the outset. In D minor, F hovers a minor third above the tonic D, never resolving, which is entirely appropriate to the poem's mood.

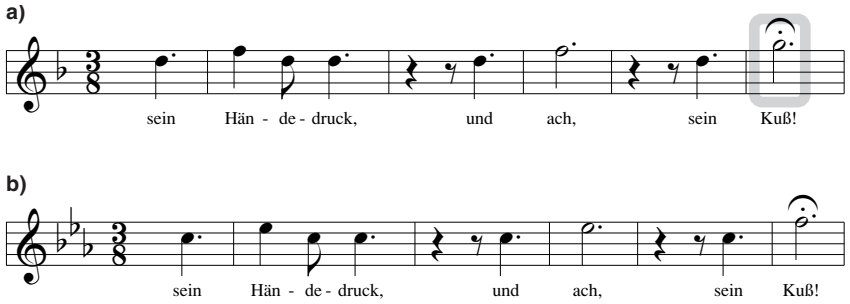
Figure 10.12 Schubert, "Gretchen am Spinnrade," Op. 2, Transposed to C Minor



Certain other keys could have been selected to accomplished the same work. Schubert could have set the song in C minor or C-sharp minor, leting the soprano theme rise to the E-flat or E-natural at the top of the second register, as is often done. That would have kept his opening triad within the soprano second register, with the lowest note being respectively G or G-sharp. But selecting either of those keys would have forced the tessitura of the opening two lines so low that there would be excessive use of the *first* register during the opening bar of the song.

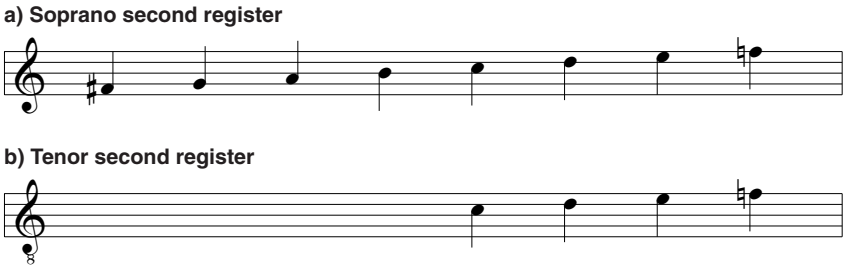
More important, the effect of a lower key would change the *development* of the song as a whole. Schubert's 11-strophe plan for the song was to have a thematic strophe, repeated four times, with variations upon it in the intervening seven strophes. The stepwise motion of the opening theme, and Gretchen's mood of hypnotic fixation, indicated that no large operatic leaps would be appropriate, even in the variation strophes.

Figure 10.13 Schubert, "Gretchen am Spinnrade," Op. 2



The breakthrough during the development strophes, to a singularity at the much-anticipated third register, would have to occur as an extension of this fixated, stepwise motion. Schubert accomplishes this in the D minor setting (a) from F to G at the phrase, "und ach, sein Kuß!" underscored by two dissonances in sequence in the keyboard. The same effect could have been achieved if the piece were in C-sharp minor, which would still locate the shift from E to F-sharp in the third register; but it could not be achieved in C minor (b), where that same step would fail to reach into the third register.

Figure 10.14 Comparison of Soprano and Tenor Second Registers



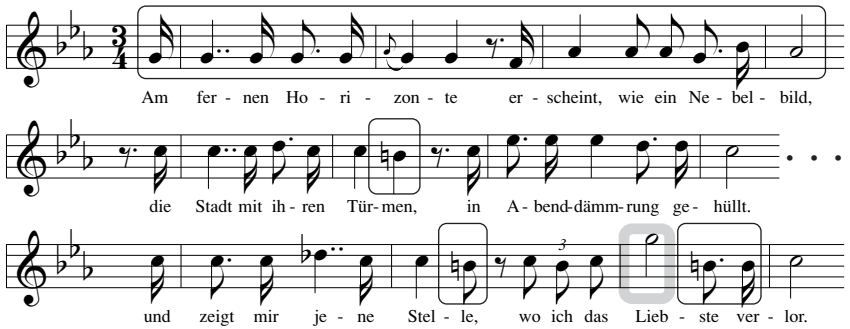
The classical literature for male voice shows many examples of how register is critical to the determination of key. In the following, it should be kept in mind that the second register of male voices spans only a fourth, as opposed to the female's second register, which extends one half-step short of a full octave. The distinction between the male first and second registers is furthermore not as audible as that between the female first and second registers (see Chapter 6).

Thus, Classical treatment of the male voice often seeks to compose the opening thematic material in a dialogue, using the two contrasting voices of the first and second registers. The first register may be used more extensively than with the female voice. At the same time, the subtler quality of the male's first-to-second register shift lends all the more prominence to his shift into the third register.

Since the range of the male second register is so narrow, any change in key will nearly always vitiate the composer's intention in the voicing of the registers.

Schubert's two late song works, *Die Winterreise* and the posthumously published collection *Schwanengesang,* are full of this geometrical approach to the poems' original vowel geometry, and the proper superimposition upon it of the tenor and baritone voices with regard to distinct registers.

Figure 10.15 Schubert, "Die Stadt," from *Schwanengesang,* Letztes Werk, No. 11



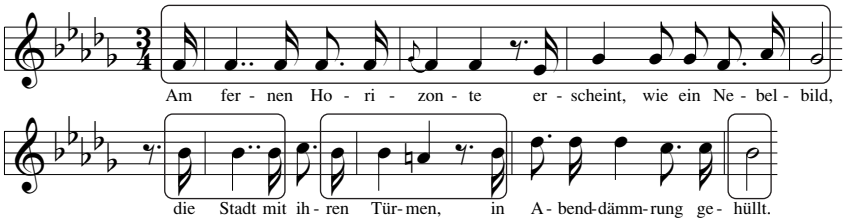
In "Die Stadt," the poet Heinrich Heine confronts the composer with several clear parameters. He creates the mood of the long poetic line by concentrating most of his strophes upon the grey, impersonal surroundings of the poem's subject. In the final line, the cause of the greyness is suddenly and ironically revealed, in the only personal reference, "wo ich das Liebste verlor" ("where I lost my beloved").

Schubert read the underlying vowel melody of the poem as a very slowly rising progression /ɔ/–/ɑ/–/i/, across the three-stanza poem. For his opening theme for the first stanza, to which he returns in the opening of the third stanza, Schubert writes repeated G's in order to set up an *appogiatura* accent on the /ɔ/ sound of "Horizonte." (He also returns to this at the opening of the third stanza, on the /ɔ/ of "Sonne" and "noch"). In the first stanza, Schubert's line rises to E-flat at the /ɑ/ of "*A*benddämmrung." After the development section, in the third stanza Schubert transforms this upward pattern to the high G (a total rise of an octave from the opening repeated G) on the /i/ of "Liebste."

Having noted this sort of inexorable ironical slowly rising pattern built into the poem, Schubert had to choose his voice type. Perhaps he considered that Heine's character, who is obviously a male, was too much of a Romantic to be sung by the calmer voice of the baritone or bass. Schubert chose to set it for tenor. Once this choice was made, he was left with only a very small range of keys to treat the singularity of "Liebste" at song's conclusion.

He made a determination, given the slowly rising nature of the poem, to create the opening theme of the /ɔ/ on a repeated tenor first-register note, to then rise to the top of the second register on /ɑ/, and finally only at "Liebste" to introduce the singularity of the tenor third register. The mood of the poem indicated treatment in the minor mode. Schubert created a C minor triad, resolving to C only at the end of each stanza. He hovers instead on the opening /ɔ/ of "Horizonte" on the fifth, G, rises to /ɑ/ of "Abenddämmrung" on the minor third, E-flat, and reserves the third register for the shocking "Liebste" at the end.

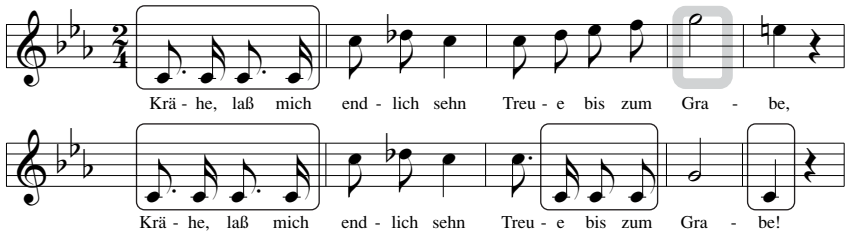
Figure 10.16 Schubert, "Die Stadt," from *Schwanengesang,* Transposed Down One Whole Step



Very few keys other than C minor would allow the composer to set the first line of the opening couplet in the tenor first register, and the second line of the opening couplet in the tenor's second register, while reserving the dramatic third register for the final "Liebste" on the high fifth. Transposed lower, to B-flat minor, for example, the distinction between the tenor's first and second registers in the opening stanza is nearly obliterated. The third-register singularity at "Liebste" is also obliterated, since the G becomes an F-natural (not shown) at the top of the second register.

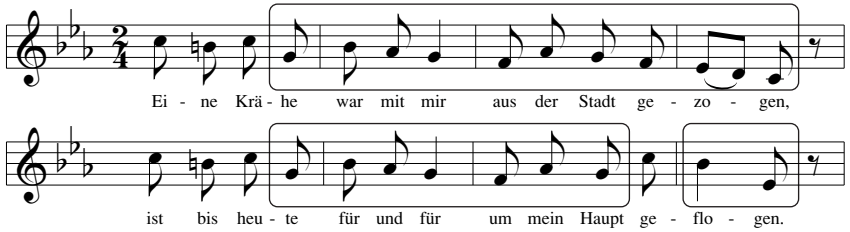
Transposing the song up to D minor (not shown) technically leaves the registration the same as in C minor. But it removes the overall sense of darkness in the opening strophes by placing the song too high in the tenor's first and second registers. The first two stanzas would sound strained, and the high note at the end, which becomes a high A (a note very rarely used in *Lieder*), would be too bright for poem's ironic somberness.

Figure 10.17 Schubert, "Die Krähe" from *Die Winterreise,* Op. 89, No. 15



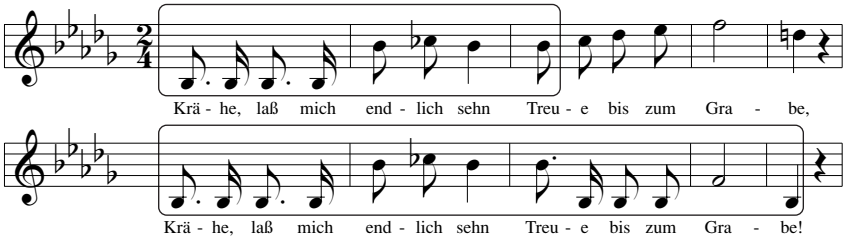
"Die Krähe," also in C minor, receives similar treatment. It was composed working backwards, so to speak, from the poem's ironic singularity at the end, "Treue bis zum Grabe" ("faithfulness until the grave"). The 24-song cycle as a whole is distinctly for tenor, despite the fact that it is often said to be more appropriate for baritone (see Figure 6.14). Schubert decided to treat the song's turning-point as a compact set of statements crossing all three tenor registers.

Figure 10.18 Schubert, "Die Krähe" from *Die Winterreise,* Op. 89, No. 15



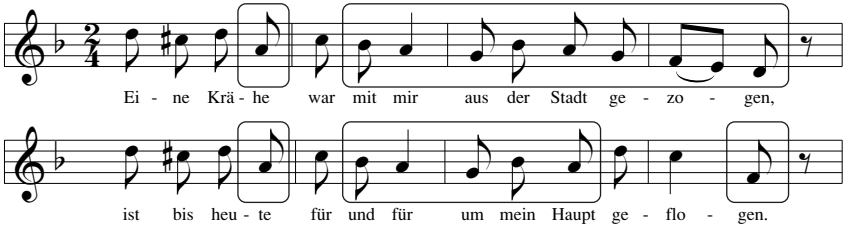
The opening of the song echoes this deliberate straddling of registers. The *unheimlich* or eerie sense of the half-frozen traveler imagining himself haunted by the crow which follows him, is underscored by Schubert's having the tenor sing precisely on the edge of his shift from the first to second register. (In this case, the B-naturals are sung as second-register passing notes.)

Figure 10.19 Schubert, "Die Krähe" from *Die Winterreise,* Op. 89, No. 15, Transposed to B-flat Minor



As with "Die Stadt," "Die Krähe," if transposed down, for example, to B-flat minor, would be rendered meaningless from the standpoint of registration. In the opening, and in the poem's turning-point, the second-register passages would instead fall into the first register. There would be no third-register notes.

Figure 10.20 Schubert, "Die Krähe" from *Die Winterreise,* Op. 89, No. 15, Transposed to D Minor



The key of this song is even more narrowly determined than in "Die Stadt," since any upward transposition will vitiate its opening registration. Performed one whole step higher in D minor, for example, the tenor no longer hovers on the edge of his first-to-second register shift, but begins firmly planted in the second register, and continues there longer than in Schubert's concept.

Pedal Points

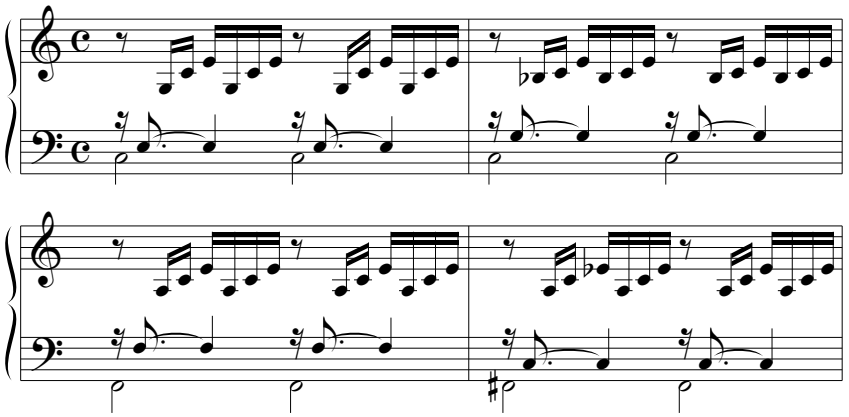
There is a third degree of necessity given by the human voice: the basic Keplerian intervals of the scale, which give the intervals at which changes of key occur.

In both Classical poetry, and Classical song based upon Classical poetry, the absolute pitch value of the vowels and consonant-inflected vowels *as a system,* develops and changes, as thematic development takes place. That is, while the relative values of the vowels to each other retain the basic harmonic relationship /u/–/o/–/a/–/e/–/i/ from low to high, the absolute pitch of for example the /u/ of Guido's "ut," *changes.* This in turn changes the absolute pitch of all the vowels in the system.

This is illustrated by the classical practice of placing a sequence of tones in the bass part, as pedal point, and using those tones as the reference tones for the choices of absolute tone-values corresponding to the selected intervals among the indicated vowels and consonant-inflected vowels.

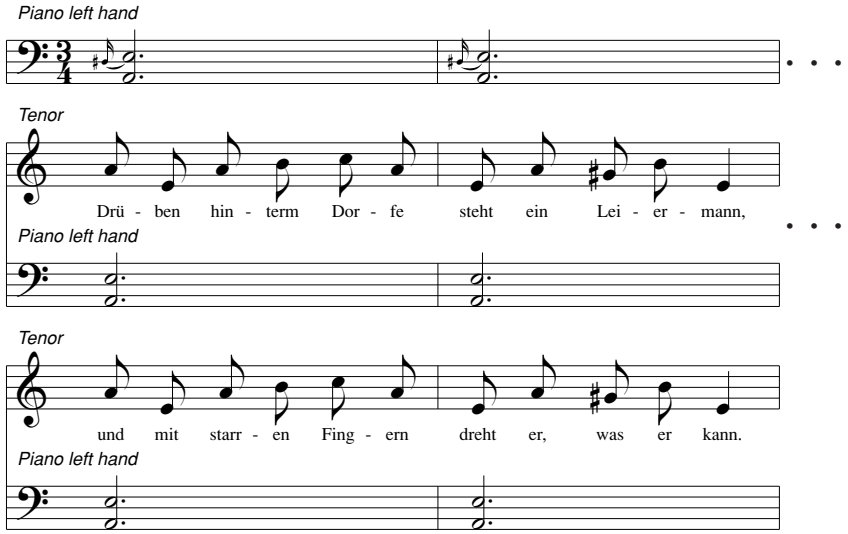
The prosody of speech, which determines certain pitch intervals, must interact, in both Classical reciting of poetry, and classical song, with such a harmonically ordered sequence of tones in the actual or implicit pedal point. These pedal-point sequences are either directly the Kepler intervals, or consistent derivatives of those intervals, such as the well-tempered octave-scale itself: octave, fifth, fourth, major third, minor third.

Figure 10.21 J.S. Bach, Prelude I from *The Well-Tempered Clavier,* BWV 846



Here in the development passage of Bach's C major prelude from Book I of the *Well-Tempered Clavier,* the lowest sustained half-notes constitute the pedal point, which falls from C in the first line of the example, to F and F-sharp in the second line. The prelude is based on the most straightforward kind of pedal-point motion.

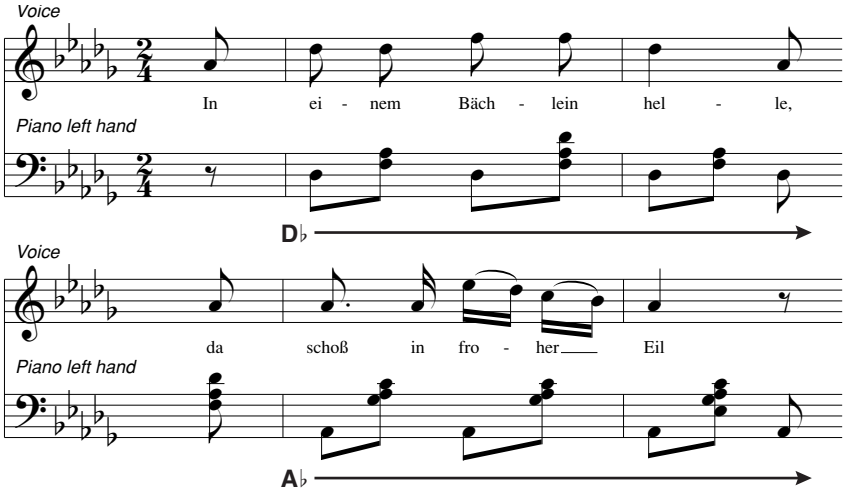
Figure 10.22 Schubert, "Der Leiermann" from *Die Winterreise,* Op. 89, No. 24



Applying pedal-point action to the composition of a song, for example, one might first introduce the reference tone as a reiterated pedal-point in the lower register of the bass line, as might be done by accompanying the singing with the pedal point of an organ or a bass viol. In that case, we might simply follow the implicit musical score of the poem as such. The principle is a sound one as far as we have gone, but the result might appear rather dull after a line or two of the poem. In the case of the example above, from the final song in Schubert's cycle *Die Winterreise,* the composer intentionally strove for such dull monotony, never altering the primary pedal point throughout the piece.

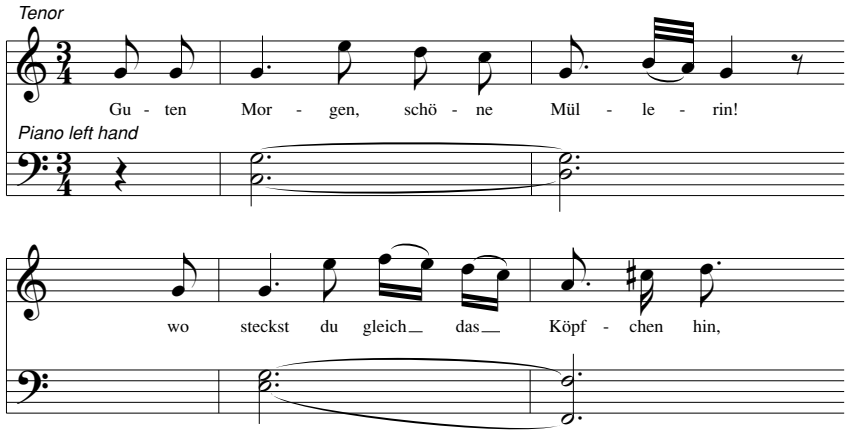
Referring to the Figure 10.2 vowel chart, one can see that the crucial features of the vocalization are rigorously determined. First is the implied rhythmic shift between the first and second sung measures, with the interval of a descending fourth (in this case, a diminished fourth) between the /ɔ/ in "Dorfe" and the /a/ in "Leier"—a simple inversion of the vocalization. Then there is the descending fifth between the /ɛ/ and the /a/ on the final two syllables of each of the two lines of the couplet. The action from /e/ in "steht" to /a/ in "Leier*mann*" on the same pitch, E, is a vocalized drop of a major seventh, an interval which has already been integrated in inverted form into the very first two measures of the bass "drone," with the grace note D-sharp moving to E.

Figure 10.23 Schubert, "Die Forelle," Op. 32



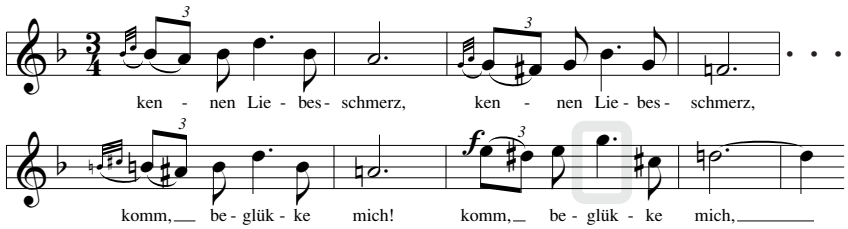
One might then proceed to change the pedal-point tone. First, one could make this change in moving from the first to second line of an opening couplet of the poem. Then one could shift the pedal-point, for example, upward, a major third, a fourth, or a fifth, or either an ascending or inverted scale-progression. In the very elementary case here, the pedal point moves from D-flat in the first line, down a fourth to A-flat. The vocal line first directly follows suit, with the /a/ in "einem" moving down a fourth to the /ɔ/ in "schoß." The /a/ is then re-established at a new pitch for the second pedal point, with the /a/ in "Eil."

Figure 10.24 Schubert, "Morgengruß" from *Die Schöne Müllerin*, Op. 25, No. 8



Next, such pedal-point changes can be introduced during the course of the first line, or even several times during the course of that line. In the opening couplet of "Morgengruß," the ascending vowel harmonies of /ɔ/ in "Morgen," /ʏ/ in "Müllerin," and /ɛ/ in "steckst," all sung on the same pitch, G, are accompanied by a rising pedal point C–D–E. The ascent is broken by the /œ/ in "Köpfchen." At this point, the pedal-point line continues to rise, to F (and to G in the following measure), but is shifted into the lower octave.

Figure 10.25 Schubert, "Ständchen" from *Schwanengesang,* D. 957, No. 4



More broadly, the vowel-harmony relation to pedal-point action is essential for establishing the unity of the entire vocal composition. Here, Schubert goes to the heart of Ludwig Rellstab's poem by setting the same climactic phrase twice, each with a different pedal point, but maintaining Rellstab's basic vocalization. Rellstab's poem is in five strophes, of which, Schubert understands the fifth, with its impassioned imperative "Komm, beglücke mich!" as a singularity. Schubert sets the poem in two great strophes, and creates a stretto of Rellstab's fifth strophe.

Schubert composes by going directly to the final imperative of the last strophe (the second line of the example). He takes account of the upward motion of "Komm, beglücke mich!" The inherent vowel melody of this poetic line rises, from /o/ to the umlauted /ʏ/ whose second formant is above that of /o/. (See left side of Figure 10.2 for umlauted vowel series.)

Schubert sets the phrase with a D pedal point first (the song is in D minor/major; here, in D major). Within that framework, he sets the /o/ of "Komm" on the sixth, B, and then rises a minor third to the /ʏ/ of "beglücke," to the tonic D.

Then, Schubert chooses to repeat the phrase, rising briefly to another pedal point, A (the fifth of D). Even with a change of pedal point, however, he sets the poetic phrase with exactly the same geometry, indicating the significance of the vowel melody. The space from the /o/ of "Komm" to the /ʏ/ of "beglücke" is again a minor third, from E to the high G in the third register.

From this final stanza, follows the setting of the first four stanzas. The first line of the example above is the analogous passage in the preceding, second great strophe.

Verbal Action

From the material presented in this chapter so far, it can now be seen that we have three musical sequences to consider. The first is defined implicitly by the application of the human vowel transform-functions to sequences of vowels and consonant-inflected vowels represented by the poem. The second is the register-shifts inherent in whichever voice species (soprano, mezzosoprano, etc.) is chosen by the composer. The third is the sequence of keys, of tones as a progression, in this illustrative case, in the pedal point.

This leads us to the broader point we have been working to situate:

By combining these in such a fashion, we have done something which ought to be recognized immediately by the student of synthetic geometry. We have defined the process of composition as *triply-connected*. The progressions defined by the natural transform-sequences of the consonant-inflected vowel domain is one action. Consideration of voice registration is another. Yet, the reference-tone for the first sequence is shifting, according to a third, pedal-point sequence, which is also strictly canonical. In elementary synthetic geometry, and the corresponding physics, this is a *triply-connected manifold*.

That is the primitive root of canonical polyphony.

One further aspect of poetry itself, however, must be considered, which confronts the composer of music upon reading a poem, before the composition of a musical setting for that poem may be directly addressed.

To the triply-connected musical geometry found in nature described above, must be added a feature of spoken poetry which involves human invention. This is construction of human grammar, based since ancient times upon *verbal action,* reflecting the power, of man alone among all the animals, to *change* the natural universe.

The basis of all speech and poetry is the use of the harmonic sounds of language to *represent change*. The Classical Sanskrit author of the earliest known books on grammar and philology, Panini, called this the "verbal paradigm." He emphasized that the very function of language is to "transform" the world around man into a mode recognizable by human perception, that is, organized sound. Thus, he described the creation of transitive verbs as the generating basis of all language. Since nouns do not transform the physical universe, he wrote, "nouns do not exist" independently from the verbs from which they are created.[7]

Thus the benchmark for inquiry into the fundamentals of poetry, music, physical science, and language generally, is Classical Sanskrit, the oldest surviving, rational, and intrinsically poetic and musical language. All languages which are not subsumed by the crucial principles so represented, must be classed as degenerated forms of language. The most elementary principle of language, poetry, music, and scientific thought generally, is the principle, that only the transitive verb can express a true perception of reality.

This principle is familiar today from the story of Moses in the Old Testament. Moses's God was not a beast, or even a man, who could be pictured. The God of Genesis is a God of action, that One which is the principle of generation which generates the entire universe, known not by an idol, but by His acts:

I *am,* that *am*.

Man is capable of perceiving only change, in not less than some finite interval of physical space-time. Either the perception of such change, or the absence of perceived change, is the only perception possible. Instantaneous objects, self-evident particles, do not exist as perceptions. Statements which simply single out an object, and say, "That is . . . ," are not true language.

"Change" were better described as some "transformation" in physical space-time. Speech can express such change, only by employment of a transitive verb. Nouns do not exist. Individual tones, in music, do not exist; individual chords, in music, do not exist. Only development, change, transformation, exist.

Each transitive verb then has a meaning as a specific form of perceivable transformation, in physical space-time. Statements of perception, constructed on the basis of this specific meaning for a transitive verb, have the function of delimiting the action's occurrence. Any such statement, based on attaching qualifications, of delimitation in physical space-time, to the transitive verb, is indivisible. If we attempt to cut the

[7] Daksiputra Panini, *Ashtadhyayi*, a Sanskrit grammar dating from the sixth century B.C. Modern edition: *The Eight Chapters,* London: Orientalia Books.

statement into parts, as if to assign independently objective meaning to each among the terms composing it, lunacy results. Such an indivisible statement, is a quantum of action, in the strictest usage of the term, "quantum."

All speech is a statement of a verbal transformation in respect to a domain of direct and indirect action on direct and indirect objects. This verbal action, corresponding to a physical transformation in reality, may be primarily actual (indicative), hypothetical (subjunctive), or imperative (transition from the subjunctive to the indicative). The verbal transformation may account closure (reflexiveness) or may describe lack of closure (non-reflexive).

Verbal action in language is what makes it literate, because the child's earliest experience of creativity is to learn to *do* something. The child first distinguishes himself from the beasts, or from the environment, by human *acts*: speaking, walking, learning to tie shoes, to write. At this point, a light goes on in the child's head, as it were, a light which is connected with a fundamental emotion of joy peculiar to the human mind: the sense of accomplishment of creative action.

Gottfried Leibniz, in his 1690 essay "On the Cultivation of the German Language," founded an international language project later expanded by Wilhelm Humboldt and others. Leibniz emphasized that "the richest and most useful language is the one which can succeed with verbal translation, and is able to follow the original step by step." Leibniz pointed out that the German language originally had the best verbs for actions of mining, farming, science, and industrialization, because the Germans were an "industrious" people, and declared that upon this, he wished to build his language.

Leibniz called for the Germans to improve the quality, quantity, and use of verbs in upgrading the German language, which had deteriorated greatly during the "little dark age" of the first half of the seventeenth century. Leibniz's friend, Kapellmeister Augustus Stefania of the court of Hanover, sent Georg Friedrich Handel into England in 1720, for the purpose of elevating the English language through music. In 1712, Leibniz's Irish collaborator Dean Jonathan Swift also published an almost identical "Proposal for Correcting, Improving and Ascertaining, the English Tongue." It was Swift who later, in *Gulliver's Travels,* castigated the Royal Academy ("Grand Academy of Lagado") for "doing away with verbs altogether."

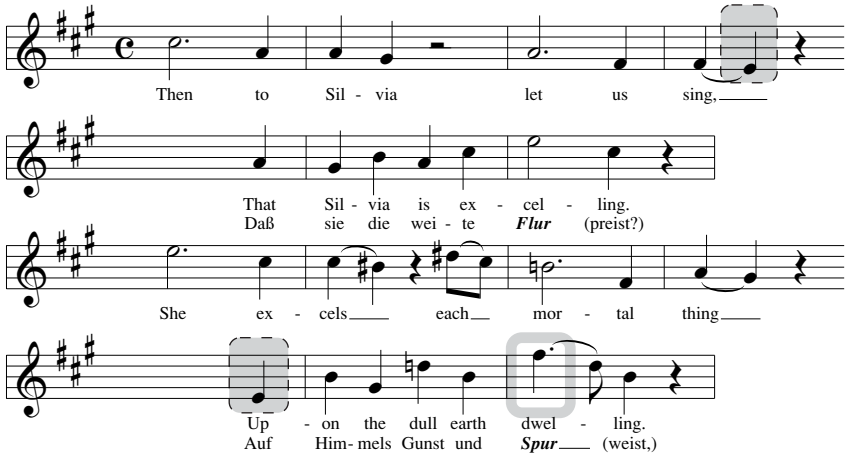
Leibniz's intervention on behalf of the principle of verbal action became the basis of the German Weimar Classical renaissance of the second half of the eighteenth century. Goethe assumed that it was general knowledge, that accentuation upon verbs, and not upon nouns, was the standard practice in Classical German. In his small tract "Regeln für Schauspieler" ("Rules for Actors"), he even complained in passing that this practice had come to be applied with excessive uniformity: "Thus it is also very good in the beginning for all syllables to be enunciated long, regardless whether they be long or short, and to speak them in as deep a tone as the voice permits, because *one otherwise customarily, in rapid speaking, lays expressive emphasis* only *upon the verbs"* (emphasis added).

Musical settings which acknowledge the principle of verbal action will always be the superior setting of any poem. This is yet another reason why the singing of songs in translation is a very poor practice. Since the great composers of the Classical period wrote music with emphasis on verbal action, the sorts of changes in syntax which occur when switching to a translation almost inevitably result in a shift of the verbal action away from the musical emphasis assigned to it by the composer.

Examine Schubert's overall unit-conception of Shakespeare's "To Silvia," beyond the prosody of the opening lines. Schubert has composed all three of his verses with special reference to Shakespeare's final verbal command: "Then to Silvia, let us *sing*!" While his opening theme is be based upon Shakespeare's vowel melody, the final imperative "Let us sing!" is the underlying concept of the song as a whole, the transformation toward which the theme is meant to finally develop.

This is made clear by Schubert's setting the imperative "sing" upon the register shift from F-sharp in the second register to E in the first register. This is then mirrored in the double-verbal inversion of the register shift at the words "that Silvia is *excelling* . . . upon the dull earth *dwelling*," which also rises from E at the top of the second register to F-sharp in the third register.

Figure 10.26 Schubert, "To Silvia," D. 891, Op. 106, No. 4



The German-language version of the third stanza, "Darum Silvia, tön, o Sang!" is just as effective as in the English; but problems begin with the rendering of "der holden Silvia *Ehren*." Here the accented high E falls on a noun, instead of the required verb "excelling" in the original English.

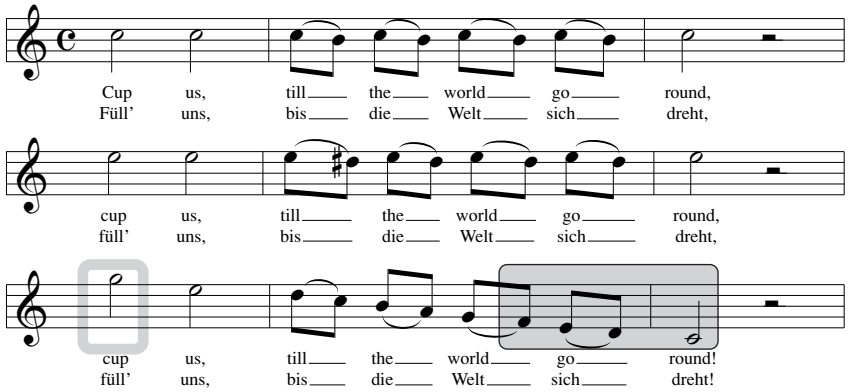
The German rendering is even less satisfactory elsewhere. In the first stanza, the line "That all our swains *commend* her" becomes "Das sie die weite *Flur* preist," again, a clumsy switch of Schubert's accent on the penultimate syllable, from the original English verb "commend," to the German noun "Flur." The differences between English and German syntax here make it indisputable that Schubert composed the text for the original English: Unlike German verbs, which frequently find their way to the end of a clause, English verbs rarely fall at the end. In the German version of "An Silvia," the verbal action at the end of the phrase is reduced to a comical afterthought: "*Flur* (preist)."

Similarly, the register shift to the high F-sharp on "The Heav'ns such grace did *lend* her" becomes reduced in the German translation to "Auf Himmels Gunst und *Spur* weist," while "that *adorèd* she might be" on the E–F-sharp shift is weakened to "daß ihr *alles* untertan."

"To Silvia" is the third and most complex in a set of three Shakespeare poems composed by Schubert during July 1826. It is fruitful to study the entire set from the standpoint we have adopted here. For, from any other standpoint, the first two songs, "Come, Thou Monarch of the Vine" from *Anthony and Cleopatra,* (D. 888), and "Hark, Hark! The Lark" from *Cymbeline,* (D. 889), are troublesome, since they do not stand as complete songs, as Schubert left them. Schubert set both songs as one-stanza fragments, following Shakespeare's original, which likewise have only one stanza. Only after Schubert's death was a second German stanza added to D. 888, and a second and third German stanza added to D. 889, in order to stretch the fragments into songs which might purport to stand separately.

Why would Schubert have set both as fragments, and both in C major? If, as all the standard editions of Schubert's works would lead one to conclude, he first set them in German, then there is no satisfactory explanation. Since Schubert wrote few one-stanza songs, it is likely that he meant these not as stand-alone pieces, but as a set of studies of English vocalization. To single out the variables of English prosody for study, he imposed upon the poems the key of C major and its familiar soprano and tenor F-sharp register shift (D. 888 is sung by a boy soprano, and D. 889 by a man).

Figure 10.27 Schubert, "Come Thou Monarch of the Vine," D. 888



Similar to "Silvia," Shakespeare's final injunction "Cup us!" gives Schubert developmental pivot of the sketch. Shakespeare repeats this line twice at the end of the boy's song, whereas Schubert chose to repeat it three times, the third time rising into the soprano third register on the imperative "cup" and then resolving down into the boy soprano's first register at the final verb "go round."

When Bauernfeld's German translation is examined according to the same criteria, it becomes evident that the German does not fit Schubert's setting. It is true that Bauernfeld matched the verbal action note-for-note, translating Shakespeare's last line as "*Füll'* uns, bis die Welt sich *dreht*." However, the vowel sounds of Bauernfeld's rendering are so harshly repetitive, with /i/, /ɪ/ and /e/, that Schubert would never have varied the figure three times in succession, had he been working from the German.

Only after having made the two shorter studies, did Schubert proceed to an English poem with a three verses for the full song, "To Silvia." Using what he had learned about the interaction between English prosody and tenor voice registers, he selected A major as the key demanded by this more complex poem. (See also Figure 6.31.)

Schubert was keen on becoming better known in England, and made dozens more settings of English poets' songs. Not all of these, however, were composed from the English. The famous "Ave Maria," for example, was originally composed in English by Sir Walter Scott, as Ellen's Third Song in Scott's *The Lady of the Lake*. Schubert, Donizetti, and many other bel canto composers, however, had few qualms about fitting the output of the Romantic Scott to their own purposes, and chose to work from German and Italian translations. Donizetti based several Italian operas on Scott plays, including his most famous opera, *Lucia di Lammermoor*.

Schubert's setting of "Ave Maria," even though published in a bilingual version by Schubert himself, clearly proceeds from the meter of the German translation. Compare the English poem and the German. The English original concentrates on a seven- to eight-syllable trochaic meter – ˘ :

Listen to a maiden's prayer . . .
Maiden! Hear a maiden's prayer.

while the German repeats a nine-syllable iambic ˘ – :

Er*hö*re *ei*ner *Jung*frau *Fle*hen . . .
O *Jung*frau, *sieh* der *Jung*frau *Sor*gen.

In his setting, Schubert repeatedly emphasizes the opening unstressed syllable in the German, the very syllable which does not exist in the English original.

The Lost Language of Poetry

The reintroduction of the lost Classical principle of verbal action in poetic composition highlights one reason for the profound crisis in musical composition today: *The art of recitation of poetry has nearly died out* in the twentieth century.

If the classical principles of poetic composition are no longer generally understood today, how can we instruct the aspiring composer in the setting of poetry to music, such that he or she does not fall victim to the popular prejudices born of the twentieth century's cultural wasteland? While meter is significant, the worst crime of modern recitation of poetry, whether German, English, or Italian, is its focus upon the sing-song rendering of the bare meter of the poem.[8] This poem, one of nine contained in Johann Wolfgang Goethe's 1795 novel *Wilhelm Meisters Lehrjahre,* might be recited by the careless student today:

Nur *wér* die *Séhn*sucht *kénnt,*	Only he who knows longing,
Weiß, *wás* ich *léi*de!	Knows what I suffer!
Al*léin* und *ábge*t*rénnt*	Alone and cut off
Von *ál*ler *Fréu*de . . .	From all joy . . .

Classical intoning of poetry as prosody, however, proceeds from scanning the musical values of the vowel melodies of *all* syllables of a poem, comprehending how the value of these is ordered and transformed by the higher conceptual process of verbal action, and then imposing that ordering upon the underlying meter. That is, by studying the natural melody of the poem's vowels, and imposing upon this the standards of emphasis on verbal action that we find in the Weimar Classical era, we can begin to reconstruct the cultural conditions of speech which equipped the great German composers of *Lieder*.

The most fruitful means of pursuing such a study is to compare how different German composers treated the same poem. The nine poems in *Wilhelm Meisters Lehrjahre* were set by dozens of composers, including Beethoven, Schubert, Schumann, Liszt, Tchaikovsky, Wolf, Zelter, Franz, Löwe, Romberg, Himmel, and Klein.

Assume, first, a reading of the poem "Sehnsucht" which eliminates modern sing-song interpretation, and instead puts weight on the verbal action. Let us then see if the composers read the poem in this way and composed it so.

Nur wer die Sehnsucht kennt,	Only he who knows longing,
Weiß, was ich leide!	Knows what I suffer!
Allein und abgetrennt	Alone and cut off
Von aller Freude,	From all joy
Seh ich ans Firmament	Look I to the firmament
Nach jener Seite.	Toward yonder side.
Ach! der mich liebt und kennt	Oh! he who loves and knows me
Ist in der Weite.	Is far away.
Es schwindelt mir, es brennt	I swoon, burning are
Mein Eingeweide.	My entrails.
Nur wer die Sehnsucht kennt	Only he who knows longing,
Weiß, was ich leide!	Knows what I suffer!

The poem works on the level of the transformation from one to the other of two levels of verbal action, "kennt" and "weiß."

In modern English, "kennt" and "weiß" are both translated as "knows." "Kennen" describes one level of knowing, to know things in the physical world, to be acquainted with, as in "I know Mr. Jones," or "I know his telephone number." "Wissen," however, has no synonymous expression in English; it is neither the German for "to understand" (verstehen), nor "to reason" (vernünftig denken). "Wissen" means to comprehend with the mind, independently of the physical senses, as in the statement, "Leonardo knew the importance of geometry."

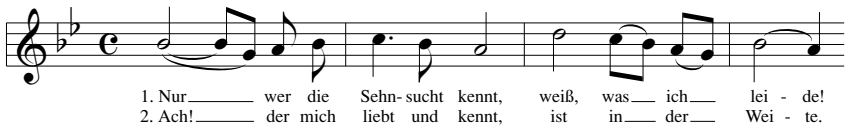
"Kennen" derives from the family of Indo-European verbs based on the root "gno-" as in "gnosis," "knowledge," and "to ken" (as in "things beyond my ken"). "Wissen" derives from another family, the Sanskrit "veda," giving rise to the Greek "idea," "wise," "wisdom," and "to wit." In the English language, it is echoed by the archaic verb "to wit," or "to wist," meaning "to make known," "to show the way," or "to guide." In Shakespeare's language (*Measure for Measure*), "Please you wit: the epitaph is for Marina writ."

[8] For reasons which should be clear from the Foreword and Preface, we will not even consider here the modern hard-core irrationalist standpoint, which might argue, for example, that the stress and intonation of individual syllables could be assigned by a computer-generated random number sequence.

The tension created by Goethe between these two verbs focuses the mind on a transformation, from the lower level of sense-certainty "knowing," to the higher level of *intelligible* "knowing," a transformation which described as that from "simple hypothesis" to "higher hypothesis."[9] Goethe made this "kennt→weiß" transformation unmistakeably pivotal by repeating it at the end of the song.

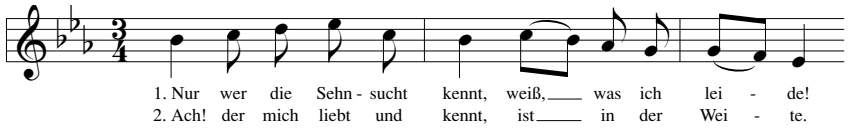
In every setting of this poem, four by Beethoven and no less than seven by Schubert, the musical stress is entirely upon the two verbs and their transformation, and not on strict metrical sing-song.

Figure 10.28 Beethoven, "Sehnsucht," Variation I, WoO 134



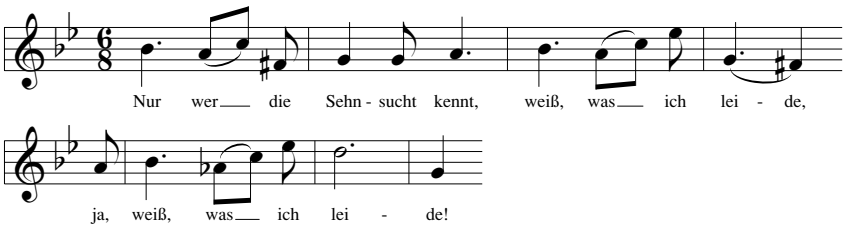
In Beethoven's first setting, "weiß," which went unaccented in the modern version, is lengthened to a half-note.

Figure 10.29 Beethoven, "Sehnsucht," Variation III, WoO 134



In Beethoven's third setting, "weiß" is the first syllable which is accented by being sustained over more than one note.

Figure 10.30 Beethoven, "Sehnsucht," Variation IV, WoO 134

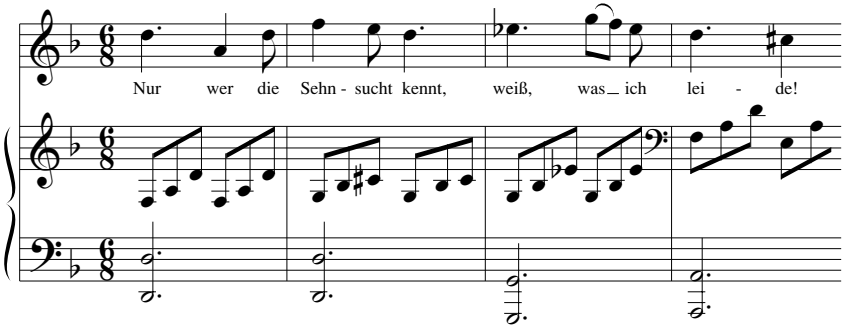


This stress on "weiß" continues through the final variation, where in the final line Beethoven creates poetic closure of all four variations by repeating "weiß, ja, weiß, was ich Leide!"

Schubert spent a good deal of time on this little poem, and several of his settings are obvious efforts to expand on Beethoven's work. Schubert's five known solo settings, in chronological order are: D. 310a, D. 310b (1815); D. 359 (1816); D. 481 (1816); and Op. 62, No. 4 (1826). He was therefore preoccupied with this song virtually throughout his entire mature creative life. In addition, in 1826 Schubert set the poem as suggested by Goethe, as a duet for soprano and tenor, and as a piece for male chorus.

[9] The "higher hypothesis" is not synonymous with Immanuel Kant's flawed conception of *a priori* knowledge. See Lyndon H. LaRouche, Jr., "In Defense of Common Sense," in: *The Science of Christian Economy and Other Prison Writings,* Washington, D.C.: Schiller Institute, 1991.

FIGURE 10.31 Schubert, "Lied der Mignon," D. 359



Both "Lied der Mignon" D. 359, and Op. 62, No. 4 in particular seem to be intended as a fifth and a sixth member of Beethoven's set of variations. Schubert follows patterns similar to those initiated by Beethoven, of stressing "kennt" and then stressing "weiß" still further, through his use of musical singularities. In D. 359, note the prominent "Neapolitan" dissonance on the first piano figure under the initial "weiß." At the end of D. 359, Schubert repeats the opening line, with its "kennt . . . weiß," no less than three times in a row.

Additional Comments on German Umlauted Vowels

The umlauted German vowels ü and ö (each of which has several gradations of sound corresponding to the closed and open vowels /u/, /ʊ/, and /o/, /ɔ/) provide an additional degree of freedom to the German sound system unavailable in Italian. We have called these the umlauted vowel series /y/, /ʏ/, and /ɸ/, /œ/.

The use of these sounds derives in particular as modulations representing grammatical transformations of tense (e.g., the preterite of "ziehen" changes from "zog" in the past, to "zöge" in the subjunctive), or number (e.g., the plural of "der Ton" is "die Töne").

They are formed as a transformation of the primary vowel spectrum, by inverting the degree of lip-rounding present in forming the vowels. Thus, while the spectrum from /u/ to /i/ shifts continuously to lesser and lesser rounding of the lips, the umlauted series inverts this, and gives the greatest lip-rounding to the /i/, with successively decreasing lip-rounding on to the /u/.

The degree of lip-rounding affects the shape of the vocal tract and, in particular, the placement of the second formant F_2 (see Figure 9.13).

In modulating from the /u/, /ʊ/ and /o/, /ɔ/ to the umlauted ü's and ö's, the German speaker shifts from the primary /u/, /ʊ/ and /o/, /ɔ/ positions to those of their vowel complements /i/, /ɪ/ and /e/, /ɛ/, and inverts the primary lip-rounding of these vowels to produce /y/, /ʏ/ and /ɸ/, /œ/. They are, therefore, versions of the bright vowels, but with inverted, dark-vowel lip positions, which lower the frequency of their second formants, upon which our vocalization charts of the relative vowel qualities are based.

Thus, the umlauted vowel series does not lie simply in the primary spectrum of the Italian vowels, but is doubly-connected to this spectrum. As "darkened" versions of the bright vowels, the umlauted series is pitched by poets and musicians nearer to the /e/ than to the dark /u/ and /o/.

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CHAPTER *11*

Artistic Beauty: Schiller versus Goethe

The reader is now situated to approach the composition of music from poetry.

The composition of Classical song, of the highly-developed complex contrapuntal level attained by the early nineteenth-century German *Lied,* was a new science, made possible by scientific studies of language and music carried out by a few individuals in Germany and Austria, led by the republican poet and dramatist Friedrich Schiller (1759–1805).

Schiller, in addition to creating works of literary art, gave widely-attended lectures and wrote studies on poetry, aesthetics, and the function of the arts. His poems, and his writings on poetry, which were translated into many languages, were central to creating the high general level of understanding of poetry in the population of Germany and Europe at the end of the eighteenth century.

Schiller outlined the scientific basis for the composition of music from poetry. He was the first to create a rigorous basis for a new musical form, what we today call the *Lied.* Certainly, German songs, generically called *Lieder,* date back before the Minnesingers of the eleventh century. These were no more than simple tunes or hymns, however, when compared with the complexity of modern *Lieder* dating from the 1780s when Schiller began his work. Schiller's collaboration with scholars across Germany, including Mozart's circles in Austria, helped produce a new art form, beginning with Mozart's songs of 1785 (see Figures 11.1–11.5 below).[1]

Schiller demonstrated that there is a *fourth, quadruply-connected requirement for composition of music, per se,* above and beyond the natural attributes of language and poetry, if music is to rise to the level of artistic beauty or fine art. In order to become *human* art, music must transcend the natural beauty of the bel canto singing voice. True musical composition is the human creative transformation of, improvement upon, a given poem, theme, or other idea.

The student is cautioned that the great Classical composers *never ceased* rigorous study of the scientific principles of natural beauty. As Johnannes Brahms said repeatedly, composition occurs simultaneously on two levels (see below, under the heading "Schubert: 'More from the Whole!' "). The composer starts with given basic material, be it a poem, a scale, or a short theme. He must fully master the given natural vocalization of the poem, the Keplerian structure of the theme, until these can

[1] Frederick Ungar, *Friederich Schiller,* New York: Frederick Ungar Publishing Co., 1959, pp. 34–5; Volkmar Braunbehrens, *Mozart in Vienna,* New York: Grove-Weidenfeld, 1989.

Schiller gained wide fame in January 1782 at age 22, with his first performance of *Die Räuber* at the National Theater at Mannheim. Schiller's first book of poems, *Anthologie auf 1782,* was also widely read. He gave public lectures at the German Society in Mannheim on the science of art throughout 1783 and 1784, including his famous lecture "Theater Considered as a Moral Institution" (1784). His second play, *Die Verschwörung des Fiesco zu Genua,* appeared in January 1784, and his third, *Kabale und Liebe,* later that same year.

There is more to the personal relationship between Schiller and Mozart than the standard report that the Dresden artist Dora Stock painted portraits of both Schiller and Mozart. Schiller and Mozart were exact contemporaries, Mozart being only three years older. Dora and Minna Stock, and Minna's husband Christian Körner, were Schiller's closest personal friends and benefactors, and Schiller moved to Dresden with them in September 1785. Mozart visited Dora Stock for his portrait in Dresden in 1789.

The ties go back still further. Throughout their youth, there was close connection between the South German Duchy of Württemberg, where Schiller lived, and both Mozart's birthplace of Salzburg, and Vienna. The Duchy of Württemberg was less than a two-day ride from Salzburg. The Duke of Württemberg and his court frequented Salzburg and Vienna, and Princess Elisabeth of Württemberg was married into the Austrian royal family. Princess Elisabeth tried several times during 1781–82 to hire Mozart as her personal piano teacher, first in Stuttgart and later in Vienna.

Schiller and Mozart were central figures in the founding of a German-language theater and opera, a project launched by the circles around Gotthold Lessing. As early as 1778, Leopold Mozart was encouraged to have his son write a German opera, a novelty at that time, for the German National Theater set up by Emperor Joseph in Vienna. The Viennese scholar Baron von Gemmingen, who worked with Mozart on the Vienna National Theater, was linked to Schiller. Gemmingen lived in Mannheim during the 1770s, where he helped found the Mannheim National Theater, and encouraged German national poetry and drama. From 1779 to 1781, Schiller commuted secretly from Stuttgart to Mannheim, because he could get his plays produced there, thereby circumventing the Duke of Württemberg, who forbade Schiller from doing so while he was in military service at Stuttgart.

Mozart spent six months in Mannheim during this period. He composed his two French songs, "Oiseaux si tous les ans" K. 284 and "Dans un bois solitaire" K. 295, in Mannheim in 1777 and 1778. In 1782, Schiller finally moved to the National Theater at Mannheim, and that same year Mozart put on his first German opera, *The Abduction from the Seraglio,* as a promotion of German theater, at the National Theater in Vienna.

Within months of the January 1782 premiere of Schiller's *Die Räuber,* Mozart's close friend and frequent librettist, the actor Emmanuel Schikaneder, produced *Die Räuber* in Salzburg, and then at the National Theater in Vienna. In 1784, he premiered Schiller's *Fiesco* in Vienna.

In 1783, Baron von Gemmingen moved to Vienna and founded the Masonic lodge which Mozart joined there.

Mozart continued to travel about Europe, visiting Mannheim and other centers of the German National Theater project, especially during the spring and summer of 1785 just before composing "Das Veilchen."

be reproduced almost in his sleep. Thus, the simpler the "raw material," the better. Only *after* this material is mastered, does the composer proceed to compose, as does a scientist who first assimilates a full knowledge of basic physics and mathematics, before creating a new invention.

Schiller emphasized that among the fine arts, especially music occurs as a *unit-transformation,* the challenge outlined in Plato's *Parmenides* dialogue: The *Many* in the composition must be transformed into the continuous substance of the indivisible *One*.

Plato points out (see Chapter 9) that in a true concept of the *One*, while many different ideas may be the subjects of thought, or even inspire a train of thought, the human mind *changes* these, shaping them into an entirely new concept which did not exist before. Such a true *unity* is not afterwards divisible into parts. Rather, it is the process of change, the generation of the *One*, nowhere named in any of the particulars, which is the identity of the final unit creation.

The *many* laws of natural beauty, such as vocalization and registration, must be mastered as God-given; the various features of a poem must be internalized. Yet, these must be completely transformed, lawfully, into *One,* when creating a musical work of art.

Schiller points out, for example, that if a composer sets the many words of a poem literally, as in a children's jingle, without change, this is not true music. Rather, Schiller writes, the composer must take the poem as a unit completely inside himself, and then create the song as a new unit-transformation of the poem, above and beyond the particular beauty, the specifics, of the words. The composer, that is, must set the "unheard sounds" of the poem, of which John Keats spoke, in reference to Schiller, in his 1820 "Ode on a Grecian Urn":

> Heard melodies are sweet
> But those unheard are sweeter.

Music which so transforms the many particulars of a poem, develops an increasing density of *singularities,* of internally-detailed ironies and counterpoint, compared to music which is relatively more enslaved to a duplication of the poem *per se* (see Chapter 9 for a definition of "singularity").

This accounts for the more "modern" or advanced sound of the *Lied* after 1785, for it is in fact a higher level of musical "technology." This ability to use music to change, to transform a poem, generates a type of music with more internal differentiation, with more densely compacted ideas, and more poetic ironies. An example of this increasing density of singularities is Figure 11.5 below.

A truly musical setting of a poem, Schiller wrote, concentrates always upon the the unspoken transfinite concept in the poet's mind, never upon his specific words. "The music may never paint words and meddle with petty trifles, but must only follow the spirit of the poetry as a whole."[2] Music alone among the fine arts "brings forth a definite *condition of mind,* without having need of a definite object," as opposed to sculpture or other plastic arts which do require objects, he observed. Schiller defined music to be "all those effects . . . which it is able to bring forth, without controlling the imaginative power through a definite object."[3]

"The overall effect of music (by which we mean music as fine, and not merely agreeable, art) consists in its ability to accompany the internal movements of the soul, and to make them sensuous by means of analogous external movements" in musical sound, Schiller wrote. "Since these internal movements (i.e., human nature) proceed according to strict laws of necessity, this necessity and determinacy also becomes transferred to the external movements through which they are expressed, and in this way it becomes clear to us how, through the mediation of this symbolic act, the common natural phenomena of sound and light can participate in the aesthetic dignity of human nature."[4]

Schiller wrote that for him, a "basic emotion of music"—a true transfinite—was in a sense a cause of poetry itself, an emotion which preceded his every poetic output. "In the beginning my perception is without a defined and clear object; this forms itself only later. A certain musical basic emotion precedes, and only after this does the poetic idea follow."[5]

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[2] Schiller to Körner, March 5, 1805, in: *Briefwechsel zwischen Schiller und Körner,* Munich: ed. Klaus L. Berghahn, 1973, pp. 342–43.

[3] Friedrich Schiller, "On Naïve and Sentimental Poetry," in: *Friedrich Schiller—Poet of Freedom,* Vol. III, Washington, D.C.: Schiller Institute, 1991, p. 392.

[4] Friderich Schiller, "On Matthisson's Poems" (1794) in: *Schiller—Poet of Freedom,* Vol. II, Washington, D.C.: Schiller Institute, 1988, p. 405.

[5] Schiller to Goethe, March 18, 1796, in: *Briefwechsel Schiller-Goethe,* Frankfurt a.M.: ed. Emil Staiger, 1977, p. 198. See also: Hermann Fähnrich, *Schillers Musikalität und Musikanschauung,* Hildesheim, 1977, p. 8.

The passage is often quoted by the scions of the Romantic movement to back their spurious claim that Schiller is one of their own, a true founder of the Romantic move-

"The musicality of a poem hovers more often before my soul when I sit down to make it, than the clear idea of content on which I hardly agree with myself. I was led to this remark through my 'Hymn to the Light,' which now occupies me many a moment. I have still no idea of this poem, but a presentiment, and yet I will promise beforehand that it will turn out."[6]

Schiller made a devastating attack against Immanuel Kant (1724–1804), then the hegemonic philosopher of art. In his *Critique of Judgment,* Kant defined art, as Aristotle did, as the elegant description or praise of natural beauty. Schiller dared to correct Kant, and demanded rather that the artist act in the image of the living God, to create new moral and intellectual beauty. The elements of natural beauty given by God were only the necessary prerequisites. Art must never violate the principles of natural beauty; yet, unless art transforms nature, it is mere description.

Schiller, in both his poetry and his philosophical essays, demanded that the poet, the composer, and plastic artist place the sovereign "divine spark" of the creative individual above, and as a ordering principle over, the natural laws of the physical universe.

"There is something secret in the effect of music, in that it moves our inner self, so that it becomes a means of communication between two worlds. We feel ourselves enlarged, elevated, devout; what is that, other than to be drawn to God in the universality of Nature? Music is a higher, finer language than words. In those moments, where to the elevated soul every expression seems too weak, where one despairs of grasping the finer words, that is where musical art begins. All excellent song comes from this basis."[7]

Schiller wrote that the song composer's primary aim is to elevate the population, to "draw them jokingly and playfully upwards," rather than bringing himself down to the level of the public, seeking to produce "popular culture" such as the more banal type of folk tune. Song must represent universal truth, "with which all persons without differentiation must empathize," he said. Rather than write a popular song for this or that ethnic group, he insisted, the composer must, "in each particular song, satisfy every class of people" with universal ideas.[8]

ment. They claim that it "proves" that for Schiller, "emotion" is superior to "cold reason." Nothing could be further from the truth: As Schiller himself discusses the matter exhaustively in his aesthetic writings, the truly creative mind knows no such barrier between reason and emotion—a barrier which was deliberately erected by Immanuel Kant and the Romantic movement in order to halt the growing influence of the Classical world-view.

[6] Schiller to Körner, May 25, 1792, in: *Briefwechsel zwischen Schiller und Körner,* p. 148.

[7] Schiller to Caroline von Wolzogen, in: Fähnrich, *op. cit.,* p. 9.

Goethe versus Musical Progress

Schiller, while attacking Kant, fought to elevate the popular Kantian world-view of poets and musicians, above all of the poet Johann Wolfgang von Goethe (1749–1832). Schiller collaborated intensely with the older Goethe in the 1790s, but repeatedly reproached Goethe, because he rejected Schiller's principle that moral beauty is the highest form of beauty.

No one would deny that Goethe's poems are beautiful, "musical poems," as Schubert wrote. Because Goethe was a major intellectual influence in Europe, Schiller set out to combat his flaws—particularly Goethe's egotism and preoccupation with sensual gratification. "Being with Goethe more often would make me unhappy," Schiller wrote to his friend Christian Gottfried Körner in 1789. "In fact, I do think he is a egotist to an extraordinary extent. He deigns to make his beneficent presence known, but only like a god . . . which seems wholly designed to assure him the fullest enjoyment of his self-love. . . . Mankind ought not allow one with such a character to appear amongst it. He is despicable to me for that, although I love his mind."[9]

Schiller fought with Goethe especially over his influence on composers of music, because Goethe's self-love, especially for his own poems, ruined his musical judgment as well as his morals. Goethe expressly rejected the elementary principle of real musical composition: the need for the composer to create a *transformation* of the poem with music. He actively discouraged any further true musical development of his material by composers who undertook to set his poetry to music.

As his personal composers Goethe used the two leaders of the so-called Berlin School, Johann Friedrich Reichardt (1752–1814) and

[8] Friedrich Schiller, "On Bürger's Poems" (1791), in: *Schiller—Poet of Freedom,* Vol. II, Washington, D.C.: Schiller Institute, 1988, p. 427.

[9] Schiller to Körner, February 2, 1789, in: *Briefwechsel zwischen Schiller und Körner.*

Carl Friedrich Zelter (1758–1832), who were officially designated by Goethe to set the poems appearing in his novels and plays. They knew something of composition, and indeed Schiller himself used Reichardt and Zelter to set his poems for some of his own publications—for example, his *Musen-Almanach* of 1797.

Goethe's most telling error, however, was that he preferred the Berlin composers over geniuses such as Mozart, Beethoven, and Schubert—precisely because the Berliners did not dare to make any creative transformations of his poems. Goethe praised Zelter on this account: "The point of origin of his compositions, as far as I can judge," he wrote, "is never an inspiration, but rather a radical reproduction of the poetic intentions."[10]

Goethe declared that a composer must not dare to add new elements to a poem, but rather must merely advertise or promote it, so that through the music, "an excellent jacket might be well fitted to the body" of the poem. He wished to see himself reflected "entirely purely" in song, such that the music should merely take the poem "like an inflating gas takes a balloon to the heights."[11] He insisted on the "simple strophic" song, in which the music to each strophe is identical, and specifically forbade variation of the strophes.

Goethe had his own method of directing composers to compose, one which was guaranteed to replicate the beautiful music of his poems—but go no further. He would ask the Berlin composers to repeatedly read a poem aloud, and then to form a melody corresponding to the declamation, that was harmonically supported by the piano accompaniment, but could also stand without it. Reichardt, in describing his own compositional method which reflected Goethe's influence, wrote in 1779: "My melodies originate everytime voluntarily, from repeated reading of the poem, without me looking for it, and all I do with it is repeat it, with small modifications, and do not write it down before I feel and recognize that the grammatical, logical, pathetic, and musical accents are so well connected with each other, that the melody sings correctly and pleasantly, and this not only for one strophe, but for all."[12] Much later, in 1823, Zelter wrote, "When I want to compose a poem, I first try to get into the word, understanding, and make the situation alive to me. Then I read it aloud, till I know it by heart, and thus, with always reciting it ever and again, the melody emerges by itself."[13]

Schiller grew very critical of Reichardt and his school. By merely copying the banal folk tunes of the peasants, he wrote, they had erected "popularity" as a god, and had also created "the goddess of simplicity." While the poet Bürger said these were the "*nec plus ultra*" of art, Schiller said that art has to be truth.[14]

Schiller described other settings of the Berlin composers as "the unspeakable platitudes, which the Germans let be sung under the title of naïve and sportive songs, and with which they are accustomed to assure themselves quite endlessly around a well-occupied table. Under the permit of good humor, of feeling, one tolerates these paltry concerns—but a humor, a feeling, which one can not carefully enough banish."[15]

Of Reichardt he stated: "One has to attack him as a musician, too, because also there, things are not entirely correct." He described Reichardt as "a devil."[16]

Schiller and Mozart: Creating a New Song Form

Wolfgang Mozart (1756–91) created the genre known as the modern German *Lied* by violating all of Goethe's musical dictums in his setting of Goethe's "Das Veilchen," in June 1785. The poem, published long before, in 1774, had been set by dozens of composers before Mozart.

Mozart and Schiller believed in similar ideals,[17] and the influence upon the song of those ideals, as opposed to Goethe's dictums, is clear.

[10] Goethe to August Wilhelm Schlegel, June 18, 1798, in: Hedwig Walwei-Wiegelmann (ed.), *Goethes Gedanken über Musik,* Frankfurt a.M., 1985.

[11] Goethe to Zelter, April 17, 1815; Goethe to Marianne von Willemer, July 12, 1821; and Goethe to Zelter, May 11, 1820; in: Walwei-Wiegelmann, *op. cit.*

[12] Heinrich W. Schwab, *Sangbarkeit, Popularität und Kunstlied,* Regensburg, 1965.

[13] Schwab, *op. cit.*

[14] Friedrich Schiller, "On Bürger's Poems" (1791), in: *Friedrich Schiller—Poet of Freedom,* Vol. II, Washington, D.C.: Schiller Institute, 1988, p. 421.

[15] Friedrich Schiller, "On Naïve and Sentimental Poetry," in *Friedrich Schiller—Poet of Freedom,* Vol. III, Washington, D.C.: Schiller Institute, 1991, p. 365.

[16] Schiller to Goethe, February 5, 1796, and November 2, 1796, in: *Briefwechsel Schiller-Goethe,* Frankfurt a.M.: ed. Emil Staiger, 1977, pp. 191, 305.

[17] See footnote 1, *supra.*

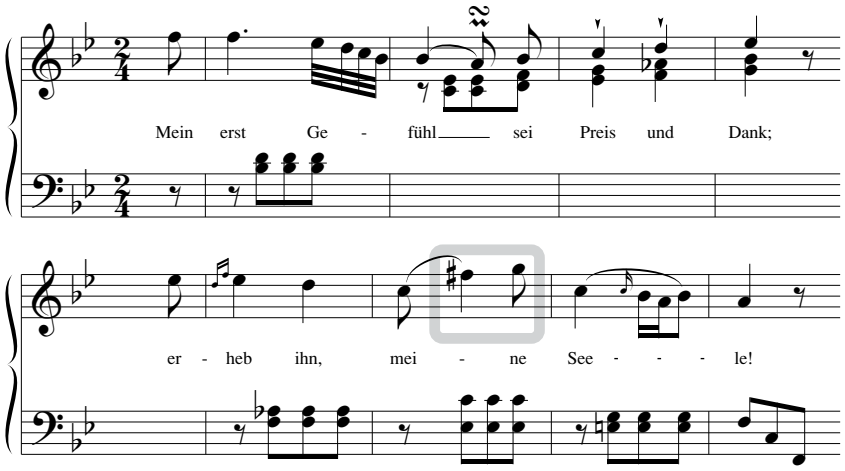
Mozart's "Das Veilchen" is a playful "Schillerian" comment upon Goethe.

Mozart was able to create the *Lied* because his method for composing music as a *unit-transformation* of nature, as a whole, inside his own mind, was the same concept studied by Schiller. Mozart described it thus: "This inflames my soul, whenever I am not disturbed. It grows continuously, and I broaden it ever wider and brighter, and the thing becomes truly almost complete in my head, even if it is long, so that from that point on, I view it with a single glance, exactly like a beautiful picture or a pretty girl, from above, in my mind. And in my imagination I don't hear the parts successively, one after the other, but I hear them all at once. That is truly a feast! All of this inventing, this producing, proceeds in me only as if in a powerfully beautiful dream; but the *over-hearing,* everything together, that is the best."[18]

Compare the songs composed before 1785, by Reichardt, Zelter, and by the masters C.P.E. Bach (1714–88), Josef Haydn (1732–1809), and by Mozart himself, with the radical new development of Mozart's 1785 "Das Veilchen" (K. 476) and his 1787 "Abendempfindung" (K. 523). Note that Haydn's "London" songs of the 1790s are a transformation of Haydn's earlier style, after Mozart's breakthrough.

One major difference is the poetry itself. Texts of the earlier High German songs were not as fully developed, as great poems, in their own right. Most eighteenth-century German song texts were simple religious ones such as hymns, secular folk rhymes or other simple rhymes, short texts equally suitable for arias.

Figure 11.1 C.P.E. Bach, "Morgengesang," from *Gellertsche Oden,* No. 4

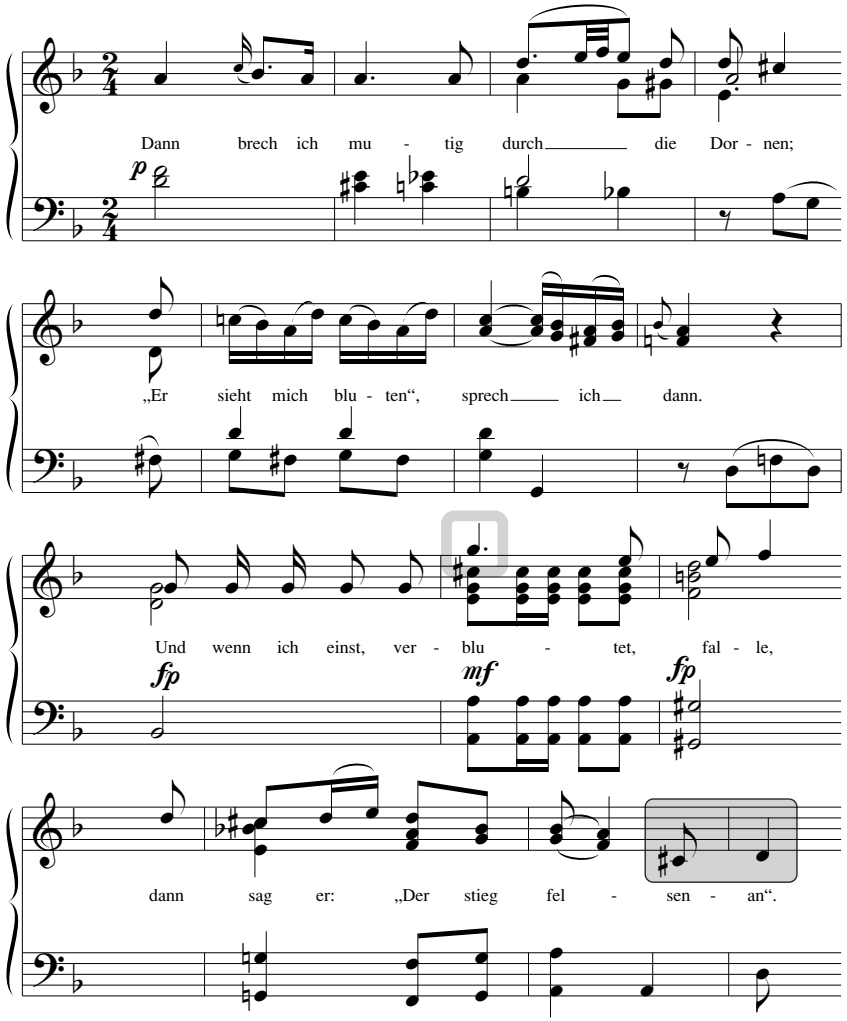


In the earlier songs, voice registration, too, was simple, following the standard registration common in all vocal music during the period 1400–1780 (see Chapters 2–8). It is in the form of a couplet: a simple statement, in one voice register, followed by a simple apposition, containing a new voice register, such as used here by C.P.E. Bach in 1758.

More significantly, *there is no independence of the keyboard* from the "melody," just as in any hymn. The song is composed on two staves, not three. The keyboard treble simply doubles the voice; there is no separate treble staff for the piano. Sometimes the keyboard bass is in figured bass, sometimes written out, but it, too, never exists as a separate voice. Because printing was exorbitant and two staves were much cheaper than three, most composers through the 1790s wrote songs this way (see also examples by J.F. Reichardt in Figures 11.8 and 11.13 below).

[18] W. A. Mozart, 1790, quoted in a letter published by Rochlitz in the *Allgemeine musikalische Zeitung* of 1815, and quoted by Heinrich Schenker in "Ein verschollener Brief von Mozart und das Geheimnis seines Schaffens," in: *Der Kunstwart,* No. 10, 1931.

FIGURE 11.2 Mozart, "Ich würd auf meinem Pfad," K. 340 (1780)



Mozart's earlier German songs for voice and keyboard spanning the years 1767–85, such as this above, were of this modest sort.

It took new ideas to force a change in the printing style. Goethe's poems were part of a conceptual advance in poetry during the wave of optimism which swept Europe at the time of the American Revolution. The breath of fresh air generated by American insistence on the perfect sovereignty of the creative individual in his relation to the Creator, and on the republic as the best form of guarantor of that sovereignty, produced what Percy Shelley in "A Defense of Poetry" called "an accumulation of the power of communicating and receiving intense and impassioned conceptions respecting man and nature."

In poetry, this was characterized by a new rate of generation of singularities, a more free creation of ideas at a rate more rapid than in previous eighteenth-century writing (see Chapter 9). While Schiller was still at school, he became inspired by Goethe's early poems of 1774–76, because of their more free sense of humor, which allowed the development of a new density of ironies, and a more lyrical beauty. Many of these early Goethe poems were subsequently set by Mozart, Beethoven, and Schubert (e.g., "Das Röslein," "Das Veilchen," "Mailied," and "Neue Liebe, neues Leben").

Goethe's poems created new possibilities for musical composers—a fact to which Goethe's own self-involvement seems to have blinded him. Mozart, however, saw it clearly. He took "Das Veilchen" and created a musical work far beyond anything in the poem.

Das Veilchen	*The Violet*
Ein Veilchen auf der Wiese stand	A violet stood on the meadow,
Gebückt in sich und unbekannt;	withdrawn into itself and unknown;
Es war ein herzigs Veilchen.	it was a dear little violet.
Da kam eine junge Schäferin,	There came a young shepherdess
Mit leichtem Schritt und munterm Sinn,	with light step and merry heart
Daher, daher,	hither, hither
Die Wiese her und sang.	up through the meadow, and sang.
Ach! denkt das Veilchen, wär ich nur	Oh, thought the violet, were I only
Die schönste Blume der Natur,	the most beautiful bloom of Nature,
Ach nur ein kleines Weilchen,	oh, only for a little while,
Bis mich das Liebchen abgepflückt	until my sweetheart plucked me up
Und an dem Busen matt gedrückt!	and on her bosom held me fast!
Ach nur, ach nur	oh, only, oh, only
Ein Viertelstündchen lang!	a quarter of an hour long!
Ach! aber ach! Das Mädchen kam	Oh, but oh! The maiden came
Und nicht in acht das Veilchen nahm,	and no notice of the violet made,
Ertrat das arme Veilchen.	and trod upon the poor violet.
Es sank und starb und freut' sich noch:	It sank, and died, and rejoiced still:

Und sterb ich denn, so sterb ich doch	and though I die, so die I, then,
Durch sie, durch sie,	through her, through her,
Zu ihren Füßen doch.	at her feet!

Consider, first, the level of complexity of this poem. It is not based upon simple couplets, but upon three- and four-line groups within each strophe, with each group in sonata-like form. That is, instead of the simple form of "statement–apposition," there is statement *A,* apposition as a development section *B,* and then re-summation *C*.

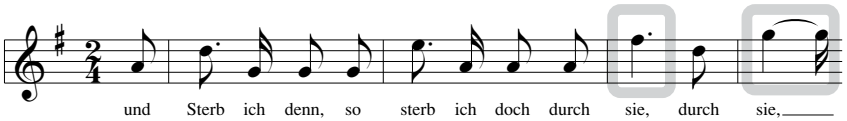
Ein Veilchen auf der Wiese stand	*A*
Gebückt in sich und unbekannt;	*B*
Es war ein herzigs Veilchen.	"*A*" = *C*

The poem is constructed in three strophes, which overall scheme itself contains a similar sonata-like form. Each strophe consists of two groups of three and four lines. The endings of these groups produce a rhyme across the first two strophes: "Veilchen . . . sang; Weilchen . . . lang," with similar poetic mood. The final strophe departs from this, with "Veilchen . . . doch" producing a distinct development.

Mozart saw in this poem the internal rates of development necessary to carry out an opera in microcosm, a new quality of *One* from the poem's *many* ironies. His use of voice registration was therefore much more complex. Mozart scanned the poem as a unit-concept from the ultimate singularity, the final verbal transformation: How does the violet die? Answer: "Durch sie, zu ihren Füßen." There he would require a strategic register shift.

The rising vowel-pitch vocalization of the repeated "Durch sie," /u/–/i/, /u/–/i/, indicated that the phrase *rise* to the desired register shift (see Figures 10.1 and 10.28).

Figure 11.3 Mozart, "Das Veilchen," K. 476



Once Mozart chose a soprano/tenor registration for the singer, G major was a clear candidate for the key of the song, because the line rises from the fifth D to the tonic G, in exactly four notes (D–E–F-sharp–G) for the four measures needed for the phrases: "Und *sterb* ich denn, so *sterb* ich doch, / durch *sie,* durch *sie*." This key has a shift into the third register on the plaintive seventh degree of the scale, creating a humorous irony on the first "durch sie," which then resolves to G when it is repeated.

To address this poem, Mozart *invented a new musical form*. The poem was too complex for an orchestral aria, but not long enough for a cantata. The level of internal differentiation given by the 20 different instrumental voices of the opera orchestra was needed, but without the large orchestral form. These many conceptual voices had to be projected onto only two physical instruments, the singer and the keyboard.

A new technology was required, a musical space broad enough so that within it there could be created a true transfinite series, with distinct internal stages of development. His solution was to elevate the keyboard to a fully independent level, by creating many distinct keyboard voices, and cross-voices between the singer and the keyboard voices. The three-staff *Lied* was born.

Mozart treats Goethe's three strophes by creating a musical *transfinite series*, the process previously referred to in Chapter 9 as an "*A*→*B*→*C* transformation." Broadly, Mozart's setting of each of Goethe's three strophes corresponds to each of *A, B,* and *C*.

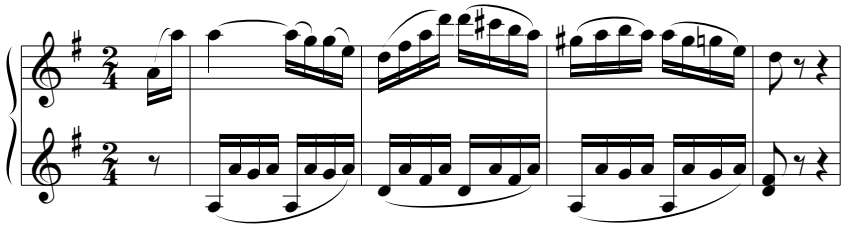
In a musical transfinite, the opening thematic statement *A,* is followed by a development passage *B,* followed by a closing *C,* which is either a restatement of theme *A,* or something new. Between the passages *A, B,* and *C* there are singularities, one between *A* and *B,* and a second, of a different order, between *B* and C. Thus, *three* is the smallest number of distinct musical passages, which can define two distinct types of singularities. Such a *progressing quality of singularities* is one necessary condition of a transfinite series. The musician will recognize that the Classical *sonata form* is the usual musical term for such an "*A*→*B*→*C* transformation" (see also Figure 12.13).

Each *A, B, C* is the musical equivalent of a simple system, analogous to the simple mathematical system of axioms and postulates, which the logical Kantian observer assumes to be fixed. The uncreative composer, too, such as Claudio Monteverdi (1567–1643), Jean-Philippe Rameau (1683–1764), and today's rock musician, often assumes a fixed musical system, and merely repeats a fixed series of chords in one key.

The creative composer, such as Mozart, delights in presenting such a musical idea *A,* only to take it apart or supersede it with new musical ideas *B,* and then *C,* in the same manner in which a scientist overturns what the Kantian assumes to be an axiomatic geometry, by performing a crucial experiment disproving a basic axiom. This has the included benefit of teaching the audience to give up fixed modes of thought in order to follow the composition. It implies the necessary *generation* by the composer of *B* and *C* (as opposed to the more passive simple *existence* of *B* and *C*). The succession of transformations so ordered, represents an indivisible transfinite *unit-process*.

Mozart's new piano introduction to "Das Veilchen" generates a simple theme *A,* a repeated falling stepwise motion from the high G: sol–fa, fa–mi, etc., defined by the soprano register shift from the high third register G and F-sharp, to the E below. The full theme is actually sung by a keyboard choir, including tenor and bass, each with its characteristic register shifts.

Figure 11.4 Mozart, "Das Veilchen," K. 476

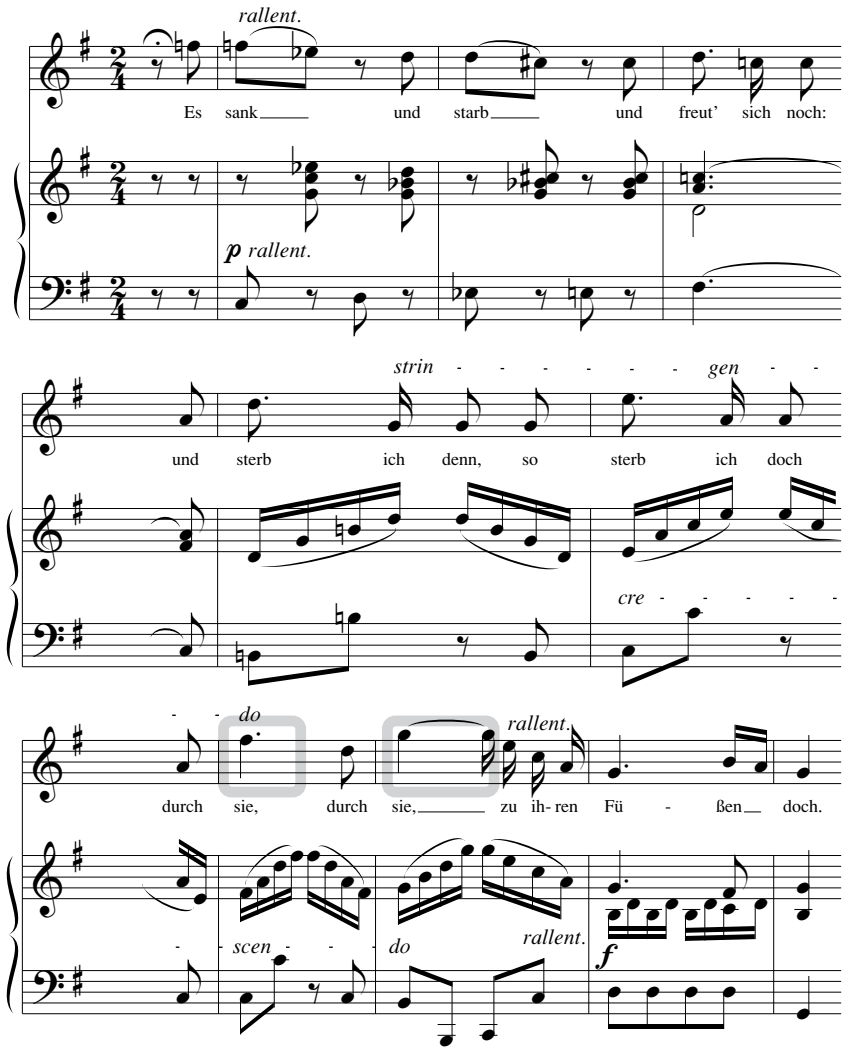


Mozart plays with the obvious features of theme *A,* which begins in a clear G major pedal point, breaking it up as a fixed idea by introducing the C-sharp, inverting the motion to a repeated rising pattern, and modulates to D. Finally theme *A* is superseded as Mozart generates a singularity, a new singing theme in D major in the keyboard, shown here, following the phrase "and [the shepherdess] sang." Such passages are no mere interludes, but are manifestations that the *entire development of the song proceeds integrally across the keyboard voices and singer's line as a unit*. For the first time in musical composition, distinct keyboard voices are available for *voice leading* the singer, rather than following the singer, as each voice in a four-part chorus may lead in the other voices.

At the second strophe "Ach! denkt das Veilchen . . . ," Mozart creates a development passage *B*. It begins suddenly in minor, with a new keyboard meter. He had generated the ability to do this back during his variation of section *A,* in the manner in which he shifted pedal point once, from G to D. In section *B,* the principle becomes a multiplication of the rate of change, in which the pedal point shifts many times (the first three lines alone have G, F, and B-flat pedal points). Each pedal point is clearly repeated in the prosaic bass line.

This principle of passage *B* is then similarly interrupted at the end of the second strophe, as Mozart interjects another singularity, re-introducing the F-sharp at "ein Viertelstündchen lang," leading to a sudden keyboard solo in E-flat (not shown).

Figure 11.5 Mozart, "Das Veilchen," K. 476



At the third strophe, which is singular in that it rhymes with no other, Mozart creates a closing passage *C,* with an even more accelerated rate of pedal-point shift, frequently not in any specifiable key. The development is *almost entirely within the keyboard*, with the singer in recitative. At the bass line of "Es sank . . . und starb . . . und *freut*' sich noch," he introduces many singularities in each measure. The bass pedal point's series of shocking register shifts, E-flat to E-natural to F-sharp, references the rich ambiguity of the combined keys C minor/C major.

This bass passage is an independent voice, which creates a cross voice, giving rise to the vocal line after the F-sharp at "und freut' sich noch" (Figure 11.5). That is, the *keyboard's development* is *voice-leading the singer,* making possible the desired vocal denouement rising to the F-sharp and the G at "und sterb ich denn . . . durch sie" (Figure 11.3).

Mozart has deliberately set up a transfinite principle of change from one strophe to the next, such that there is an *increasing density of singularities*. This, particularly in the keyboard voices, is something entirely new in music, with Mozart's *Lieder* from 1785 on.

The succession of transformations so defined, represents a *principle of change;* and since it is rigorously ordered, the process of change so represented, is a unity, a transfinite unit-transformation. That unitary concept, as a concept, is indivisible; it is thus a true *One*. Mozart is conscious of the transfinite process with which he has transformed Goethe's poem, and so adds his own humorous final comment:

> Das arme Veilchen!
> Es war ein herzigs Veilchen.

Beethoven's Battle with Goethe

Among composers, none identified more with Schiller's Promethean world-view than Ludwig van Beethoven (1770–1827).

As a child in Bonn in the 1780s, Beethoven frequented Schiller's plays at the Elector's Palace, and began setting Schiller's "Ode to Joy" to music while still at Bonn at age 22 in 1792, over 30 years before he composed his Ninth Symphony. Beethoven's circles in Bonn were in correspondence with Friedrich and Charlotte Schiller in Weimar, and Beethoven was an avid reader of Schiller's plays from the 1790s onward.[19]

Upon his arrival in Vienna in 1792, Beethoven began his studies with Haydn, just after Haydn had completed his remarkable 1791

[19] Fischenich to Charlotte Schiller, January 26, 1793, in: Alexander Wheelock Thayer, *Thayer's Life of Beethoven,* Princeton: Princeton University Press, 1964, p. 120.

"London" songs in Mozart's new style. Although Beethoven's *Lieder* are belittled by ignorant modern opinion, Beethoven was a major *Lieder* composer who made several important advances in the new art. In "Adelaide," Op. 46, written in 1795, Beethoven extended the independent contrapuntal voicing in the keyboard beyond anything in Mozart, such that the song became almost a small piano sonata with voice accompaniment.

Beethoven also invented the *Liederkreis* or song cycle, in 1803, with his "Sechs Lieder von Gellert," Op. 48. Schubert and Schumann based their most important vocal works upon this milestone.

Beethoven, like Mozart, did not undertake to compose Schiller's poetry as *Lieder,* whereas he took up many of Goethe's poems. In 1809, while trying to obtain a commission to set Schiller's play *Wilhelm Tell* to orchestral music, Beethoven told an associate bluntly: "Schiller's poems are very difficult to set to music. The composer must be able to lift himself far above the poet; who can do that, in the case of Schiller? In this respect, Goethe is much easier."[20] His comment in many ways encapsulates the concept elaborated here, because it demonstrates that Schiller and Beethoven had the same *method*. It is the negative, but conclusive, proof that Beethoven, too, believed that a true musical setting of a poem, is relatively *transfinite* to the poem's text. Why did Beethoven feel he could not set Schiller's poems as *Lieder*? Precisely because he agreed with Schiller, that a musical setting must totally transform a poem, be of a higher order of scientific concept than the poem itself; otherwise, why write music, since it were better to simply read the poem aloud.

This matter touches upon the very nature of music. Compare for example, the role of time, in a poem, and in the musical transformation of that poem. It is the nature of music, as a medium, that a musical transformation of a poem occurs in an expanded time frame. A musician such as J.S. Bach or Mozart frequently requires an extensive four-voice chorus or fugue, in order to set the two words "Kyrie eleison." Musical transformation of a given poetic phrase frequently requires far more time than recitation of the poem.

Beethoven stated that his musical method was to "lift himself above" the poem. This means to create, above and beyond the beauty of the poem, a new work in the artistic quality of the music as such, as a medium, and produce a musical work in the medium, rather than simply follow the musicality of the poem. The musicality of the poem *per se* defines the level of necessity, the raw material from which the composer, in freedom, creates a higher form in music. Thus, the more complex the poetic "raw material" presented to the composer of music, the more musical dimensions required to supersede it.

Beethoven's mastery of Schiller's epistemology might have enabled him to write poems as great as Schiller's, had he so chosen. But, could he have written better poems? Schiller's insistence that a good setting in music requires the higher transformation of a poem by the medium of music demands exactly that: that the composer produce something which transforms the poem he is given to a higher plane.

Precisely because the idea-content in Schiller's poems was so dense, Beethoven saw that it would be impossible to approach Schiller's poems in the condensed form of *Lied,* given those conceptual standards for a musical setting. He made the scientific judgment that Goethe's poems, and not Schiller's, were best for *Lieder,* because, although musical and lovely, the idea-content of Goethe's poems was far more simple than that of Schiller's. Beethoven considered that the setting of a single Schiller poem required 30 years' study and the invention of a new symphonic form. The fact that Beethoven so openly and succinctly stated that judgment, gives us a direct image of Beethoven's standards for musical composition.

Beginning with "Der Floh" from *Faust* (published 1790), Beethoven made dozens of *Lieder* from Goethe's poems. He had high regard for the inherent musicality of Goethe's poetry: "Goethe—he is alive, and he wants us all to live with him. That is why he can be set to music. There is no one who lends himself to musical setting as well as he."[21]

Beethoven, however, chose Goethe's poems precisely because he could see, from his higher moral level, how to transform them—which annoyed Goethe no end. Beethoven made no secret of his disappointment with Goethe's maxims. He wrote to his publisher: "Goethe is too fond of the atmosphere of the courts, more so than is becoming to a poet. Why laugh at the absurdities of virtuosi, when poets, who ought to be the first teachers of a nation, forget all else for the sake of this glitter?"[22]

Hardly needing Beethoven to expose his flaws, Goethe exposed himself, through his preference for the musical settings of his Berlin

[20] Beethoven to Czerny, 1809, in: Thayer, *op. cit.,* p. 472.

[21] Beethoven to Rochlitz in 1822, quoted in: Thayer, *op. cit.,* p. 802.

[22] Beethoven to Breitkopf und Härtel, 1812, in: Thayer, *op. cit.,* p. 538.

friends, over the superior counterpoint of Beethoven and Schubert. Regarding settings of "Kennst du das Land?"—Mignon's first song in Goethe's 1795 novel *Wilhelm Meisters Lehrjahre*—as late as 1822 Goethe praised Reichardt's 1795 setting, and dismissed Beethoven's superior 1809 version: "I can not understand, why Beethoven and Spohr could totally misunderstand the poem when they composed it through," Goethe wrote. "The distinguishing marks occurring at the same place in each strophe should be, so I would believe, sufficient for the musical composer, to show him that I expect from him only a song. Mignon, according to her character, is well able to sing a song, but no aria."[23]

Goethe was not alone in this preference among poets. Friedrich Matthisson (1761–1831) seems to have had the same myopic view of Beethoven's setting of his "Adelaide." Matthisson never replied to Beethoven's friendly letter forwarding the song, but in his 1815 republication of the poem, commented sarcastically, "Several composers have vitalized this little lyric fantasy with music; but, according to my strong conviction, none of them so threw the text into the shade with his melody as did the highly gifted Ludwig van Beethoven in Vienna."[24]

Beethoven and 'Wilhelm Meister'

Beethoven's method for the transformation of poetry is illustrated by a comparison of his settings of a poem, with multiple settings of the same poem by other composers. Such multiple settings demonstrate the role of the *Lied* as a kind of "Rosetta Stone," particularly in the relationship among music, poetry, and Classical drama. These settings are important both for their common values, and for the distinctions among them.

Before presuming to judge how well Beethoven has set a poem, compared to the setting of Reichardt (for example), the fact must be admitted and understood, that the modern reader is ignorant of the basic principles of reading a poem, in comparison with Reichardt, not to mention in comparison with Beethoven. This modern illiteracy makes it important to begin with the study of what the literate composers of the nineteenth century did in a *similar* manner. The striking similarities among the settings show that Classical composers, as literate German speakers, were able to read the natural musical values of language in a poem, as a musical score, in a way entirely missed by the modern reader. The modern reader must first learn to read the poem over the shoulders of a number of literate composers. Through such study, it is then possible to discern the significant *differences* between musical settings, in order to see how one composer succeeded in transforming a poem, and where another failed to achieve such a transformation, or only partially succeeded in doing so.

Wilhelm Meisters Lehrjahre featured nine poems which caught the imagination of composers across Germany and Europe. The poems were set off in the text as song lyrics, and the novel's first edition featured musical settings of each by Reichardt. Subsequently, dozens of composers, including Beethoven, Schubert, Schumann, Liszt, Tchaikovsky, Wolf, Zelter, Franz, Löwe, Romberg, Himmel, and Klein, made numerous settings of these poems (see Figures 10.28–10.31).

The first poem, a song for Mignon, "Kennst du das Land?" was treated by composers according to many common principles.

[23]Goethe to Tomaschek, August 6, 1822, in: Walwei-Wiegelmann, *op. cit.* Ludwig Spohr (1784–1859) was a violinist and younger composer from Braunschweig.

[24] Thayer, *op. cit.,* p. 193.

Kennst du das Land, wo die Zitronen blühn,
Im dunkeln Laub die Gold-Orangen glühn,
Ein sanfter Wind vom blauen Himmel weht,
Die Myrte still und hoch der Lorbeer steht —
Kennst du es wohl?
Dahin! Dahin
Möcht ich mit dir, o mein Geliebter, ziehn!

Kennst du das Haus? Auf Säulen ruht sein Dach,
Es glänzt der Saal, es schimmert das Gemach,
Und Marmorbilder stehn und sehn mich an:
Was hat man dir, du armes Kind, getan? —
Kennst du es wohl?
Dahin! Dahin
Möcht ich mit dir, o mein Beschützer, ziehn!

Kennst du den Berg und seinen Wolkensteg?
Das Maultier sucht im Nebel seinen Weg,
In Höhlen wohnt der Drachen alte Brut,
Es stürzt der Fels und über ihn die Flut —
Kennst du ihn wohl?
Dahin! Dahin
Geht unser Weg; o Vater, laß uns ziehn!

Dost thou know the land where the lemons blossom,
the golden oranges glow amid the dark leaves,
a gentle wind wafts from the blue sky,
the myrtle stands silent, and the laurel tall?
Dost thou know it?
Thither! Thither
would I go with thee, o my beloved!

Dost thou know the house? On pillars rests its roof,
its hall gleams, the furnishings shimmer,
and marble statues stand and gaze at me:
What have they done do you, poor child?
Dost thou know it?
Thither! Thither
would I go with thee, o my protector!

Dost thou know the mountain and its cloudy path?
The mule seeks its way in the mist,
the ancient brood of dragons dwells in caves,
the rock tumbles, and, over it, the flood—
Dost thou know it?
Thither! Thither
leads our path; o father, let us go!

The syntax of Goethe's poem repeats two musical refrains in all three strophes. Each begins with the repeated but changing question, "Kennst du das Land? Kennst du das Haus?" and ends with the repeated exclamation: "Dahin! Dahin." The prosody thus rises with the underlying vocalization of the vowels, from /ʊ/ to /a/ at the beginning of the strophe, and from /a/ to /ɪ/ at the end of each strophe:

/ʊ/–/a/ ?	/a/–/ɪ/ !	du . . . Land?	Da-hin,
/ʊ/–/a/ ?	/a/–/ɪ/ !	du . . . Haus?	Da-hin,
/ʊ/–/ɛ/ ?	/a/–/ɪ/ !	du . . . Berg?	Da-hin!

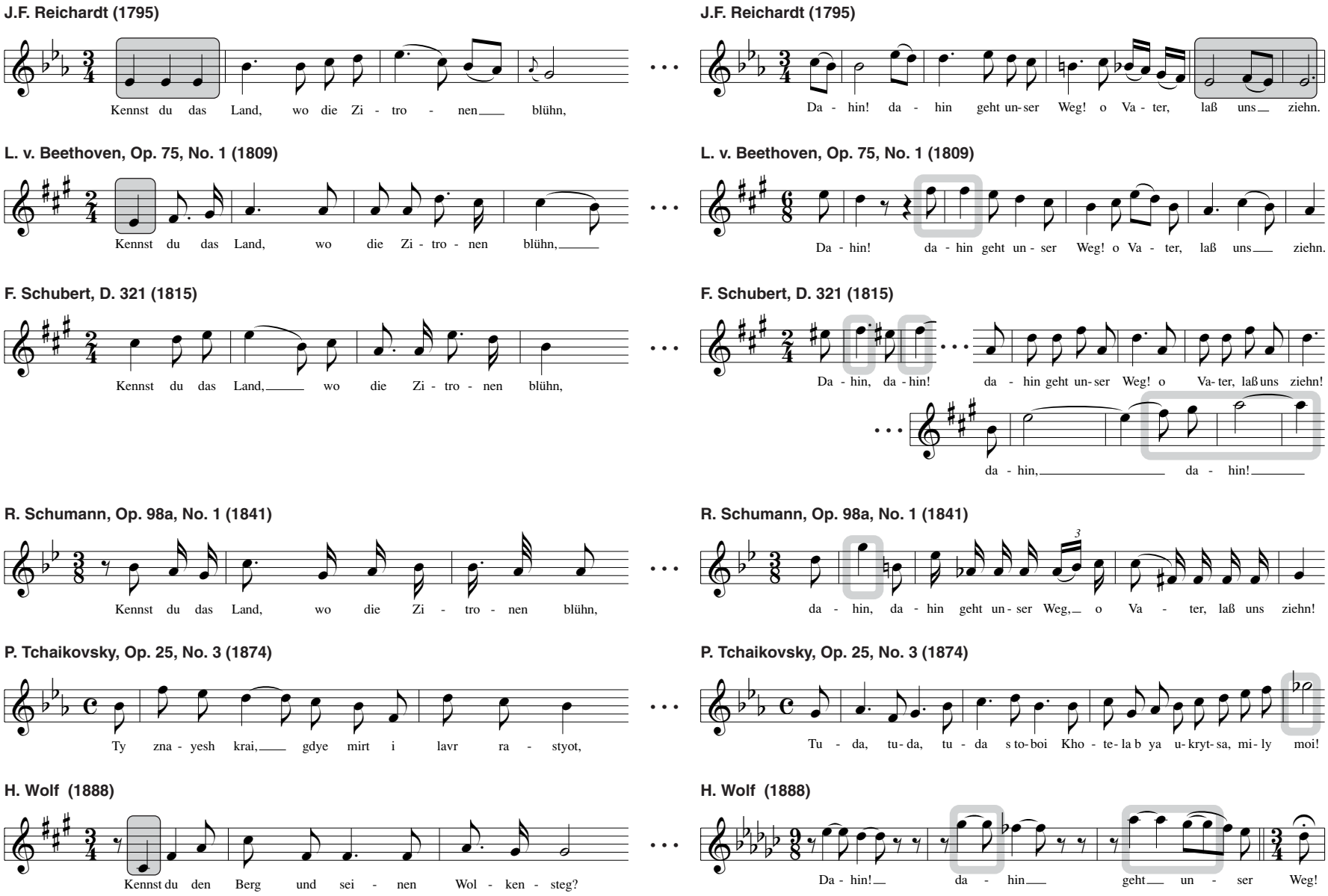
The final "Dahin! Dahin *geht*" has more of a sense of completion for the German audience than the corresponding phrase in the first and second strophes. The "Dahin! Dahin" at the end of the first two strophes, part of the verb "dahinzieh(e)n," is separated from the final "ziehn" by the remainder of the sentence. The clause starts with the subjunctive modal verb "möchte ich" ("would I"), creating a passive sense, especially since it is repeated twice. The final "Dahin geht unser Weg," from the verb "dahingehen," comes as a strong contrast, a sudden strengthening of the verbal action by condensing the two parts of the verb together, which is further strengthened by the addition of the final imperative, "laß uns ziehn!" The *unit-concept* or "long line" of the poem therefore extends from the repeated question "Kennst du . . . , Kennst du . . . , Kennst du . . . ?" to the final answer in the third strophe: "Dahin! *Dahin geht* unser Weg!"

Every composer who has approached this poem has seen it this way, creating a musical theme which rises in pitch across this long line of the song as a whole. Most have set the opening couplet of each strophe with

a rising pattern (or variations upon one), from the verbal "Kennst du" to the objects "Land," "Haus," and "Berg." Every composer has also set the final "Dahin" on a rising pattern.

This alone is strong evidence of the universality of Schiller's principle of unit-transformation: All Classical *Lied* composers set not predicates, but only and precisely the long line of the entire poem, all the way through. The natural vocalization of the vowels works with the idea-content of the poem to produce a unified work. The rising thought pattern underlying the poem, the conceptual content, which has no physical sound, is mirrored in the physical pattern of the sounds themselves, the physical tonality of the basic underlying vowel tones. These vowel tonalities move across the poem as a whole, in direct accord with the unspoken conceptual development. As Mignon asks her repeated question, the mind rises, in the sense that a question rises, and the vowel pattern does this with the idea. As she gives her answer, "Dahin!" the mind rises, and the vowel pattern /a/–/ɪ/ of the answer "Dahin!" rises.

FIGURE 11.6 Comparison of Six Settings of Goethe's "Kennst du das Land?"



Composers uniformly focus on the long /u/ of "du," rather than that short /ɛ/ of "kennst," despite the latter's verbal importance. One reason is the longer singing quality of the /u/ itself: Unlike the other vowels, /u/ must be produced by protruding the lips forward in order to maximally elongate the vocal tract. This elongation accounts for why the /u/ has the lowest second formant (see Chapter 9). The singer therefore requires more time to enunciate /u/ than is required to enunciate /ɛ/—especially in German, where the /u/ is rounder and darker than the English /u/.

More importantly, composers often focus not on particular syllables, but on *vowel clusters,* patterns of sound vocalization, in whole passages of a poem. There is a predominance of /u/ throughout the first couplet of each strophe: "Im *dun*keln Laub . . . auf Säulen *ruht* . . . das Ma*u*ltier *sucht*," and so on. The melody rises from this repeated /u/ vowel cluster of the opening, to the higher-pitched /a/ and /ɛ/ of the shifting object ("Land," "Haus," "Berg"). Frequently the composer will rise from the /u/ of "Kennst du" to the object ("Land," etc.), and will then return to the same lower notes when the /u/ pattern recurs in the second line, such as in "Im *dun*keln Laub."

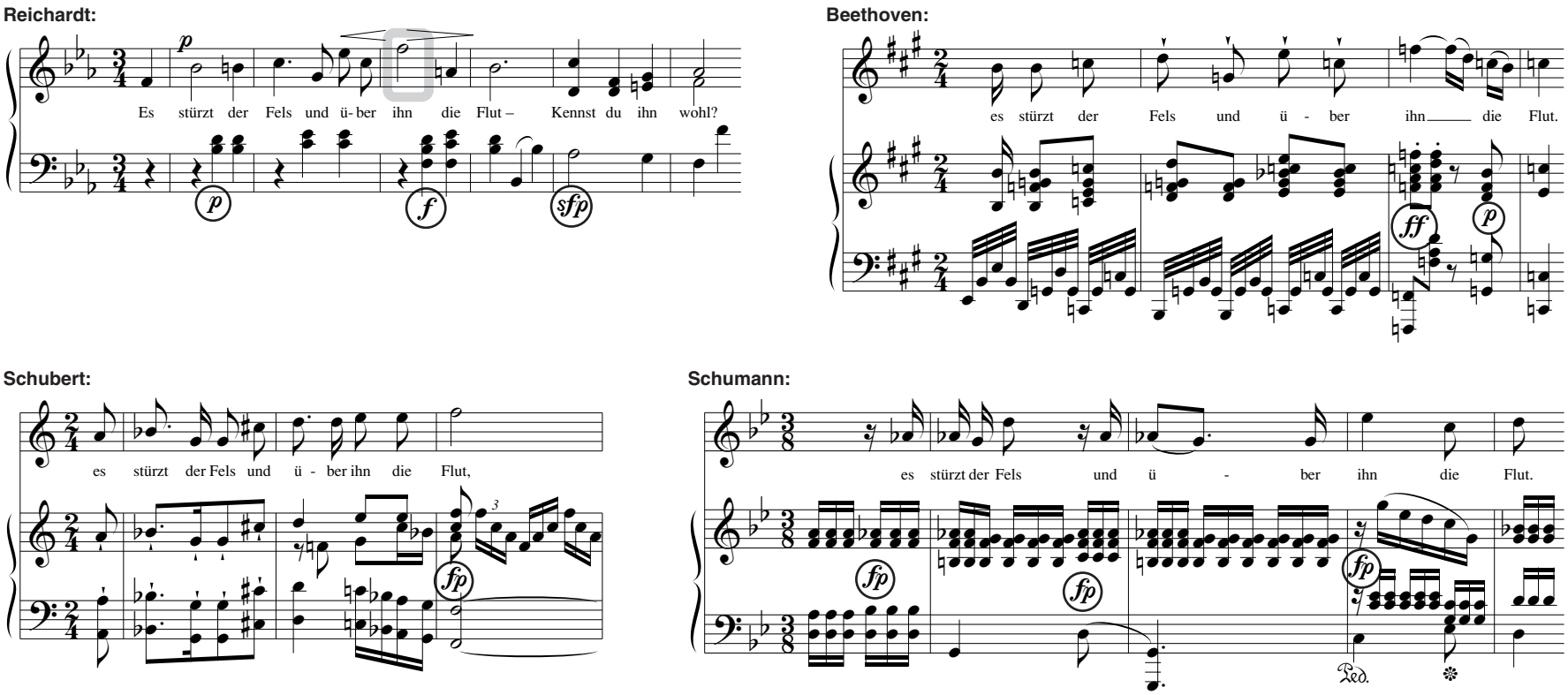
The long-line concept of the song also creates a similar *registration* for most composers. The settings are largely for the soprano voice. The opening question "Kennst du . . ." more often than not is set in the first register, and the rest of the opening couplet in the contrasting voice of the second register. The rest of the development of the song generally continues in the second register. The final imperative "Dahin" is so strongly heard by the composers, that its two contrasting vowels are drawn out, and are generally sung on notes which rise in direct correspondence with the vocalizations for /a/ and /ɪ/ as presented in Figure 10.2. This is heard not only as the final exclamation of each strophe, but as the long-line denouement of the song as a whole. In most cases, the brighter /ɪ/ of "da*hin*" is the note upon which the composer chooses to finally rise into the third, most dramatic, register.

Examining the settings in Figure 11.6 individually, Reichardt's is a good "song" by Goethe's cited standards for the old style of song. It fails to transform the poem, but it very nicely represents the poem, following the poem's natural vocalization. That is an art which is itself lost today, and modern composers have much to learn from it. Indeed, in order to ascertain exactly how the poem would be spoken in recitation by a literate German of Beethoven's day, the modern (poetically illiterate) reader would do well to simply sing the Reichardt setting.

Reichardt begins with a low E-flat, the tonic, on the low vowel /u/ of the opening refrain "Kennst *du*." From there, he rises to the fifth, B-flat, on the /a/ of "Land" (first strophe) and "Haus" (second strophe), and the /ɛ/ of "Berg" (third strophe). Over the course of the poem, he also rises another major third to the high D, with the appogiated tonic E-flat above it, on the imperative "Dahin!" and the following verbs "möcht' " and "geht," both of which also contain the brighter vowel sounds /œ/ and /e/. He does not use the third register here, but his setting does rise, to the top of the second register.

This rising sequence is the same in all settings shown in Figure 11.6. Beethoven's vocal line rises along with the inherent vowel pitches as in Reichardt's setting, from /u/ to /a/, and later from /a/ to /ɪ/ in "Dahin." Similarly, in Schubert, Schumann, Wolf, and even Tchaikovsky.

FIGURE 11.7 "Kennst du das Land?" by Reichardt, Beethoven, Schubert, Schumann



A secondary point which is similar in all the settings, is the end of the second couplet in each strophe, which is finally stated in the third strophe as ". . . und über ihn die Flut." It completes Mignon's question, coming just before the answer "Dahin," and thus is a secondary dramatic peak of each strophe.

Precisely because Reichardt was preoccupied with highlighting features given already in the poem, many basic aspects of the Reichardt setting also appear in subsequent composers' settings. Take Goethe's poem without music, for example, write Reichardt's dynamic instructions below the words, and then compare this to the dynamic instructions of later composers, such as Beethoven, Schubert, Schumann, and Wolf. Almost all composers adopt prominent dynamics much like Reichardt's.

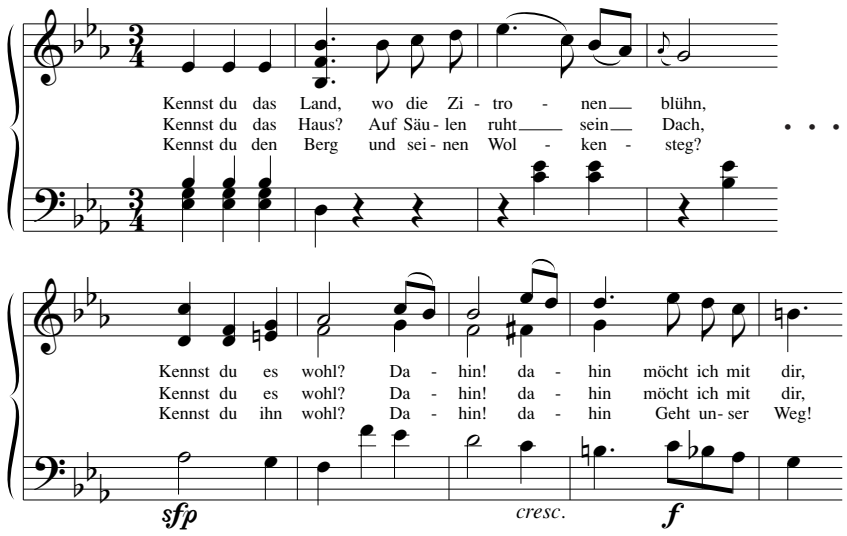
The settings all have a crescendo to a *forte* on the second couplet of each strophe, as shown in Figure 11.7. This is followed, in all settings, by either a decrescendo or a *subito piano* of some sort. Reichardt has a *sforzando-piano* (which is close to a *subito piano*) on the subsequent "Kennst." Beethoven has a *fortissimo,* followed by a *subito piano* at the end of that line. Schubert has a crescendo and then decrescendo in the first and second strophes; in the third strophe, he makes this more explicit, with a *forte* in the voice at "Flut," followed by a *subito piano* in the keyboard. Schumann, too, follows Reichardt's *sforzando-piano,* using repeated *forte-piano* expressions across the same poetic line. Wolf is not shown, but has similar dynamic instructions in this passage.

Almost all settings at this point utilize a musical line which rises in pitch to go with the crescendo in the poetic line.

The basic curvature of physical space-time (see Chapter 1) is shown in many characteristics of music, inclusively that actually heard music, which proceeds as action in space over time, does not move in the type of straight-line, rectilinear motion to which the student may be accustomed from the standard Cartesian coordinate grid, such that a line of music is imagined to be representable by a Cartesian "straight line" from note *A* to note *B*. Rather, music moves along a path of curvature, characterized by wave-like action, and the phrase under discussion may be thought of as a secondary breaking shock wave in a series of musical shock waves. All of the settings sweep up to a secondary peak, both in pitch and in volume, on this line. Following this, the wave falls with the decrescendo or *subito piano,* and eventually sweeps up further to the primary conceptual peak, at "Dahin."

A final similarity, of tertiary importance but still significant, occurs in all settings of the second couplet of each strophe, represented in the first strophe by "Ein sanfter Wind . . ." (not shown). Every setting has either a key change, a rhythmic transformation, a mood change, or a combination of these as the second couplet begins. Reichardt here has an obvious key change, along with a sort of metrical shift. At the end of the first couplet, he pauses under "glühn" with a sustained note in the keyboard, and then simply restarts his accompaniment pattern. Other composers make much more obvious shifts in rhythmic pattern here, but in fact are simply writing contrapuntal variations upon Reichardt's notion that this is a new voice, or new idea. Beethoven and Schubert break into rapidly moving triplets in the keyboard precisely at this point. Schumann takes this a step further, setting the first couplet in quasi-recitative, and then beginning the accompaniment proper at the second couplet "Ein sanfter Wind" with a complex two-against-three rhythmic relationship between voice and keyboard. Wolf similarly, if belatedly, introduces a significant key change on "Wind."

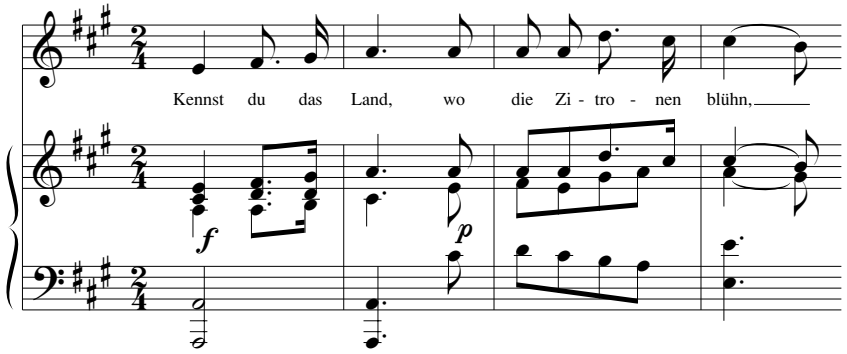
FIGURE 11.8 Reichardt, "Kennst du das Land?"



The *differences* between composers' settings point out the superiority of Beethoven's method of transformation.

Reichardt pointedly ignored the musical progress, the technologies developed to change and transform the poem, which Mozart and Haydn had introduced in the ten years since 1785. He carefully avoided any musical inventions, especially in the keyboard. His keyboard line is the barest, almost unncessary accompaniment, a derivative of the melody, adding little to it.

Figure 11.9 Beethoven, "Kennst du das Land?" Op. 75, No. 1



Beethoven's setting of "Kennst du das Land?"—one of his first Goethe songs—dates from 1809, the year of his comment that "Goethe is easier." Goethe's ignorant complaints about Beethoven's setting point precisely to where Beethoven excelled over Reichardt. Despite Goethe's aforementioned comment, this is neither an "aria," nor "through-composed." It is a Classical varied strophic *Lied* setting.

Correct terminology notwithstanding, Goethe was troubled about something in Beethoven's setting which totally violated Goethe's maxims. Here was a profound development of the new "technology" introduced by Mozart, a completely independent voice-leading among distinct voices in a fully independent keyboard and singer. Goethe complained that Beethoven had made the 13-year-old character Mignon to sing an "aria;" but it was not vocal pyrotechnics which he feared as "operatic." In fact, the vocal range of Beethoven's Mignon, from low E to high F-sharp, is slightly narrower than Reichardt's, which ranges from low D to high F-natural.

Rather, what frightened Goethe was Beethoven's overall concept of *multiple voices*. Beethoven's demand upon the singer is entirely mental, and it is a far more difficult demand than that posed by Reichardt. Here the soprano must conceptualize her part as an upper voice participating in the complex cross-voices of choral writing. Beethoven creates four or more independent choral voices—soprano, alto, tenor, and bass—at all times across the three staves of the *Lied*. This is represented by two distinct voices on the keyboard treble staff, the alto with the upward stems on the notes, and the tenor with the downward stems. Such polyphonic part-writing results in voice-leading passages in the keyboard which transform the poetry in precisely the manner Goethe resented.

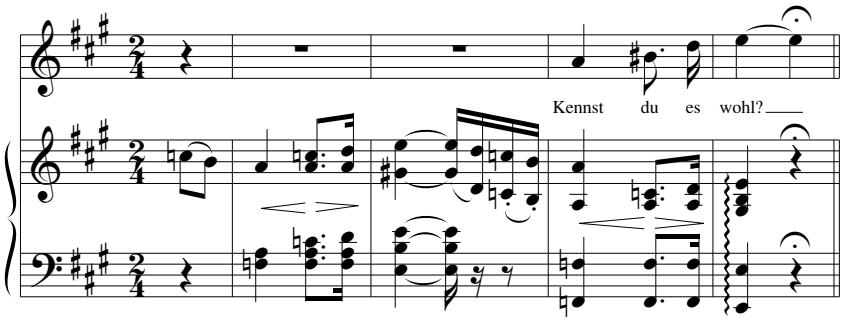
The superiority of Beethoven's setting starts with its registration, which has the most unity of all the settings. Each strophe begins with precisely one singularity in the first register, and ends at the "Dahin" with precisely one set of singularities in the third register.

Beethoven's song is also a textbook example of how choice of a poem with its underlying vocalization, and choice of a voice species (in this case a soprano, with her F-sharp register shift), determines a narrow range of possible keys for bel canto composition. He chooses the inherent rising pitch-pattern of the poem, from "Kennst" to "Land," and from "Da-" to "-hin." He chooses the soprano character voice. He then decides to set the opening phrase with one singularity in the first register, and the closing phrase with one singularity in the third register.

Therefore, if "Kennst" must be in the first register—i.e. *below* F-sharp—and if "-hin " must be in the third register—i.e., at high F-sharp or above—then Beethoven's scheme means that there will be precisely a one-octave range of the "long line." Without over-extending the range and making it into an aria (as Goethe wrongly charged), there is a limited number of keys in which this can be done.

Thus, the opening couplet of each strophe revolves around the register shift from the fifth on the dominant low E in the first register, to the tonic A. To that is later counterposed the rise to the fifth, the high E at the top of the second register, and its transformation in the final verbal imperative "Dahin" passage to the third-register F-sharp (which Schubert later used in "To Silvia"—see Chapter 10).

FIGURE 11.10 Beethoven, "Kennst du das Land?" Op. 75, No. 1



Here Beethoven introduces the problem, the rise to the fifth at the high E, and its potential transformation later to the high F-sharp, in a voice-leading phrase in the keyboard which creates the singer's subsequent phrase.

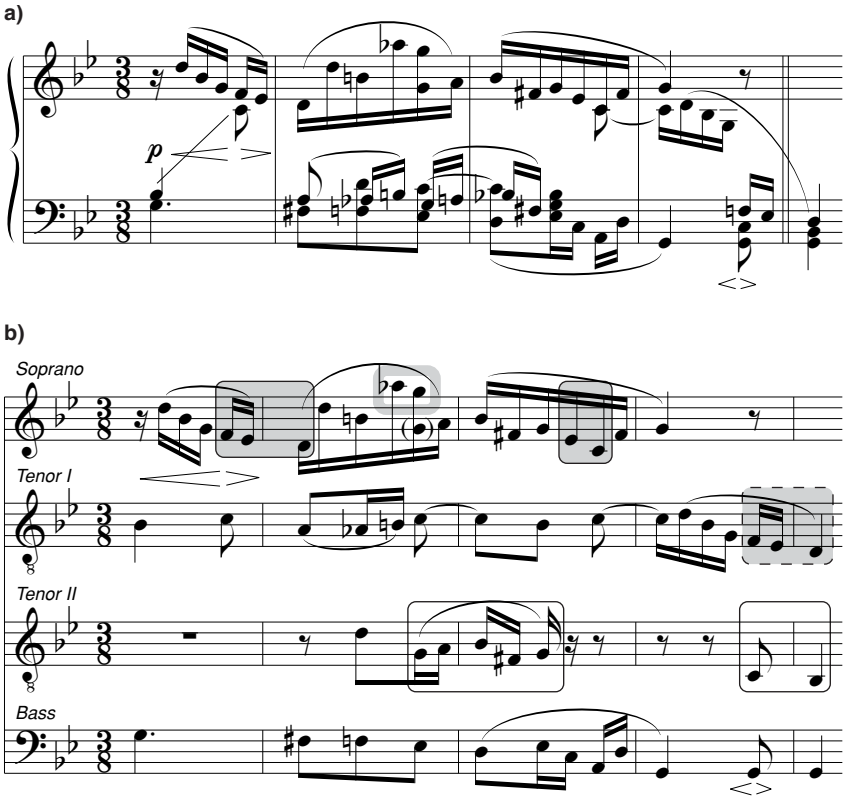
This polyphonic method was so apparent to composers after Beethoven, that over 100 settings of this poem appeared during the nineteenth century. These composers fell into two distinct camps: those who developed Beethoven's idea, and those who fell short of it.

Schubert's early setting (see Figure 11.6) attempts to follow Beethoven in many respects, notably in choosing Beethoven's key of A. But it is inferior to Beethoven's in its deviation from the natural prosody. There is an over-emphasis on the nouns "Land," "Haus," and "Berg," produced by an unnecessary two-note setting for these one-syllable words. The concluding couplets of each strophe have excessive repetitions of "Dahin"—11 per strophe, and 33 in all. Had Goethe criticized Schubert's setting, and not Beethoven's, as "overly operatic," he would have had some grounds for doing so.

Schubert also repeats a sustained high A in each such passage, which is an excessive use of the upper reaches of the third register for *Lieder*. Beethoven, writing in the same key, eschews the high A tonic altogether for that reason.

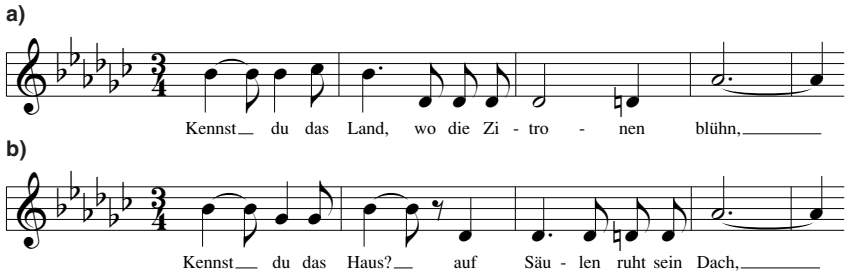
Schubert furthermore is the only composer (other than Wolf, who makes small variations in the first line) who avoids the rigor of a simple strophic setting, despite the fact that Schubert was master of that form. (See below, under the heading "The Simple Strophic Song.") Here, however, Schubert resorts to the minor in the third strophe, principally because having already repeated "Dahin" 22 times in the first and second strophes, he has exhausted his original musical material. By the third strophe, some sort of variation is required, lest monotony ensue. Compared to the more rigorous form of pure strophic setting, this solution is a form of high-level cheating.

FIGURE 11.11 Schumann, "Kennst du das Land?" Op. 98a, No. 1



Schumann's setting is a more obvious development of Beethoven's method, and may be said to return to Beethoven's "main track." Although less immedietely sweet to the casual ear than the melodious Schubert setting, Schumann's has a great deal more of Beethoven's counterpoint, particularly in the keyboard. Schumann has created a four-voice choral keyboard introduction which introduces the soprano voice before the singer's entrance. The second system shows an exploded score of Schumann's voicing.

Figure 11.12 Wolf, "Mignon IV"



Hugo Wolf understood the poetry perhaps better than anyone since Beethoven. But due to the heavy influence of Wagnerian chromaticism, in which arbitrary movement by half-step supplanted movement according to the Keplerian harmonic ordering of the well-tempered system, Wolf's musical execution of the poetic ideas is flawed to that extent. He did not become a truly great composer of the *Lied,* but only a frequently effective one. Nevertheless, because Wolf was a master of vocalization of a poem's basic sonority, it may be said that among all settings of the poem, Wolf's is the most faithful to Beethoven's setting, and indeed is almost a parody of it.

The immediately striking feature of Wolf's setting of "Kennst du das Land?" is that he has used exactly Beethoven's registration, following it more closely than any other composer. Melodically, Wolf has some variation between his strophes, but still reflects his close study of Beethoven's stricter strophic treatment. Wolf constructed his strophes as variations upon Beethoven's basic rising pattern.

The first strophe is almost in a monotone, but this is but a means of setting up the variation, which then converges upon Beethoven's prosody. Wolf's second strophe is much closer to Beethoven's, with its rising /u/ to /a/. In the third strophe (Figure 11.6), it then becomes apparent that the entire setting has been developing in accordance with Beethoven's pattern. At the "Dahin," as in his opening couplet, Wolf is meticulously faithful to the prosody of Beethoven's setting.

Some of Wolf's piano meters in the "Dahin" passages are variations of Beethoven's accompaniment at the corresponding locations.

Schubert: 'More from the Whole!'

Schubert, following Beethoven, became a master of this principle of musical composition. While in his teens, Schubert intensely studied Schiller's aesthetic theory, poetry, and drama. But after many early attempts at settings of Schiller's poems, he, like Beethoven, turned to Goethe's poetry to produce some of his best songs.

Schubert had direct personal experience of Goethe's willful ignorance regarding musical matters. Schubert and his friends sent Goethe volumes of musical settings of his poems, but Goethe ignored Schubert completely. Two letters to Weimar went unanswered. One, in 1816, contained Schubert's songs "Gretchen am Spinnrade," "Erlkönig," "Heidenröslein," and others. A second packet, in 1825, included "Ganymed," "An Mignon," and "An Schwager Kronos." Goethe wrote to others that in general he disliked certain songs he had received, some of which were only simple strophic settings, but nevertheless completely transformed his poems. It displeased him, Goethe complained, "to see oneself many times mirrored, concentrated, expanded, seldom entirely purely."[25]

The fate of Schubert's famous "Erlkönig" shows that the established publishers of the day agreed with Goethe, and that Schubert's *Lieder* were as revolutionary as the music of Beethoven. Goethe published the poem in 1782, as the opening of his operetta *Die Fischerin.* His stage directions read: "Scattered fishermens' huts. . . . It is night, and silent. . . . Nets and fishing tackle everywhere about. Dortchen, as she works, sings." Dortchen is a fishwife, and her song, Goethe wrote, is to be simple, a song which "the singer knows by heart, and turns to in any and every situation. These can and must have only strictly regular tunes, which everyone can easily remember." For the opening performance in Weimar in 1782, the actress Corona Schroeder composed such a simple strophic setting, which Goethe approved.

Schubert's song, composed in October 1815, is famous for being as far as possible from such a "strictly regular" simple song, especially in its very difficult keyboard voices. His friends tried many times to have

[25] Goethe to Marianne von Willemer, July 12, 1821, in: Walwei-Wiegelmann, *op. cit.*

it published, but publishers objected that no one could play such a thing. Schubert even wrote an amateur's version of the piano part, to no avail. Finally the song was sent to Breitkopf und Härtel in 1817. They forwarded it for confirmation to the only Franz Schubert they knew, another musician in Dresden. The latter replied: "With the greatest astonishment I beg to state that this cantata was never composed by me. I shall retain the same in my possession to learn, if possible, who has so impertinently sent you that sort of rubbish, and also to discover the fellow who has thus misused my name." Breitkopf refused to publish the song.[26]

Schubert, with Beethoven, shared Schiller's contempt for the idea of chaining the independent creative power of the composer. His most passionate wish, Schubert wrote, was "to deliver a pure work of music, without any other ingredient but the uplifting idea of a great poem, which is, however, appropriate to be set into music."[27] "O, imagination!" he wrote in his diary of the creative principle, "Thou most precious treasure of humanity, from whom artists drink as well as scholars! O, stay by us, even though acknowledged and honored by few, to protect us from every so-called Enlightenment, every ugly skeleton without flesh and blood!"[28] And elsewhere in his diary: "From the depths of my heart I hate that one-sidedness, that makes so many miserable ones believe that only that which they are pushing, were the best, and all the remains were but nothing. *One* beauty should inspire man throughout his entire life, it is true; yet the gleam of this inspiration should illuminate everything else."[29]

Every great composer has always worked from this principle. The single most valuable documention of this compositional method is the personal account of Brahms's student Gustav Jenner, *Johannes Brahms as Man, Teacher, and Artist*.[30] Brahms's extensive study of Schubert's method is also documented there.

Brahms's motto, Jenner notes, was: "More from the *whole*!" Consequently, his pedagogical approach to the student of composition (who was assumed to already have a thorough grounding in vocal polyphony as reflected in strict counterpoint), was to set the student first at learning how to rigorously compose *Lieder*, rather than instrumental forms. The bel canto polyphonic vocalization of poetry was thus, for Brahms, the foundation for all musical composition.

Brahms focused the student on Schiller's principle of generative transformation of the poem as a whole, as a rigorous, *two-phased* process. The composer must first fully assimilate all of the particular nuances of the poem to be set. Jenner wrote of Brahms: "Whenever he discussed a song with me, the first order of the day was to investigate whether its musical form corresponded to the text *throughout*. He reproached errors in this regard with special severity, as a lack of artistic sense or the result of inadequate penetration of the text. . . . Brahms's first requirement was that the composer know his text in detail. By this he also meant that he should be completely clear about the poem's structure and meter. Then he would recommend that before composing a poem, I should carry it around in my head for a long time and should frequently recite it to myself aloud, paying careful attention to everything pertaining to declamation."

Once this has been accomplished, the composer must then cast these nuances aside and concentrate on penetrating deeply into the core of the unit-idea of the poem, from which alone he is to generate an entirely new unit-idea in song. "He therefore advised me, if at all possible, not to proceed to the working-out of a song until its full plan was already in my head, or on paper. 'Whenever ideas come to you, go take a walk; then you'll find that what you had thought was a finished idea, was only the beginnings of one.'" I.e., Brahms recommended the same working method reported by Mozart, in his abovementioned description of the "over-hearing" of a composition.

"Brahms never composed so-called 'mood-poems,' which consist entirely of an assemblage of word-paintings. Whenever the course of the melody followed the word-expression too closely, he would reproach this with the words, 'More from the whole!' thus getting right to the heart of the matter."

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[26] John Reed, *Schubert's Songs,* Manchester, U.K.: Manchester University Press, 1981; Maurice Brown, *The New Grove Schubert,* New York: W.W. Norton & Co., 1983.

[27] Schubert to Rochlitz, November 1827, in: Heinrich Werl, *Franz Schubert in seinen Briefen und Aufzeichnungen,* Leipzig, 1951, p. 181.

[28] Schubert's diary, March 29, 1824, in: Werl, *op. cit.,* p. 108.

[29] Schubert's diary, March 25, 1824, in: Werl, *op. cit.,* p. 108.

[30] Gustav Jenner, *Johannes Brahms als Mensch, Lehrer und Künstler: Studien und Erlebnisse,* Marburg an der Lahn: N.G. Elwert'sche Verlagsbuchhandlung, 1930. Jenner (1865–1920) was Brahms's principal composition student from 1888 to 1895. An English-language by the Schiller Institute is in preparation.

The Simple Strophic Song

Jenner reported that "of all the song forms, Brahms considered that of the strophic song to be the highest. . . . 'I like my little songs better than my big ones,' " he quoted Brahms. Brahms found the simple strophic song, as with the canon, to be a form so rigorous, so demanding of a unified conception, that only if the student has such a *complete* idea in mind, can the composition be successfully finished. Brahms's use of the simple strophic song as a form for student instruction resembles J.S. Bach's puzzle canons, which he assigned the student to "solve." Jenner remarked that "in the case of a strophically constructed song-text, there is an underlying mood which is maintained through all particulars or all the varied images. . . . In order to achieve clarity about which texts were to be treated strophically and which not, [Brahms] recommended a careful study of the collected songs of Franz Schubert. . . . 'There's not a single Schubert song from which you can't learn something.' "

Whereas Goethe demanded the simple strophic form as a brake upon composers, in the hands of Beethoven and Schubert this simplest of forms became a rigorous framework against which the most complex musical creations could be worked out as a unified whole. Schubert, according to his contemporaries, proceeded much as Mozart had described it, "completely from above" the particulars of a song. Anna Fröhlich reported that Schubert would often view a poem and at the first glance, without writing a single note, would conceive of an entire song setting in his head. Fröhlich brought Schubert Franz Grillparzer's poem "Ständchen" ("Zögernd leise . . .") as a candidate for musical setting, and described Schubert's reaction: "Laid on the piano, repeatedly read through, he cried time and again: 'But how beautiful that is—that is beautiful!' He gazed upon the page awhile, and finally said: 'So, it's already finished, I have it already.' And really, already on the third day he brought it to me complete."[31]

Brahms and his teaching assistant Eusebius Mandyczewski outlined to Jenner the many ramifications, the "do's" and "don't's," of Schubert's unit-process method, in elevating the simple strophic song into a form of high art. They stressed, for example, that Schubert always avoided a *literal* setting of the poetic text in sequence. Of Schubert's setting of Goethe's "Nähe des Geliebten," Jenner wrote: "Schubert set this text to a simple melody in the compass of a few measures. But whoever thinks that this melody is in some way a composing-out of the first strophe of the Goethe poem, according to which the rest of them can be 'sung off,' is quite mistaken. Oh, no! This melody has welled up from the same single deep emotion from which flowed all the images which are so manifold and yet always say the same thing anew. It is a musical expression of what the *entire* poem left as an impression within the composer; and so we find that with each new strophe, as always with Schubert, it glows more fully and seems to say new things, because with the new text the underlying emotion becomes increasingly distinct and is expressed with increasing intensity."

Goethe composed "Nähe des Geliebten" in Weimar in 1795 during the period of his closest collaboration there with Schiller, and it is one of his most musical poems. Out of it, Beethoven made an entire four-hand piano composition, starting with a song and concluding with six variations for two pianists ("Six Variations (*Lied* with Changes)," WoO 74, written 1799, published 1805). If Goethe thought Beethoven's "Kennst du das Land" was an aria, he must have considered this a full opera.

[31] Anna Fröhlich, quoted in: Paul Mies, *Franz Schubert,* Leipzig, 1954.

Nähe des Geliebten

Ich denke dein, wenn mir der Sonne Schimmer
Vom Meere strahlt;
Ich denke dein, wenn sich des Mondes Flimmer
In Quellen malt.

Ich sehe dich, wenn auf dem fernen Wege
Der Staub sich hebt;
In tiefer Nacht, wenn auf dem schmalen Stege
Der Wandrer bebt.

Ich höre dich, wenn dort mit dumpfem Rauschen
Die Welle steigt.
Im stillen Haine geh ich oft zu lauschen,
Wenn alles schweigt.

Ich bin bei dir, du seist auch noch so ferne,
Du bist mir nah!
Die Sonne sinkt, bald leuchten mir die Sterne.
O wärst du da!

Nearness of the Beloved

I think of thee, when the sun's shimmer
gleams from the sea;
I think of thee, when the moon's glimmer
is painted on spring-waters.

I see thee, when, on the distant road,
dust rises;
In deep of night, when, on the narrow pathway,
the traveler shudders.

I hear thee where, with muffled roar,
The wave mounts.
Often I wander in the quiet glen, to listen,
when all is still.

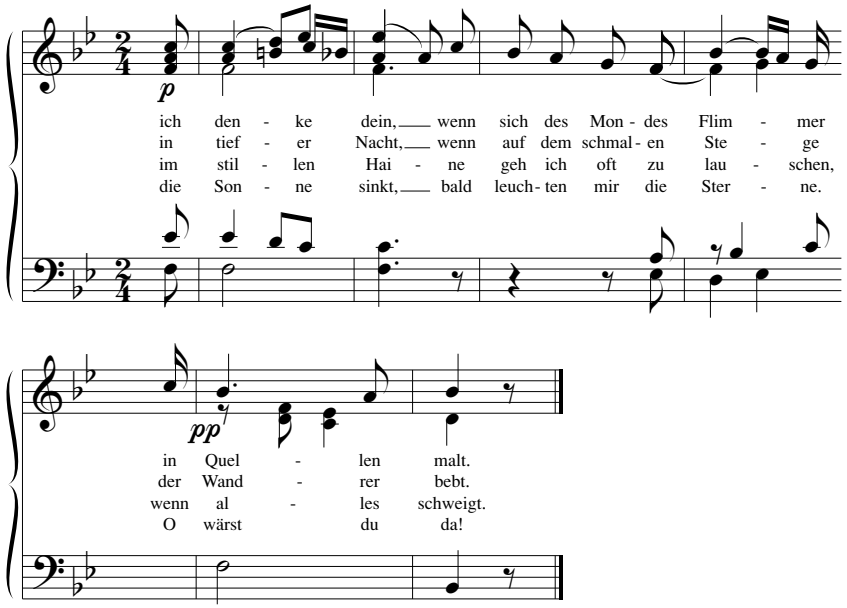
I am with thee, however far away thou be,
thou art close to me.
The sun sets, soon the stars will light me.
O wert thou here!

Goethe's poem has four strophes; each strophe has four lines, cross-rhymed, in a regular iambic meter, with an alternating soft and hard ending to each line. The vocalization proceeds in a long line across the poem from higher vowels /i/ and /e/, to relatively lower more central vowels such as /ɑ/. The predominant bright vowels ("ich," "dich," "dir," "mir") at the beginning of the poem and the beginning of every line, become darker vowels at the end of the poem and the end of most lines ("strahlt," "malt," "Rauschen," "lauschen," "nah," "da"). The last strophe has a distinct quality, reflected also in its more complex punctuation, including the poem's only exclamatory subjunctive. The emotional development intensifies from the simple statement "Ich denke dein," becoming more urgent with "Ich sehe dich," "Ich höre dich," and finally most intense at "Ich bin bei dir"—the point of arrival of the nearness of the beloved. The first three statements describe natural phenomena ("Wenn sich der Sonne Schimmer vom Meere strahlt," etc.), while the last proceeds to human action: "Ich bin bei dir . . . Du bist mir nah."

Goethe accelerates the development poem with a singularity in the third line of each strophe, which prepares the higher quality of the fourth strophe. In the first and second strophes, the speaker pauses twice: in the first and third line after precisely four beats, such as at "Ich den—ke dein," and "In tie—fer Nacht," for a comma and caesura.

In the third strophe, Goethe introduces a singularity, a long phrase with a comma only at the end: "Im stillen Hai—ne geh ich oft zu lauschen," with no pause until at least the fifth syllable after "Haine." This is deliberate, since he could have omitted the final "e" of "Haine" in order to maintain the rhythm of the first two strophes. Goethe creates a metrical irony here, in that the "I" grows more active, because the new five-syllable phrase puts extra stress on the following verbal phrase "geh ich": "Im stillen Hai—ne *geh ich* oft zu lauschen," is heard. This is the only sentence in the poem which is constructed in this different way. This singularity in the third strophe presents difficulties for a simple strophic setting.

Figure 11.13 Reichardt, "Nähe des Geliebten" No. 23 (1795)



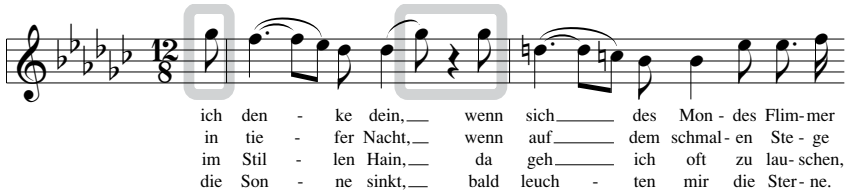
Contrast Reichardt's 1795 setting with Schubert's. Reichardt makes the mistake of composing the poem *ad seriatim*: He simply sets the first strophe, and lets the rest be "sung off," in Jenner's pejorative description, as the tail follows the dog. Reichardt misses Goethe's major poetic ideas in the third and fourth strophes, let alone improving upon the poem. Reichardt directs the listener's attention to the particulars of the text of the poem, and not to its concept. The melody is simple, with no difficult intervals. Reichardt failed to hear that his melody, grounded as it is in the first strophe, becomes clumsy in the third strophe precisely at Goethe's new development "Im stillen Haine *geh*. . . ." Instead of emphasizing a singularity at the verbal action "*geh,*" it draws out the less important noun "Haine."

Reichardt's preoccupation with the first strophe also yields an inadequate treatment of the important shifts in the poem from the first and second strophes, to the final two strophes. For example, in the fourth and fifth full measure of the example, the rapid sixteenth notes proceed from a linear setting of the first strophe's ending, ". . . Flimmer in Quellen malt."

Conceptually, however, the most important phrase in the song occurs just there, but in the fourth strophe, at the exclamatory subjunctive "O wärst du da!" By rushing this with sixteenth notes, Reichardt misses the concept, spoiling the entire song. The 2/4 measure merely copies the rhythmical short-long of the iambic meter.

Reichardt himself was dissatisfied with this setting, and rewrote it later, correcting some of these flaws.

Figure 11.14 Schubert, "Nähe des Geliebten," Op. 5, No. 2 (1815)



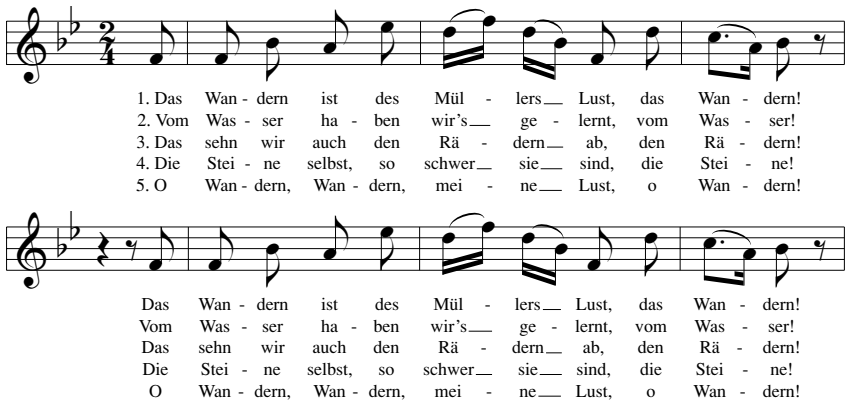
Schubert was familiar with Beethoven's version, as well as with both Reichardt settings. He chose the simple strophic form, but so scorned a *seriatim* setting based upon the first strophe, that his melody is actually somewhat awkward in the opening two strophes. For example, were Schubert simply considering the first strophe (as Reichardt did), there would be no reason for the accent on "wenn *sich* des Mondes Flimmer." In the second strophe, that accent is even more awkward, on the less important syllable "auf." Only at the end of the song, is it seen that Schubert proceeded from the underlying concept of the poem, which is revealed in the fourth strophe. Schubert's vocal line is entirely appropriate for the climax in the final strophe, when the sustained figure grows with the shining of the stars.

Regarding Goethe's singularity in the third strophe, Schubert's method again demonstrates the superiority of working from the concept of the poem as a whole. Schubert saw that the concept required the melodic line to be vocalized according to the fourth strophe, as shown above, with emphasis on the verbs "sinkt" and "leuchten." Such a vocalization, however, would have distorted the third strophe, splitting up "Haine" in such a way as to accent its final syllable on the high G-flat, and accenting the pronoun "ich" rather than the verb "*geh*." Schubert needed to alter either his melody, or the poem's text. He boldly changed the text, dropping the final dative "e" of "Haine" and substituting the particle "da" to begin the next phrase. Schubert made the change carefully, shifting only a predicate, so that nothing conceptual was lost in the third strophe. That is, he demonstrated his understanding not only of the fourth strophe, but also of the need for Goethe's singularity in the third. His tiny change maintained not only Goethe's rhythm, but also his conceptual verbal emphasis on "*geh* ich."

Schubert also represents the line-shifts adequately, for example, with a register shift beginning the final measure of this example. (Robert Schumann has an adequate, but different solution to these problems in his soprano-tenor duet setting of the same poem.) He was thus not merely avoiding the mistake of a *seriatim* setting. His positive approach was to go to the core idea of the poem, the non-literal, unspoken concept of the poem as a whole, and to structure the vocal and instrumental lines in such a way as to anticipate the development to that end-result over all the strophes.

In order to accomplish this artistic purpose, Schubert often introduced something into the vocal line of a song which is *contrary* to a literal reading of the natural music of the poem. Jenner relates a story told to him by Mandyczewski, who was editing Schubert's songs for the first time from the manuscripts. Mandyczewski came across a manuscript in which Schubert had crossed out a very good vocal line for the first strophe of a strophic song, after he found a better setting for the song as a whole. Schubert used the latter in publication, despite the fact that it was nowhere near as good for the first strophe as the setting tailored to the that strophe had been, because "the effect had to intensify, rather than flag," through the *whole* song. As many singers and accompanists have observed, it often seems at first that Schubert has taken something away from what might have been done with the setting for the first strophe; but this is done in a manner which anticipates something which is coming in a later strophe, or which anticipates a need for some variability.

Figure 11.15 Schubert, "Das Wandern," from *Die Schöne Müllerin,* Op. 25, No. 1



Another clear example of the same principle is the voice line of "Das Wandern," composed not from the prosody of the first strophe, but from that of the fifth strophe. The opening leaps of a fourth and fifth (F to B-flat, then A to E-flat) are a repeated refrain. The words, however, are awkward in the first strophe, and indeed never repeat on those notes, until the fifth and final strophe: "O, Wandern, Wandern, meine Lust!" which is revealed to have been the compositional reference-point.

The final strophe also shows the vocalization of the poem on which Schubert based his theme. It rises from /a/ to /ɛ/ ("Wandern") twice, then to the highest vowel /i/ on the high point of "meine," and returns to the lowest note on the lowest vowel, the /u/ of "Lust."

That, and the distinctly differing sonorities of each of the five strophes, gives the song as a whole a comprehensible development such that five strophes is *not* too many, as singers often claim by way of an excuse for the popular bad habit of singing only three of them.

Accompaniment of Strophic Song

True artistic creation of the strophic *Lied* must be achieved not only by perfection of the vocal line, but by its polyphonic development with respect to the piano accompaniment. Thus, Brahms would say, in choosing the accompaniment for the song line, that the composer should choose a piano accompaniment which is designed to facilitate this progressive process of bringing a composition conceptually to a complete statement, and which would be incomplete without such.

In strict strophic settings, Schubert always created a strophic accompaniment which was *not* intended to be performed in a constant manner for the singing of each successive strophe of the poem. Rather, he anticipated the variation which must occur in the singer's treatment of each strophe, and created an accompaniment which is adapted to the performance of all the strophes.

Figure 11.16 Schubert, "Nähe des Geliebten" (Second Version), Op. 5, No. 2

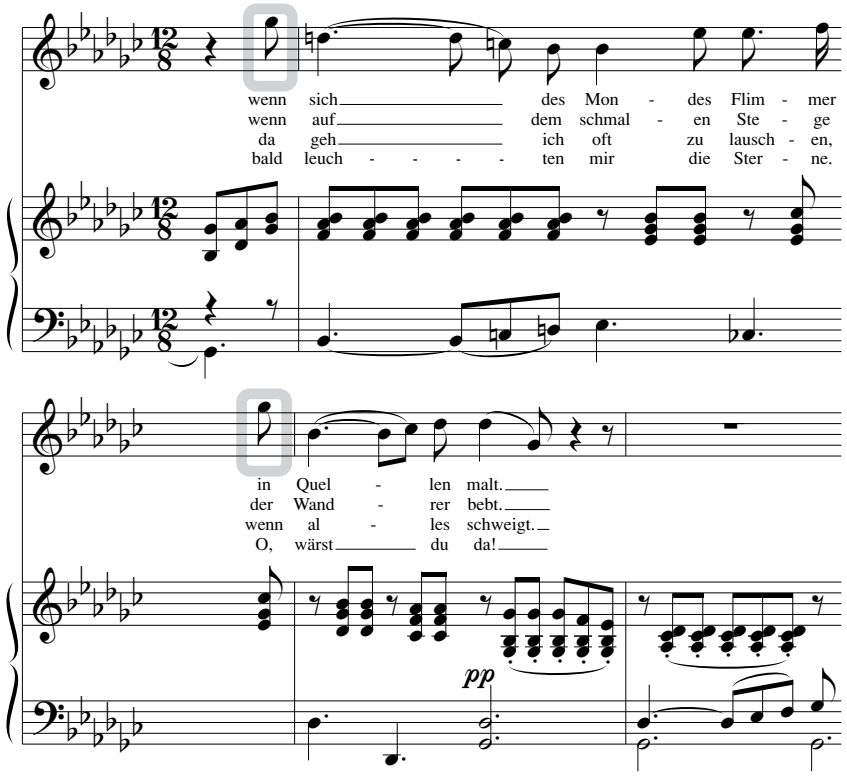
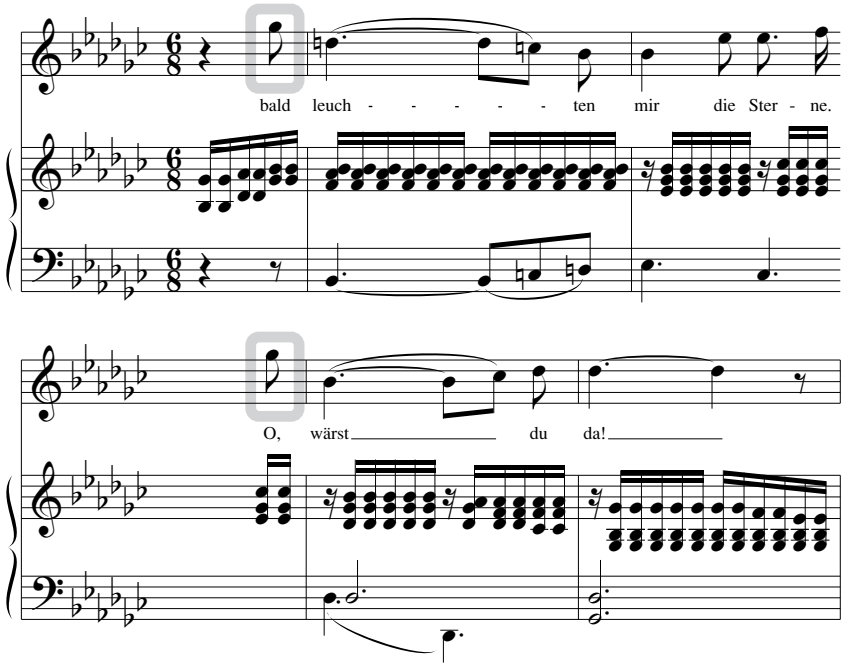


Figure 11.17 Schubert, "Nähe des Geliebten" (First Version), D. 162a



In was on these grounds that Schubert reworked the accompaniment to "Nähe des Geliebten" before publishing it. Compare Schubert's final setting (Figure 11.16), which the composer preferred and published, to his initial one composed earlier the same day (Figure 11.17). One major change is to slow the rapid sixteenth-notes in the first draft, into eighth-notes in the final setting. Schubert considered this second setting superior, because of its more sustained emotional intensity, caused by the manner in which the voice is more suspended (i.e., supported with fewer notes) over the slower eighth-note accompaniment. Over the course of the song, this evokes that quality of love, sustained and stretched across time and space, which is the poetic effect not of any one strophe, but of the song as a whole.

The song is directed at the final wish, "Bald leuchten mir die Sterne. O wärst du da!" equating the beloved with the infinite extension of the stars. In both versions, Schubert breaks his insistent accompaniment rhythm here, interposing rests on the strong beats of the piano treble,

where before there had been constant motion. At the final "O wärst du da!" this leads to the ultimate "suspension" of the voice over the bass line in the second system of Figure 11.16, as it makes a dramatic full-octave drop from D-flat to the D-flat below.

The momentary relenting of the insistent piano treble pattern at the end of Figure 11.16, makes the voice hover as if suspended, with nothing underneath it. The effect is only noticeable *over the course of the song,* and thus requires both pianist and singer to *perform each strophe with a different degree of this sustained quality*. It is barely noticeable in the first strophe, where it is not particularly related to the poetry, nor in the second. But meanwhile, the sense of suspension at the end of the first and third strophes, each concluding with an incomplete verbal action ("malt," "bebt," "schweigt"), impels the song to continue.

The passage with the rests becomes noticeable in the third strophe, where "wenn alles schweigt" is a full dependent clause, and then is sustained most obviously at "O wärst du da!" of the fourth strophe.

Once this progressive, changing emotional quality of suspension across the time-passage of all four strophes is recognized as the concept of the song, the quicker sixteenth-notes of the first version are revealed to be far too choppy, breaking up the sustained quality. The later version, of course, lengthens not only the notes of the repeated figure, but the rests as well.

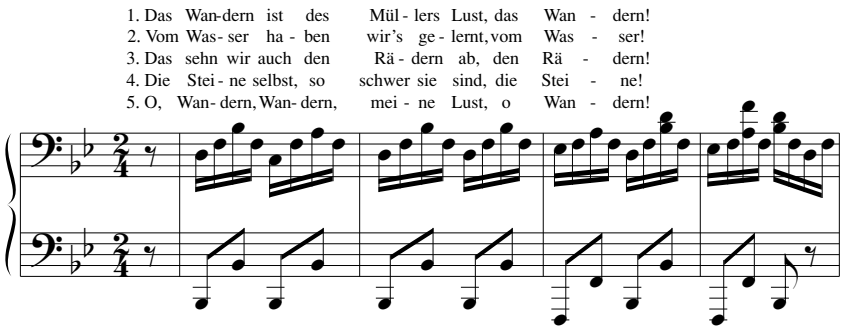
The repeated rising bass motif, which becomes the postlude, is a variation on the theme of the final "O wärst du da!" Both that vocal phrase and bass motif occur in dotted-quarter and eighth-note (usually contrary) motion. In the discarded first setting, the sixteenth-notes which double the keyboard's treble line against that vocal-bass motif, tend to break up that line. In the second setting, the eighth-note motion in the right hand is in phase with that of the bass and vocal theme.

A related proof could be made from Beethoven's "Six Variations (*Lied* with Changes)" WoO 74. Beethoven's theme ends in a similar stretching of the voice over eighth-note motion in the piano on "O wärst du da!" from which he crafts several bass and other accompaniment lines in contrary motion, to which Schubert's setting refers.

In Schubert's strict strophic songs, the accompaniment must be played differently each time. This does not mean, however, that Schubert desired a Wagnerian "program music," a mere imitation of the specific imagery contained in the poem. In "Das Wandern," modern pianists often seek to imitate the water, the mill wheels, and the mill stones, but this is Romantic and incorrect. Nor is arbitrary variation for its own sake admissible.

Rather, in strophic form, in poetry itself, and therefore also in the *Lied* setting of the strophic poem, there is a progression, such that one is, in a sense, holding back in the performance and in the composition, in order to bring the work to a proper conclusion. The most important thing in a composition is the unity of effect of the composition as a whole. Each subsection must have a sense of completeness; it must convey a sense of being neither too long, nor too short, of having said what it must say, and then becoming silent and bringing on the next movement or next composition.

Figure 11.18 Schubert, "Das Wandern" from *Die Schöne Müllerin,* Op. 25, No. 1



This is the first of a 20-song cycle, and the verbal gerund "das Wandern" is repeated precisely 20 times over the course of the five strophes, so that monotonous execution would destroy not only the song but also the audience's attention to the entire cycle. Working from the vowels and consonants of the poetry, it is seen that differentiated patterns emerge which Schubert has exploited, and which allow us to form hypotheses about how the five strophes may be varied.

The pattern of the syllables in the first strophe is longer ("Wandern," "Lust"), and may be sung and played *legato*. The consonants are more prominent in the second strophe ("Vom Wasser . . . das hat nicht Rast"), and in order to be enunciated properly, require a more *marcato* singing and playing. Relative to the second strophe, the first does not have as many double-"s" and harsh consonants, and the stressed /u/ of "Lust" and "muß" in the first strophe is a deeper vowel which requires more time to enunciate with the necessary pursing of the lips. The third strophe returns to the *legato* style, and the fourth repeats the *marcato* style. The fifth strophe is then properly situated as the "breakthrough" at the end, a singularity, which returns to the *legato* by virtue of the longer vowels, but which must be sung and played in an entirely new voice—for example, a new quality of *piano*.

All musical thought is essentially located in that kind of transfinite ordering, a process of development which is not merely a development in the sense of a succession that we can map out (*B* following *A, C* following *B,* etc.). Rather, the ordering of *A, B, C,* and *D,* as variations and development, itself is a unified conception, an indivisible conception, a *One;* and that *One* is the essence of the idea of the composition.

It is not the sameness of the composition which is the composition throughout, but rather the slight variation, the differences. So, it is recognized that there is something which is "almost the same as," but not quite so, and the succession of "not quites" and how these "not quites" are integrated and ordered, is what ought to occupy our attention. From understanding how these things are ordered to be slightly different from one another, there arises a unifying conception of the compostion as a whole.

That is the particular genius of a well-performed Schubert strophic setting. It is not colored by wild, arbitrary, Romantic variation for color or effects; but rather, the apparatus of performance is used to make these very slight distinctions, which never violate the rule. Yet in this degree of variation, it is an underlying dynamic in going from one strophe to the next, which at the conclusion becomes a very special quality of excitement, an excitement of being in the presence of something ghostly from the standpoint of ordinary sense perception—a ghostly presence behind the ordering of sense perceptions, a ghostly presence with a personality.

At the end, the listener recognizes the face of this ghostly presence, a *metaphor* for the composition as a whole. He associates that presence with the name of the composition, named for the metaphor, and that metaphor is the concept of the composition. That is precisely what Schubert usually does. That is his genius in the compact strophic songs, and is also the same principle in other forms of composition: to portray the clear image of this face as a name for the metaphor, this ghostly presence, which becomes fully clear at the end of a well-performed composition.

CHAPTER 12

Theme and Variations

Instrumental Variations as Vocal Music

Brahms's assignments to Jenner,[1] along with the simple strophic song, included theme and variations as the related study task of the student composer. Brahms's stress upon this aspect of musical composition, together with his emphasis on strophic song, makes clear that he understood theme and variations to be not only a compositional form, but a method of compositional thought which is deeply rooted in the vocalization of Classical poetry. Theme and variations is therefore an ideal pedagogical route to the rigorous extension of the principles of bel canto vocal polyphony into the realm of musical instruments. The form obliges the composer to remain firmly rooted within the vocalization and poetic ironies of the original "song" or theme, and restrains the composer from becoming so intoxicated with the increased potential offered by instrumental music, that he yields to the temptation of throwing overboard the principles of bel canto polyphony, and leaps into the vast ocean of arbitrariness which has come to be called "absolute music" or "pure instrumental music."

At the same time, the theme and variations form is a rigorous exercise in constructing a *unit-transformation,* comparable to the exercise rigor involved in the composition of a canon or a simple strophic song. The act of working out a rigorously ordered series of variations demands that the composer take an entire poetic unit, in this case, the theme, inside the mind completely, and transform that material again as a new unit-creation.

Jenner writes: "No form is so well-suited to teach the beginner how to distinguish what is essential from what is inessential, to educate him in artistic, rigorously logical[2] thought, to preserve his disciplined imagination from arbitrary excesses, and to refine his sense for pure form. It is certainly not enough to merely ornament the theme's melody with a few arabesques; on the contrary, the object is to penetrate deeply into the core of the theme, and out of it, to invent new things, without, however, violating the form of the theme. . . .

"[W]hen working on variations, I cannot help being reminded of my contrapuntal studies on a given cantus firmus. For here, too, the freely creative imagination remains on a firm footing, directed by the will toward a clearly recognized, conscious goal and protected against all arbitrariness. But only an acute, continually practiced artistic sense is capable of firmly laying that basis; only a great energy of will is capable of never losing that goal from sight and attaining it on the straight path; and these two factors to a large degree determine whether the work of art assumes that stamp of necessity which assures that it will have a deeply compelling effect.

"In the variation form, that which is essential is given in the theme; in the preservation of this essence within the form, the mind is exercised and sharpened, the will is steeled, and the imagination becomes more profound, in that it becomes accustomed to exhausting the content of an idea."

The theme and variations form therefore satisfies the most difficult requirement of the creation of a unit-transformation, namely, the requirement that the transformation be entirely lawful, i.e., that every aspect of the creative transformation be congruent with the negentropic ordering of the universe as a whole. Classically, this problem was posed by Plato in his *Parmenides* dialogue as the transformation from the *Many,* to the *One*. (See Chapter 9, pp. 152–53.)

The question is, how is this transformation achieved within the creative mind? How can it be demonstrated that there is an *ordering principle* a principle which is lawful, by which the transformation takes place, other than arbitrary re-arrangement of the *Many*? The theme and variations is a unique method for demonstrating the transfinite ordering principle behind the *Many*-to-*One* transformation.

This requires "problem-solving" in the process of composition. There is the desired result, or problem, and the need to *generate* the precise means to achieve the result, the solution. That implies a notion of lawfulness in taking the problem, and creating the solution, by the very attitude of viewing the process and problem and solution, respectively. Thus it is common for great Classical composers to report upon the

[1] Gustav Jenner, *Johannes Brahms als Mensch, Lehrer und Künstler: Studien und Erlebnisse,* Marburg an der Lahn: N.G. Elwert'sche Verlagsbuchhandlung, 1930. An English-language translation by the Schiller Institute is in preparation.

[2] Brahms's use of the word "logical" here does *not* signify Aristotelian inductive-deductive logic. Rather, he uses the term somewhat loosely, to denote rigorous thought in conformity with Reason, or with what in the Bible is described as "the Word" or in Greek "logos."

experience of composing an entire work in the mind, and only afterwards, writing it down. The actual work, of conceiving of the musical problem and creating its solution, is done entirely within the mind. Frequently, the composer will write down a unit of music for the audience's sake, as a scientific demonstration, as an ordered presentation, or a re-ordered presentation, of the ordering principle by means of which the piece was composed. For example, this was the guiding principle behind Beethoven's later works.

The fully developed theme and variations demands a concluding fugal section. This requirement stems from the polyphonic nature of the original thematic material, which consists not only of a melody, but of a *vocal* bass line (see below). Over successive variations, the constraint imposed by strict adherence to the bass line assists the mind in the effort to comprehend the ordering principle employed. Yet at the point that the composer has fully developed the two polyphonic lines simultaneously with respect to each other, this constraint becomes an impediment to the full presentation of the composition as a unit-transformation. The fugue's explicitly vocal choral polyphony[3] enables the composer to now bring the melody line and the bass line—or elements thereof—into their own ordered succession, such that the two lines become transformed into a single concept. The fugal section is then generally followed by a concluding or coda section, which celebrates, in symbolic form, what has been achieved.

In all its essentials, the exercise of composing a theme and variations along with its concluding fugue, is identical to the process which the composer must go through, with varying degrees of elaboration, in the composition of the *Lied,* as discussed in the two preceding chapters. The difference lies only in the far greater compactness of the *Lied.* Indeed, the working-out of a theme and variations on a given thematic material should be approached as a *preparatory exercise* for composing a successful *Lied.* That exercise completed, the composer has arrived at a conception which can be compacted in what seems a very innocent little piece of strophic song-writing, but which has imbedded in it certain characteristic features of what differentiates a mere vocalization—as recommended, for instance, by Goethe and executed by Reichardt—from the far richer conception of Beethoven, Schubert, *et al.* Conversely, those small, sometimes exceedingly subtle differentia, reflect the knowledge, expressed in a more elaborate way, by a polished theme and variations.

[3] The fugue historically was based on the human vocal choir. It arose from the sixteenth-century Italian "canzona" (in French, "chanson;" set also by Thomas Morley as "canzonettes" in English), from the Italian verb "cantare," to sing. The canzone were instrumental models of the Italian and French contrapuntal madrigals, vocal pieces with three or more different voices. The early sixteenth-century canzone were based on simple imitative series of entrances at the fifth.

Translated into organ music in Italy, the form was dubbed "fuga" from the Italian verb "fugire" meaning to flee, and also "fleeting" or "transient" because of the extended internal contrapuntal development of each voice which was then created. Each voice consisted of a rapid series of particulars, which were transient, with the process remaining primary. Other terms originally used to denote fugal writing were "caccia" (Italian), "chasse" (French), and "catch" (English), denoting the "hunting" of one thematic statement after another.

The Bass Voice in Variation

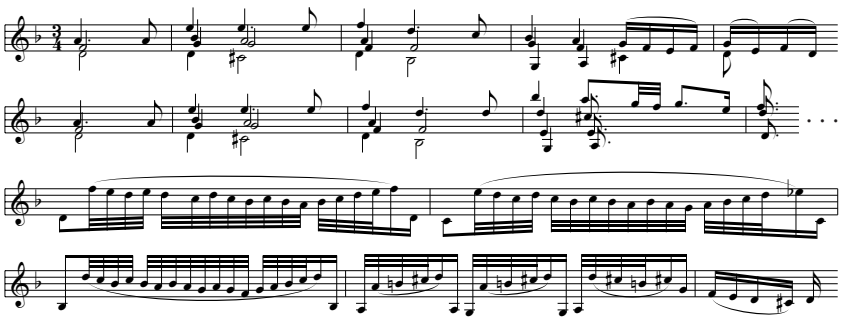
Brahms guided Jenner to focus first on the bass line of his thematic material: " 'The bass is more important than the melody,' [Brahms] said. Not that this bass line had to be preserved under all circumstances; but through the complementary and explicatory melodic line of the bass, the melody of the upper voices first takes on a definite physiognomy, and a variation of the bass can modify the entire character of a melody more strongly than a variation of this melody itself. Thus Brahms rigorously insisted that the variation of the bass line, despite new turns of phrase, must not arbitrarily destroy the sense and character of the original course of modulation—not even when, as occurs often in Brahms, the course and the goal of the modulation is altered. . . .

"Here, too, the variation, the development, must proceed from what is already given, if the whole is not to take on the impression of arbitrariness. 'You must always keep your goal fixed before your eyes, and that is only possible when the bass line is firmly established; otherwise you're floating in the air; and now let's go straight at the target, without any diversions!' "

In order to maintain this unity above all else, Brahms was conservative about changes in key: "Brahms did not find fault when I changed key in individual variations. Both the theme and the kind of variations also have a say in this matter. But it is also certain that he himself, along with Beethoven, always made more restricted use of key

changes, and that he considered the most rigorous and elevated form of variation to be the Bach Chaconne."[4]

Figure 12.1 J.S. Bach, "Chaconne" from *Violin Partita No. 2 in D minor,* BWV 1004



Here Bach conceives of the widest possible type of variation on a simple four-measure bass theme. The movement remains almost entirely within D minor and D major. The bass voice is able to unify the broadest range of variations.

The same constraint is followed in most Classical theme and variation forms. With the exception of concluding fugal or coda passages, the key is usually restricted to the major and minor of the original key, along with the respective relative minor. Some examples: Beethoven's early variations, such as that upon Paiseillo's *Nel cor non più mi sento* WoO 70, are all in the basic key of G, varied between major and minor. Beethoven's *15 Variations and Fugue on an Original Theme* ("Eroica" Variations), Op. 35, are all either in the initial key of E-flat major, or in a few instances in E-flat minor or the relative C minor. Brahms's *Variations and Fugue on a Theme by Handel* Op. 24 similarly remain within either B-flat major or B-flat minor.

Brahms told his collaborator, the violinist Joseph Joachim, that J.S. Bach's *Goldberg Variations* and works of other older composers such as Handel had shown him that they composed their variations more from the bass line than even Brahms had done. Brahms told Joachim of his intention to shift his compositions further in that direction.

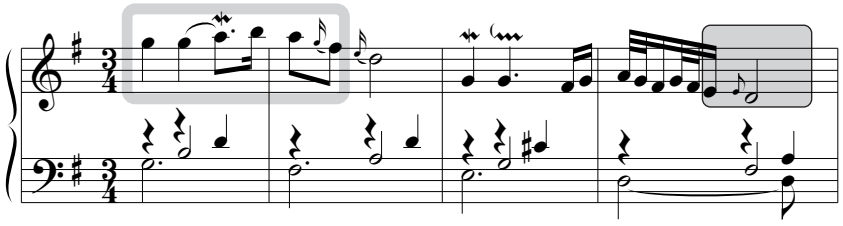
Study of the most elaborated variations by Handel, Bach, Beethoven, and Brahms, demonstrates that the bass line is a *human* choral voice, an individual singing voice with whose specific characteristics the audience is assumed to be familiar. The individual notes of the bass line are varied, but the concept of one continuing human voice is invariant throughout. Even in those cases when the bass line is transposed upward or downward by a variety of intervals, it preserves its "hereditary" relation to the distinguishing register shifts of the human bass voice, even as the registration of some other voice species is superimposed upon it. That secondary voice species superimposed upon the bass line, may be derived either from the poetry of the thematic statement itself, or (in the case of wind and stringed instruments) from the secondary registral characteristics of the particular instrument.

Keyboard Variations as Vocal Polyphony

Classical composers throughout the ages have always understood keyboard instruments to be replicas and extensions of the human singing chorus. The oldest organ keyboards were built to contain distinct human soprano, tenor, and bass voices. The "built-in" registration of stringed keyboard instruments generally follows that of the child or female soprano voice. But the well-constructed keyboard instrument has the additional advantage of being flexible enough to imitate any one or more of the entire array of voice species. (See Book II.) This "vocal transparency" of the keyboard instruments makes variations for keyboard alone into the ideal departure point for our investigation.

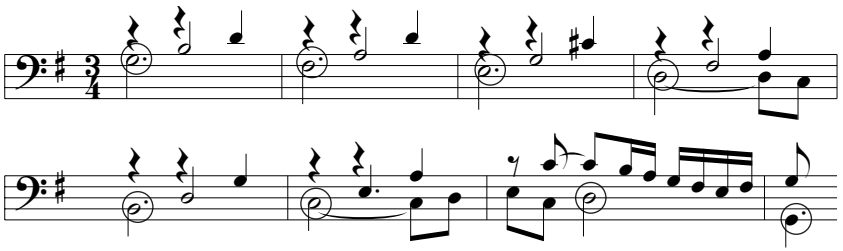
[4] The chaconne was originally a seventeenth-century vocal aria form—not a dance—created in order to allow bel canto singers to improvise freely with their highly florid vocalizations. To create a coherent unit-concept within which the voice could work, the instrumental bass played a "ground bass," in which it repeated a specific pattern. In the chaconne, the bass pattern generally begins at the tonic, briefly falls, and then rises back to the same tonic from which it began, as in Figure 12.1.

Figure 12.2 J.S. Bach, Aria from *Goldberg Variations,* BWV 988



The treble voice of the aria shows the familiar poetic outlines of a soprano-registered voice. The first couplet begins in the third register, and ends in the first.

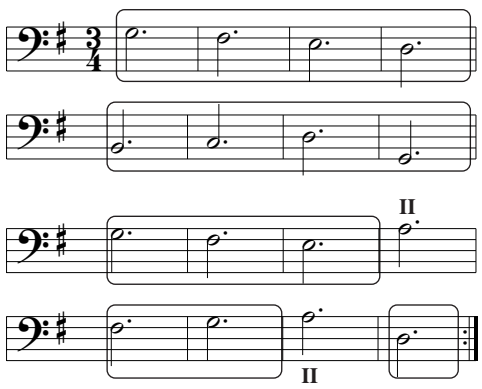
Figure 12.3 J.S. Bach, Aria from *Goldberg Variations,* BWV 988



Bach's *Goldberg Variations* are a beautiful example of how a well-conceived bass voice line can enable the composer to acheive a remarkable degree of freedom in varying the soprano and other voices, often almost beyond recognition, while preserving poetic unity over an extended span of development. The Goldberg bass is in a passacaglia,[5] and functions as a pedal point series (see Figure 12.12). Bach has set this passage entirely within the bass voice's first register, in order to give a unit-concept to the very short bass theme. Bach uses it to create harmonic coherence through the composition.

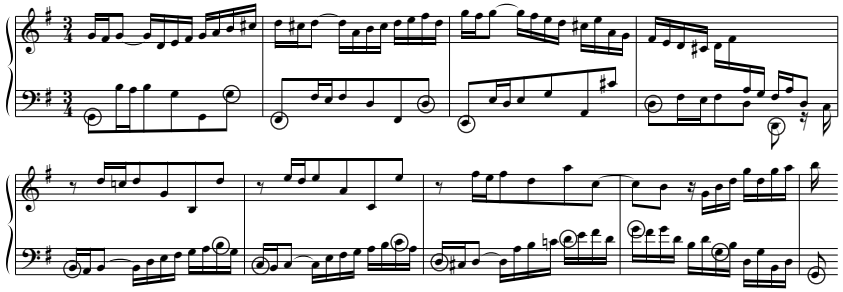
[5] The passacaglia was an aria form similar to the chaconne. The ground bass repeats throughout the aria, in this case, in a descending pattern, falling from the tonic to the tonic an octave below, as in Figure 12.3. In the nineteenth century, the two terms began to be used interchangeably.

Figure 12.4 J.S. Bach, *Goldberg Variations,* BWV 988, Bass Voice of First Two Couplets



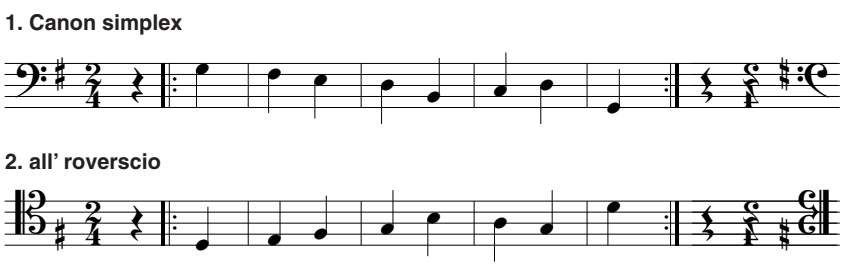
These first eight measures of the bass voice mark the first poetic couplet of the aria, which consists of two stanzas with two couplets each. The second couplet begins the same way as the first, but then instead of descending from E to D, it jumps up to A (register shift), after which it precisely mirrors the notes of the second line of the first couplet, only transposed upwards by a fifth. The aria is thus based on variation of the bass line, and each successive variation is actually a *variation on a variation*. This is what allows Bach to so greatly extend the composition's development.

FIGURE 12.5 J.S. Bach, *Goldberg Variations,* BWV 988, Variation 1



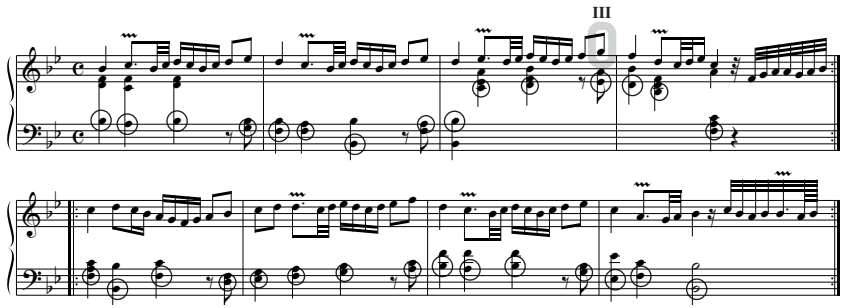
The bass vocal line, sometimes over the same time frame, sometimes over an extended or compressed time frame, is the basis for each variation. Variation 1 achieves a free transformation of the soprano theme (including inversion of the theme's soprano register pattern) by a rigorous maintenance of the bass voice. The notes circled represent the original bass of the theme.

FIGURE 12.6 J.S. Bach, *Various Canons Based on the First Eight Bass Notes of the Preceding Aria,* BWV 1087



Later Bach wrote a series of puzzle canons on the same eight notes, to be used as instruction for students of composition.

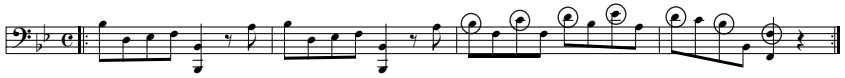
FIGURE 12.7 Handel, Aria from *Suite in B-flat Major,* HG II.ii.1



Handel, highly trained in composition for the bel canto voice, was careful to compose a theme entirely based upon the registration of the human voice. The bass line is a classic example of an opening statement in the central register, followed by a poetic apposition in the higher register—in this case, the human bass third register—which begins on D above middle C.

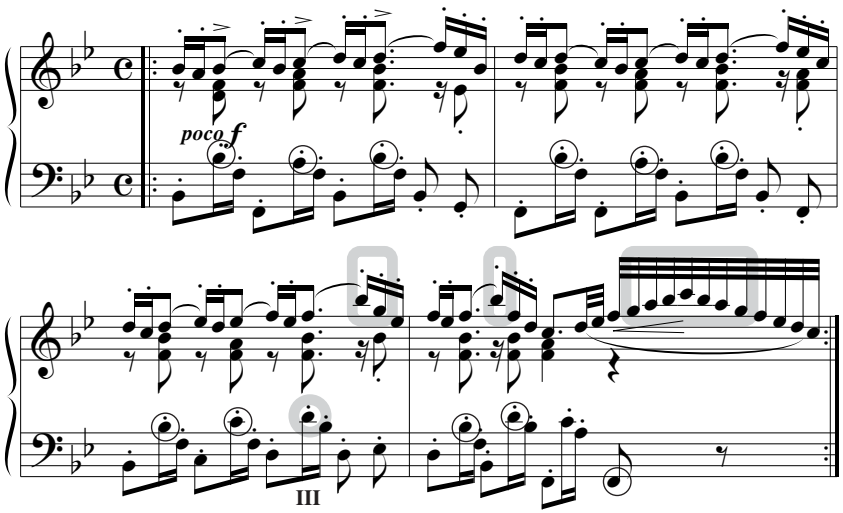
Handel also constructed the registration of his soprano line in coordination with the bass line, such that just after the bass shifts into the third register, the keyboard treble voice makes its sole shift into the third register. The soprano voice otherwise remains entirely in the second register, thereby lending even more prominence to the third-register singularity and its relation to the bass line.

FIGURE 12.8 Handel, *Suite in B-flat Major,* HG II.ii.1, Variation 1, Bass Line



Handel, as did J.S. Bach, used the principle of varying the bass while maintaining it as a coherent human choral voice, to allow freer variation of the treble. The notes of the bass voice are circled.

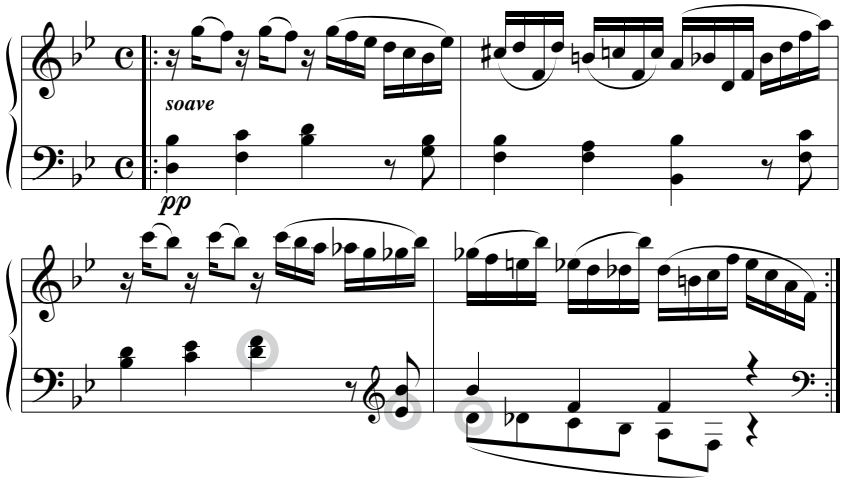
Figure 12.9 Brahms, *Variations and Fugue on a Theme by Handel,* Op. 24, Variation 1



Brahms adopted Handel's aria note-for-note as the basis of his own Op. 24 piano variations. His opening theme is identical to Handel's. His first variation demonstrates the principle of conducting his variations especially in the bass line of which he spoke to Joachim. He does so by turning the first three bass notes B-flat–A–B-flat, through diminution and transposition into the soprano voice, into the motivic element of the variation.

This first variation, while so attentive to the bass, is simultaneously so attentive to the soprano registration as to make a pun on it. Taking a cue from Handel's Variation 3 (not shown), Brahms emphasized the shift in the Aria's third measure to the third register by setting it a minor third higher than the high G of the Aria, on a repeated high B-flat. He further commented upon this by transposing the final thirty-second note flourish an octave upward, creating a humorous echo in the third and fourth registers.

Figure 12.10 Brahms, *Variations and Fugue on a Theme by Handel,* Op. 24, Variation 12



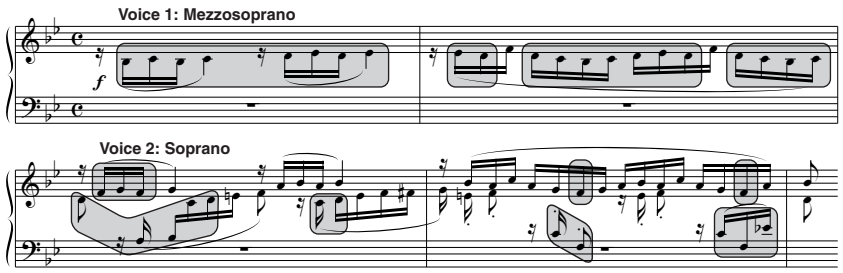
Throughout his extended series of variations, each variation consistently follows the outlines of the bass line as presented in the original Handel aria. The changes which Brahms made here are in the manner of ironic chromatic comments upon the original Handel bass line.

Jenner's report that Brahms conceived of the bass and the soprano line of songs as a unit, applies to the upper and lower keyboard voices. "With one hand he would cover the upper staff of the piano accompaniment, and, indicating the vocal line and the bass, would say with a meaningful smile: 'I only read *this*.' Not infrequently, such a procedure would demonstrate to me *ad oculos,* so to speak, the unnaturalness of what I had invented; I could no longer imagine how I could have arrived at such barren voice-leading in the melody and at such boring bass lines, unless I were to assume that I had been completely captivated by the accompaniment figures, and thus had been unfree.

"For him, the determining dominance of the melody and clearly conceived, well-counterpointed bass lines were an unconditional requirement which also remained in force in the artistic shaping of the entire song. . . . But if the singing voice was thrown but a few miserable crumbs now and then from out of the piano accompaniment, Brahms would not tolerate dignifying such concoctions by calling them 'songs.'"

Thus, in his keyboard variations, Brahms also made remarkable use of Handel's human soprano registration in the treble.

Figure 12.11 Brahms, *Variations and Fugue on a Theme by Handel,* Op. 24, Fugue



Following his extensive variations, which involve multiple voice transpositions and much more beyond that, Brahms concludes by reasserting the choir of (in this case) four choral voices in a fugue. He chose for his fugal subject a fusion of Handel's original soprano treble theme, and the inversion of the first three notes of Handel's original bass line. Because the theme fuses elements of the soprano and bass voices, Brahms found it best to introduce the theme with a different voice, the mezzosoprano. The statement begins in the mezzosoprano first register and immediately rises into the second register. The second (soprano) entrance begins at the fifth on F, sitting substantially in the soprano first register, and its repeated imitation lies entirely in the soprano second register.

Beethoven Variations

Beethoven's variations, especially those composed from 1802 on, go to great lengths to emphasize the bass line as crucial to defining the way in which to develop variation. The most remarkable demonstrations of the principle are Beethoven's successive refinements of the "Prometheus" theme spanning from *The Creatures of Prometheus* Op. 43, through his subsequent "Eroica" Variations Op. 35, and concluding in his *Symphony No. 3*; and his later elaborate "Diabelli" Variations Op. 120, whose included purpose was to demonstrate the primacy of the bass voice in variations.

Beethoven remarked that his 1802 "Eroica" Variations were in "quite a new style," presenting the bass line *before* the theme, and then showing that the treble theme developing as a predicate of the bass line. Op. 35, he wrote, "as you have seen, begins with the *bass* of the theme, then expands to two, three, and finally four parts; and then the theme, at last, appears" (emphasis in original).[6]

Beethoven also created a new treatment of bass *pedal point* as a transfinite, relative to the bass line voice and other keyboard voices. Pedal point originated in late Renaissance composition of organ music with a sequence of held tones in the bass line, each sustained by organ pedal, which moved in a lawful progression *at a slower rate of propagation* than the music of the treble, tenor, and other voices. Examples of explicit pedal points are found in Chapter 10 (Figures 10.21 and 10.22).

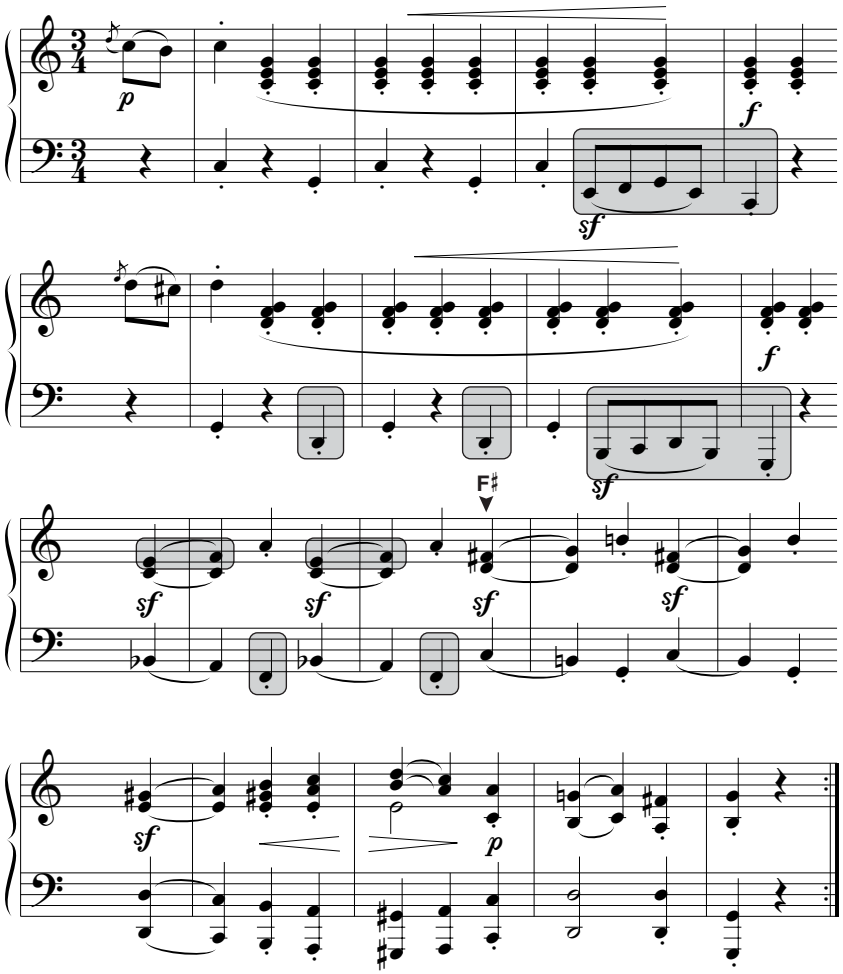
Indeed, in all Classical music there is an implicit, often unwritten, pedal-point series which moves in a lawful progression at a slower speed of propagation from the notes of any individual voice (Figures 10.23–10.25). Beethoven sought to develop this implicit pedal point into a representation of the composition as a unit-idea. For example, he used not only the obvious registration of the human bass voice in the bass pedal point, but also introduced the differing registrations of other voice species, which he frequently made to overshadow those of the human bass—all the while retaining the implicit registration of the human bass. This multiple-voiced significance of the pedal point became a crucial feature of the development of the composition as a whole. The pedal point became a representation of all of the polyphonic voices of a composition taken as a unit.

In this section, we will first examine selected features of the later "Diabelli" Variations, because of the straightforwardness of its C major bass line and pedal point, and then will return to a fuller appreciation of Beethoven's earlier work on the "Prometheus" material.

[6] In Alexander Wheelock Thayer, *Thayer's Life of Beethoven,* edited by Elliot Forbes, Princeton, N.J.: Princeton University Press, 1964, pp. 320–1.

The 'Diabelli' Variations

Figure 12.12 Beethoven/Diabelli, Theme from *Thirty-three Variations on a Waltz by Diabelli,* Op. 120



In 1819, the publisher Anton Diabelli presented this theme to a number of composers, requesting the composition of variations on it for a collection. Beethoven took up the original theme, the first half of which is shown here, and during 1819–23, created a set of variations dwarfing in scope all others submitted (and previously composed).

This touches upon the question: How does a composer choose his raw material, the theme upon which to create variations? Brahms advised students to confine themselves to themes by masters such as Beethoven, themes which could be relied upon for excellent construction. Beethoven did not simply accept subjects offered him. He chose themes by masters such as Mozart, or composed his own, as in the "Eroica" Variations. When he did take up a common theme, it was because he saw in it a specific musical feature for which he had a prior plan.[7]

In the case of the Diabelli theme, Beethoven had been seeking very elemental material, with which to raise basic issues on composition by a certain method of writing the bass line. The key of C, and the humorous simplicity of Diabelli's theme, were important; still more important was the fact that the substance of this theme lay almost entirely in the bass line of the keyboard.

The theme is in the surprising poetic form of a human soprano voice, transposed down two octaves, to the keyboard bass range. This is seen from the basic structure of the theme, which demands two voices, each of which is divided by the soprano F-sharp register shift. Viewing the extended composition in C major as a unit, Beethoven is making a statement regarding the division of the C octave, the basic metric of the universe, into its characteristic two halves or tetrachords, C–F and G–C.

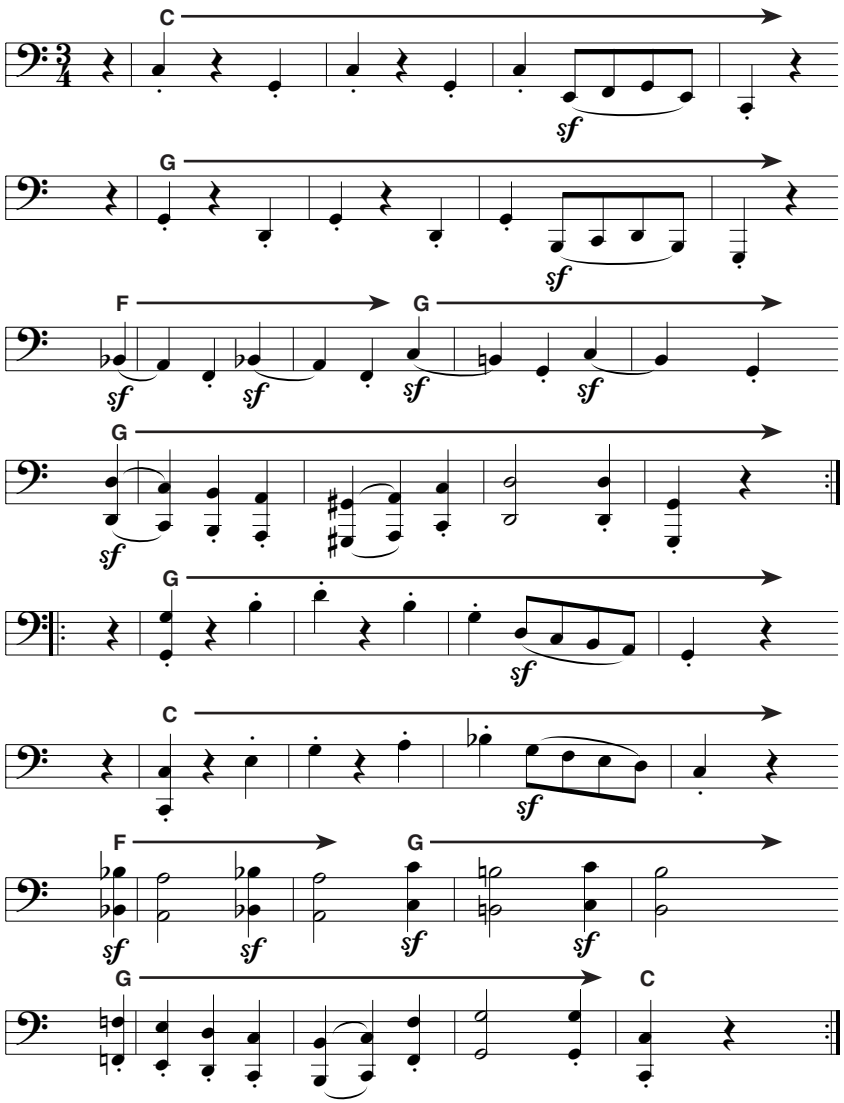
The repeated descending fourth "*do,* sol, *do,* sol, *do*" is meant to be read in one register, with the succeeding humorous eighth-note figure

[7] Jenner reports: " 'Writing variations is perhaps the best thing you can do for the time being,' Brahms told me right at the start of my lessons; and thus one of the first pieces I brought to him was a theme and variations for piano. I had based these variations on a poem, whose four strophes had a determining influence on an equal number of variation groups, in the sense that one strophe was placed as a motto above each of the four successive variation groups. Brahms was happy about this idea of mine, and told me he had once carried out the same idea, but that nothing had come of it. He then reproached me for the much too great number of variations, which could not help but damage my idea. 'The fewer variations, the better; but then, they also must say everything which has to be said.' My variations themselves were much too free for his liking, for he was very precise about this particular form. Already in the selection of the theme, he recommended extreme caution, 'since there are not many themes which are suitable.' And despite the fact that I had succeeded in finding one which he considered suitable, he still advised me rather to look for one in Schubert or elsewhere. As a model he mentioned Beethoven's variations, which I could not study carefully enough."

of the third measure entering into the lower register, representing the lower half of the C major scale. When the theme is transposed down to G in the fifth measure, it is transformed, relative to the constant F-sharp register shift, such that the off-beat now lies in the lower register. Such a soprano "great bass" has been in use since the Renaissance.[8]

Diabelli's theme, as with any good one, is itself a simple *unit-transformation*, broadly, from C to G (shown) and back to C (not shown). The transformation occurs via a singular twist in the third line in Figure 12.12, the off-beat half-step contrary motion from B-flat to A in the bass, and E–F, and F-sharp–G in the treble, creating brief motion to the fourth, F. When repeated in measure 25 (not shown) at the high E to F, it leads to the only third-register passage of the waltz, and the humorous return to C major.

Figure 12.13 Beethoven/Diabelli, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Bass Line



The chief reason why Beethoven chose Diabelli's bass theme, was its clear *pedal-point series*, based on the motion from C to G, and the way in which that worked with the bass line as a whole. Beethoven used this

[8] The use of soprano registers in the bass line goes back to the Renaissance "great bass," a bass instrument set below the human bass range. Renaissance winds, for example, were built in six-piece choirs, or "chests of voices," four in order to double the human choir of soprano, alto, tenor, and bass, plus two more: the sopranino, pitched a fourth to an octave above the human soprano, and the great bass, pitched a fourth to an octave below the human bass. The latter instrument often had an F-sharp register shift.

as the occasion to hammer, with much irony, on the role of the pedal point as a driver in musical development. The implicit pedal-point series shown here may be sung while the waltz is played, in order to verify that it is representative of an underlying process more profound than "all of the notes."[9]

This pedal point is demonstrably a *transfinite series* to Diabelli's waltz as a whole, a musical example of the process already referred to as an "*A*→*B*→*C* transformation" (see Chapter 9 and Figures 11.4–11.5). The thematic statement *A* (here, the opening theme revolving around C), is followed by a development *B* (the central passage largely around G), followed by a closing passage *C* (the last bars returning to C), which is either an apparent restatement of theme *A,* or something entirely new. In Diabelli's waltz, between passages *A* and *B,* and *B* and *C,* there are two singularities.

In such a transfinite process, the axiomatic "rules" or obvious features of the first system *A,* are questioned or broken up as a fixed idea. Here the theme, system *A* (*do*, sol, *do*, sol . . .) as a fixed repetition of C, breaks down as a repetition. The composer intervenes by generating a singularity (the humorous *sforzando* eighth-note figure in measure 4 of Figure 12.12), which shows that repetition of theme *A* is "not all there is to music." He creates system *B,* a relative shift to movement around G, generically a new process with new rules, at a higher level than the previous system *A*. This new system holds up to experiment and compositional variation more broadly, but is then shown to be similarly "not the last word" and to require transformation by new musical experiment. The singular half-step passage briefly referencing F is an example of such an experiment within the overall development around G. Finally, system *B* must be superseded, and the composer generates a second singularity, here the shift of the keyboard in to the high third and fourth registers, and produces passage *C,* in whose final bars C is re-asserted, but in a new way, as a small joke, this time by falling *to* C *from* G, not *from* C *to* G.

Beethoven at first rejected Diabelli's waltz as frivolous, but returned to it, because here is a piece in which the true pedal point, the true *transfinite process of the entire 32-measure composition,* had been made to serve as the explicit bass voice line itself. It can be seen immediately that the C pedal-point phrases have predominantly C in the bass, that the G pedal-point phrases have predominantly G in the bass, and so on. It must be pointed out that this is not always the case, and is not easy to handle. Beethoven was proud of composing such a theme in his *Creatures of Prometheus,* as he noted when publishing his 1802 "Eroica" Variations on it.[10]

The full breadth of the "Diabelli" Variations—especially Beethoven's second phase of work on it, in which he introduced a slightly altered bass pedal-point line in Variations I and II—go beyond the scope of the first volume of this manual. The "Diabelli" Variations are a perfected reflection of the same conception which Beethoven worked up in 1808 in a study piece, 32 Variations in C minor, WoO 80. In this work, Beethoven directly references the C major/C minor "royal theme" which inspired the most profound work of J.S. Bach, Mozart, and many others (see below, p. 242f.). He condenses the theme into an eight measures, and each eight-measure variation is played without repeat, which causes the work to take on the character of a passacaglia, thereby further focusing attention to the bass pedal point.

Pedal Point in Unit-Transformation

In the variations form, the *given* theme, here Diabelli's waltz, is analogous to the *given* poem, such as Goethe's "Nähe des Geliebten." As Schubert grasps the poem and creates from it a single new song, so Beethoven, working from the theme, conceives a single unified work of

[9] In identifying pedal-point series, it must be remembered that every Classical composition must first and foremost be thought of as a process of *unit-transformation*. The role of pedal point is only properly understood as a vehicle for that transformation.

The student is cautioned to avoid the common error of confusing Beethoven's concept of pedal point, with the deductive-inductive structural approach introduced by Heinrich Schenker's *Urlinie* concept (*Der freie Satz,* Vienna: Universal Edition, 1956). Although Schenker's approach can yield useful insights into the construction of a Classical composition—especially in the so-called "foreground" and "middle ground"—the rote insistence on *formal unity* of the composition as embodied in the *Urlinie* misguides the student away from the *actual unity* of the unit-transformation, and down the sterile pathway of deductive-inductive reasoning. The *actual unity* of the composition is represented not as formal structure, but as a *single moment* of musical-creative problem-solving, or an ordered series of such moments.

[10] According to Thayer (*op. cit.,* p. 321), Beethoven requested that the first engraving his Op. 35 variations make special mention of the fact that his "Eroica" Variations were taken from his own theme from his *Creatures of Prometheus* ballet.

art. From this single concept of transformation, the composer decides how the pedal-point series of any variation shall progress.

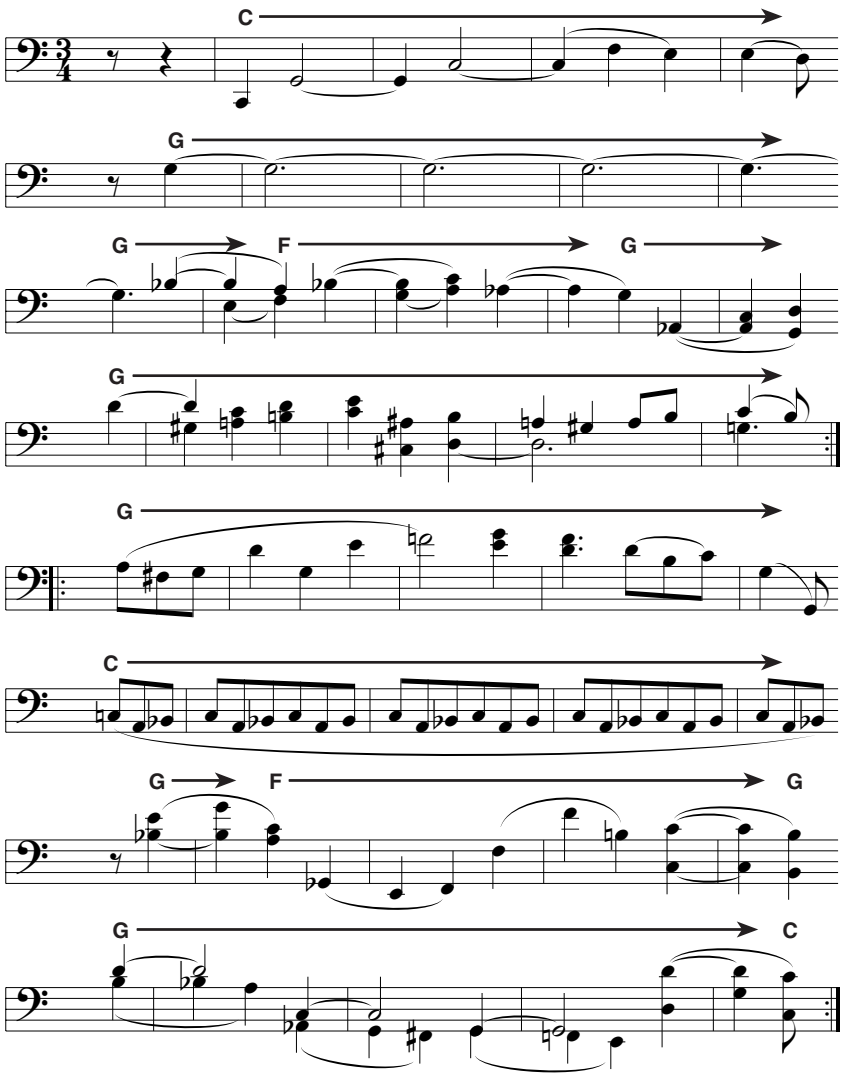
This does not mean "composing off" Variations I, II, etc. in numerical succession, just as Schubert never "composed off" the stanzas of a strophic song in performance order (see Chapter 11). Frequently a great composer, having conceived of the transformation he wishes to make, will work backwards. Given the opening theme, he will next sketch the ending which he wishes the unified work to create. He will then solve the geometrical problem so constructed, by sketching out the central development section to fit the overall necessity, frequently modifying details and entire passages to conform to the overriding demands of the unit-transformation.

Looking at Op. 120 as a whole, Beethoven saw it as an *A*→*B*→*C* transformation of the bass pedal point, in three broad divisions. Set *A* is the set made up of the theme and the initial variations with the same C–G pedal-point series. Set *B* is the next set of variations, whose pedal-point series vary ever more widely from the original. Set *C* is the final variations, which break into a new form, the fugue, with a new class of pedal point. Most unusual for the variation form, the final fugue Variation XXXII is a double fugue in E-flat major, far removed from the basic C major. After a remarkably free transition passage to an *adagio,* modulating widely, even to E major, there follows a coda, the final Variation XXXIII, an innocuous minuet in C major.

In the transition to the final variation lies the outline of Beethoven's single concept for Op. 120. It is a demonstration of how much one sovereign human mind can create, from the most basic law of music, i.e., that a simple theme in the universal soprano voice, in the key of C, is divided in half by the fixed F-sharp register shift. Diabelli's waltz presents a theme entirely in the soprano second register spanning the upper half of the C major scale. Beethoven transposes the theme to the other voices of the keyboard, each voice in its second register, and then into the higher and lower registers of each voice, and in all four voices of the keyboard choir into a dozen other keys.

How does that same drop of a fourth behave when taken through four human choral voices, soprano, mezzosoprano, tenor, and bass, in all keys of the 24-key well-tempered system? In each key, the fixed set of human register shifts will divide each key differently, uniquely, and in a knowable relation to the C scale.

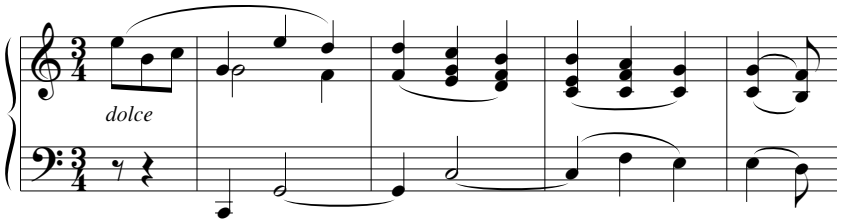
Figure 12.14 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation III, Bass Line



During the first set of variations (with the partial exception of Variations I and II, as noted above), Beethoven holds constant Diabelli's basic pedal-point sequence (except for slight prolongation of some passages),

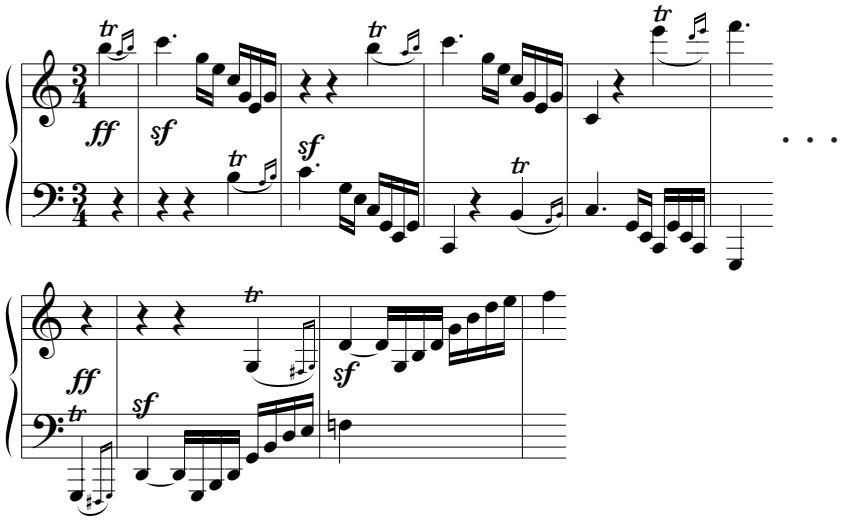
demonstrating how the underlying metric may be developed and yet maintained coherently. Variations III through VII have almost the identical bass pedal-point sequence found in the theme, as shown in Variation III above.

Figure 12.15 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation III



At the outset of Variation III, the theme, although still in C, is transposed to new voices and new registers. In the opening bar it is transposed from Diabelli's bass, to the highest treble voice, but remains a soprano in the second register from C to G. In the second voice, the theme is transposed to mezzosoprano and inverted, spanning the lower half of the scale, falling from G to C. As soon as this is done, it effects a change in register, a shift down into the mezzosoprano's first register. The theme also appears inverted in the bass, rising from the lower C to G, transposed down to the first register of Diabelli's original great-bass soprano.

Figure 12.16 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation VI



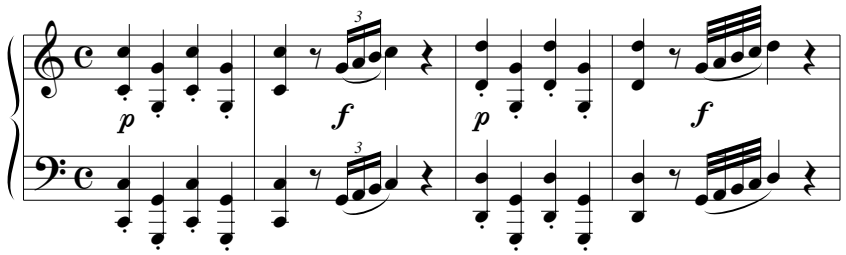
Remaining within the basic C pedal-point series, Beethoven demonstrates, even in the earliest variations, how much can be created in a simple framework by transposition of voices to the extremes of the keyboard. Here the theme, with Diabelli's embellishment, is transposed to the high soprano third and fourth registers, and is then repeated throughout all the registers of all voices down to the lowest registers of the bass. In the second half of the variation (see second line of the figure), Beethoven takes the inversion, the rising interval from G to C, through the same process.

Despite what sounds like wide modulation, Beethoven repeatedly points out that in fact he is managing all this creative work while remaining more or less within Diabelli's original pedal-point series. In Variation IX he changes key for the first time to C minor, but in such a way that the basic C–G pedal-point series remains exactly the same as it was in the C major theme. In Variation X he accents the constant pedal point by writing out explicit pedal-point notes.

By Variation XIII (not shown), Beethoven has created a new set *B* of variations, those whose pedal-point series vary ever more widely from that of Diabelli's bass theme. Each stretching of the bass pedal-point framework, yields the power to multiply many times the number of

singularities in all the keyboard voices. In Variation XIII Beethoven demonstrates that a change to the relative A minor can result in a relatively extensive change in the pedal-point series.

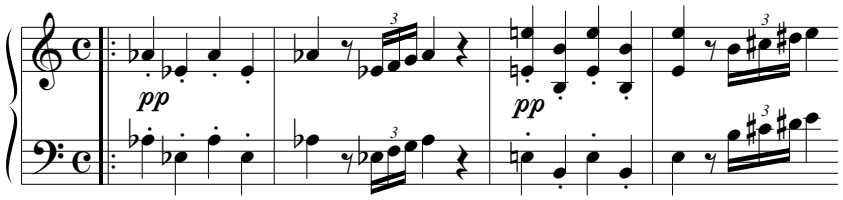
Figure 12.17 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation XXII



In Variation XXII, Beethoven makes a singular intervention into the bass voice pedal point. In the variation's first half, he develops the familiar C–G soprano voice motion, simultaneously in all four voices of the keyboard, first downward, and then in an upward inversion, moving by half-step motion up to the high G above the staff.

This reminds the audience, in the midst of all Beethoven's inventions, that Mozart already made the theme famous back in 1785, with his bass aria for the servant Leporello which opens his opera *Don Giovanni*. By so referencing a familiar vocal air to create the laughter of recollection, he underscores yet again the primacy of the singing voice's registration. To underline that his bass voice is his theme, Beethoven sets it in parallel voices in four octaves. Mozart had the buffoon Leporello repeat a simple descending fourth, to echo his repeated complaints about life. Beethoven's citation of Mozart reminds the audience that while Diabelli's original descending fourth was in a single register voice, just as Leporello repeats a fixed idea, the creative composer can make much more of it.

Figure 12.18 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation XXII



After the repeat, just as the audience gets comfortable with Mozart's tune, Beethoven moves the composition up another half-step, from G to A-flat, and then down to E-natural, introducing two entirely new keys into the pedal-point series. This development is all the more striking because the audience remembers Mozart's bass *buffo* as someone lacking such inventiveness. Beethoven's sudden *pianissimo,* too, mocks all repetitive thinking such as that of Leporello.

The bass line here also has a remarkable use of the prominent mezzosoprano register shift from E-flat to E-natural. Beethoven transposes the soprano second-register theme suddenly to the mezzosoprano voice, shifting from E-flat in the first register, to E-natural in the second register. This mezzosoprano shift—a singularity to which Beethoven has not referred so clearly heretofore in the composition—becomes one of the most prominent features of the concluding variations.

The more profound reference here is to Mozart's concept of *C minor/major*, featured in many of Mozart's works after K. 394, notably the famous K. 475 titled by Mozart "Fantasy in C Minor," but to which he assigned the key signature of C major. This latter work, and its associated Sonata in C Minor, K. 457, represent the culmination of the explosion in Mozart's creative development which began around 1782 with his intensive working-through of the works of J.S. Bach, notably the *Well-Tempered Clavier* and the 1747 *A Musical Offering,* and probably also including the *Mass in B Minor*. Mozart's breakthrough lay in the attainment of a new "bel canto polyphonic voice" which works "across" the constituent voices. His fugues and fantasies dating from this period through 1785 all reveal his strenuous efforts to fuse the elaborated polyphony of J.S. Bach with the "monophonic" bel canto musical poetry which surrounded him during his earlier development. He was greatly assisted in this breakthrough by his mentor and close friend Joseph

Haydn, who in the immediately preceding years had been working along precisely the same lines, following the lead of J.S. Bach's son Carl Philipp Emanuel (1714–88), in perfecting the string quartet as a single polyphonic voice, and the "sonata" as its most efficient form of development.

The literature of Bach, Mozart, Beethoven, Schubert, Chopin, and others in the "C minor series" is a scientific study of the musical space of C minor-major as the prototypical working of the universe.[11] Compositions in the "C minor series" add to the standard geometrical focus upon the soprano F-sharp shift, a special focus on the E-flat–E-natural shift of the mezzosoprano, for which there was little literature before Bach developed it (see Chapter 4). It is the introduction of E-flat, of course, which changes the C major triad to C minor, and E-flat, B-flat, and A-flat are necessary for the full C minor scale. The mezzosoprano voice allows the creation of a new registral voice right at the transition between C minor and C major (Figure 4.3). Note also that the human bass voice's first-to-second register shift occurs between G and A-flat (Figure 2.7), a shift which often leads to modulation into C minor. Both C minor and C major are considered simultaneously, as indicated by the frequent use of the progression E-flat–E-natural–F-natural–F-sharp, which reflects the intersection of both keys but is fully available only in C minor.[12]

Whereas Diabelli's theme is restricted to a quick reference to the soprano F-sharp shift, Beethoven immediately cites the C minor/major idea in Variation I (not shown), by introducing E-flat and A-flat, harbingers of C minor which are absent in Diabelli's original theme. In other early variations, he introduces the E-flat–E-natural mezzosoprano shift. The characteristic C minor/major progression E-flat–E-natural–F-natural–F-sharp develops with Variations VIII and IX.

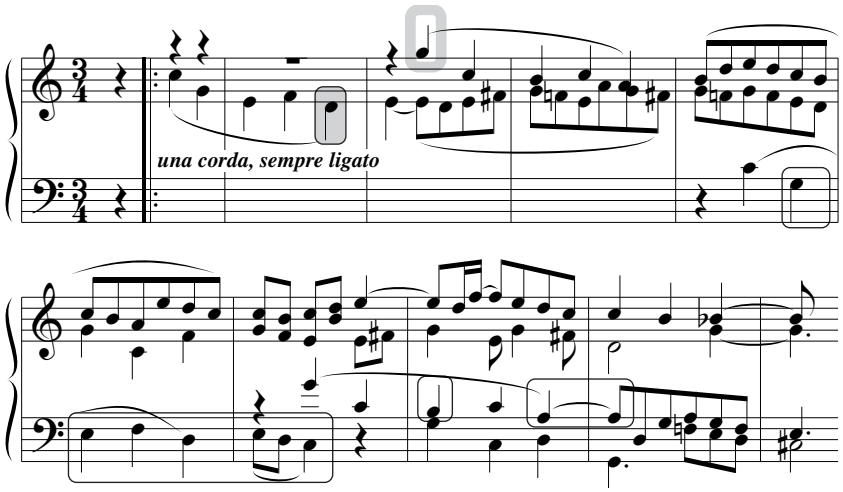
[11] The soprano F–F-sharp register shift, and the mezzosoprano E–flat-E-natural register shift, are elementary singularities in the harmonic ordering of the universe as a whole, and are determined in first approximation by the 180-degree and 90-degree rotations of the self-similar C major conical spiral. See Chapters 1 and 2 *passim,* especially Figures 1.8 and 2.8.

In addition to the examples cited, the following compositions are explicitly based on the same "C minor series" material: Mozart, "Dissonant" Quartet, K. 465; Beethoven, Sonata for Piano, Op. 13 ("Pathétique"), Sonata for Violin and Piano, Op. 30, No. 2, and Sonata for Piano, Op. 111; Chopin, Sonata for Piano, Op. 4; and Schubert, Sonata for Piano, D. 958.

[12] Lyndon H. LaRouche, Jr., "Beethoven as a Physical Scientist," *Executive Intelligence Review,* Vol. 16, No. 22, May 26, 1989, pp. 16–21.

Thus, Beethoven demonstrates that system *B,* characterized by ever broader shifts in the pedal-point series, gives rise to an increasing number of vocal contrapuntal singularities such as the E-flat and A-flat.

Figure 12.19 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation XXIV (Fughetta)



Beginning with Variation XXIV, Beethoven creates a new system *C,* characterized by not one, but many fugues. Fugue is the only form appropriate for the level of distinct voicing he has created, each voice with its own fully developed registration. The new form also allows yet more extensive modulation of the pedal-point series to distant keys, the hallmark of Beethoven's later work. Detailed discussion of his late concepts is not within the scope of this volume; but it is noteworthy that a fugue, especially a double fugue, is the most rigorous test yet invented for how a theme behaves when begun in one singing voice, and then transposed into other voices, other registers, and other keys.

For each fugue, Beethoven creates a subject which is a variation, in four-part vocal polyphony, of the basic descending-fourth theme. Each fugue begins with four separate entrances, of the four human choral voices: soprano, mezzosoprano, tenor, and bass. Each of these voices must be considered, in the keyboard, as utilizing the different human register shifts: F-sharp for soprano and tenor, E-natural for mezzo-

soprano, D for bass, and others for the first registers of the male voice.

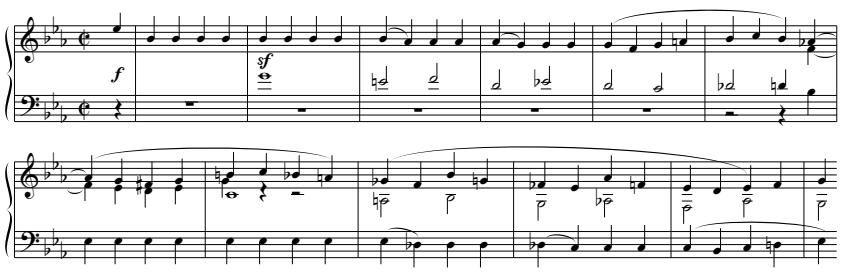
Each different voice enters and sings the fugue theme, with its own characteristic registers creating certain poetic division of the theme. Initially, the fugue is arranged so that the four different voices are able to sing the opening fugue theme in that same poetic division. Although each has different register shifts, the key and their entrances are so arranged that each voice's register shifts divide the theme in a similar manner.

In Variation XXIV, Beethoven has varied the original *staccato* material in measures 1–3 of the bass, the descending fourth C–G, and eighth-note turn on the low E, to form a continuous *legato* descending fourth and turn on the third below. Each voice sings the theme in a single register, except for a single contrapuntal note shifted into another register.

The first voice entering on C is a mezzosoprano, singing entirely in the second register, except for the contrapuntal first-register note on the single lowest note, D, of the opening phrase. The second voice entering in measure 3 is the soprano, who similarly sings entirely in the second register, but starts with an inverted register shift, the single high G in the third register. In measure 5, the bass enters with a singular note in the second register, and finishes the remainder of the subject in the first register. The tenor enters on a high G in the third register, and then drops into the second register.

In the concluding variations, Beethoven introduces the "C minor series" theme first developed in the "Mozart" Variation XXII as a direct extension of his original theme. Several variations quote the "C minor" progression. A second fugue, Variation XXX—an *andante cantabile* in C minor/major—draws on the same material. It is followed by a very long *largo* Variation XXXI in C minor/major, consisting entirely of chromatic C scales based on the C minor series progression, which Beethoven ends unexpectedly in E-flat major, the key of the following grand double fugue.

Figure 12.20 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation XXXII (Fugue)



Beethoven's double fugue well demonstrates the origin of the word "fugue" in "fleeting": He takes the familiar descending-fourth pattern and repeats it so quickly and in so many keys, that particular notes literally fly away, leaving only the concept behind.

Here Beethoven takes the descending fourth of the original theme, which has been shown so often to be "uni-registral," and demonstrates what happens to it, if it is transposed to many keys and many distinct voices and register-shift geometries.

The subsequent development of the fugue occurs by variation of the original material, by allowing the different register shifts of the distinct voices to divide it differently. By this sort of variation, Beethoven adheres to the same principle of variation by the register shifts of the human voice; he uses a new principle of variation which is rigorously derived from the original one.

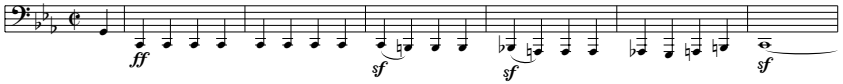
In effect, Beethoven demonstrates the distinctions between keys in the well-tempered system. Since the underlying invariant principle of the universe is the division into two equal parts of the C scale by the F-sharp register shift, if a theme which is uni-registral in C, is taken through a series of keys, the relationship of those keys to C major is demonstrated—by the standards of the human voice.

The fugue subject enters first as soprano, demonstrating that in E-flat as well as C, the descending fourth from the tonic sits in a single soprano register—here, the space from E-flat to B-flat below in the soprano's second register. Each of the following voices divides up the subject and countersubject differently.

The countersubject is not uni-registral. In its first entrance, it begins in the tenor voice with a singularity at the high G in the second measure.

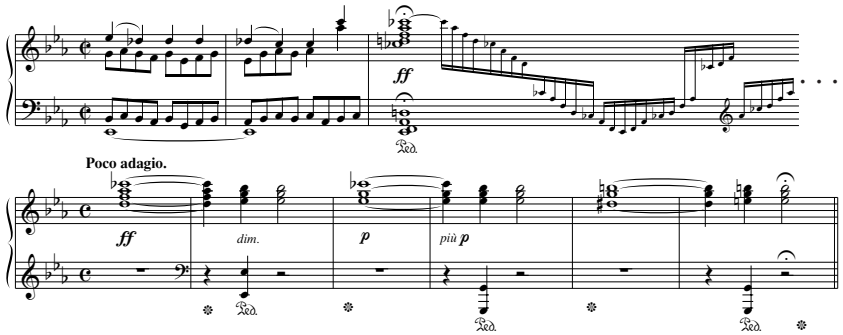
The first subject returns in measure 6 at the bass entrance from B-flat downward to E-flat, a shift from the bass second to first register. The countersubject's second entrance is remarkable, since according to standard fugal "logic," this voice ought to be a mezzosoprano. Instead, in measure 8 the mezzosoprano voice drops out (see rests), and Beethoven takes up the countersubject once again in the tenor voice, this time placing the first note in the tenor second register and the following notes in the first register.

Figure 12.21 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation XXXII (Fugue)



After carrying this thematic idea through a half-dozen keys within the opening 30 measures, Beethoven finally reasserts the original Diabelli theme's bass pedal point here, by falling from G to a low repeated C in the *basso profondo* range. Following a repeat of the theme in the C–G interval in every imaginable octave, he returns firmly to E-flat major, and repetitively so.

Figure 12.22 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation XXXII (Fugue)

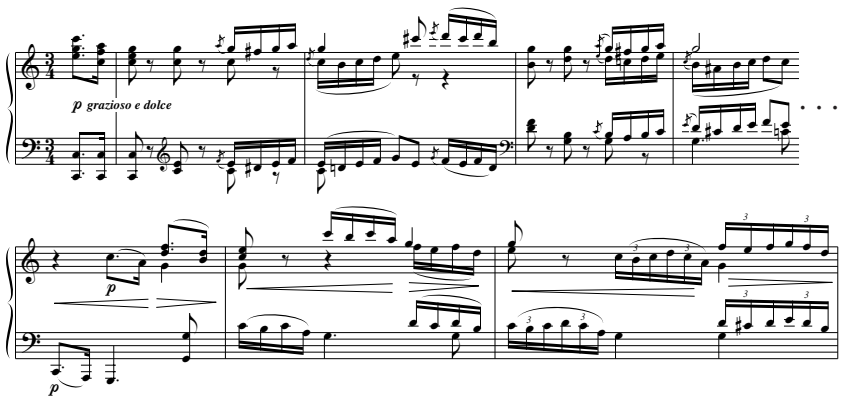


The double fugue concludes by demonstrating that the C minor/major musical universe fundamentally underlies the key of E-flat (and by implication, all keys). Shortly before the passage shown, Beethoven has the soprano voice sing the countersubject at the top of the treble staff. In measures 1 and 2 here, the soprano "voice-leads" downward by half-steps back to C, repeating the high C octave in the soprano fourth register, while the tenor voice also repeatedly touches on C in his moving figure. Meanwhile the bass voice continues the fugue's E-flat pedal note. The soprano voice deliberately echoes, and is an inversion of, the bass voice, which rises chromatically to C in the last measures of Figure 12.21, where the bass voice-led forcefully back to C from the E-flat fugal opening.

At the *fortissimo* in measure 3 of Figure 12.22, Beethoven strikes a "shocking" C-flat diminished chord over the E-flat pedal point, instead of continuing the previous sequence. The voices of this chord could resolve equally readily to E-flat, or indeed to either C minor or C major. With the fermata Beethoven intensifies the ambiguity as to the direction in which he intends to resolve, stretched further by the following free arpeggio, which hammers home the connection "in between the notes" of C minor/major and E-flat.

Building still more tension, Beethoven does not return to C, but at the *poco adagio* makes a temporary resolution to E-flat. This is heard, not as a comfortable return to the fugal home key of E-flat, but as contrary motion against the underlying *unit-transformation* of all Op. 120, the necessary return to Diabelli's C major. Extending further afield with an enharmonic shift in the treble, he interjects the mezzosoprano register shift from E-flat to E-natural, citing the clever use of that mezzosoprano register shift in the "Mozart" Variation XXII (Figures 12.17 and 12.18). The pun references not only Mozart's aria, but all of Mozart's works in C minor/major, for which the mezzosoprano register shift from E-flat to E-natural creates the pivotal motion. The final fermata on an entirely new key, E minor, effects yet more intense contrary motion against the underlying C, a point of maximum work for Op. 120 thus far. The listener is left in suspense as to what might ensue.

Figure 12.23 Beethoven, *Thirty-three Variations on a Waltz by Diabelli,* Op. 120, Variation XXXIII



Beethoven finally rises to the soprano fourth-register high C in this last variation, which has a special kind of humor. After such complexity, to return to an obvious idea in C, which becomes almost trite when performed poorly, creates a coda, a summation of the entire development of all 33 variations. Beethoven makes his point unmistakeable, by continuing his repetition of the original descending C–G pattern here, in all the possible voices of the keyboard, from the lowest to highest.

Thus we have a refutation of the standard music textbook equation of Beethoven's power of extensive modulation, with the Romantic "free" modulation of Richard Wagner and his school. For Beethoven and his students through Brahms, there is a hypothesis, a unit-conception of scientific transformation, behind all modulation, whereas Wagner and his assorted heirs such as Richard Strauss, Igor Stravinsky, and Arnold Schoenberg, stand in violation of Beethoven's basic principles, in their insistence that chromatic half-step and other modulation may be taken as desired, without regard for science, art, and beauty.

In Beethoven, modulation in music always proceeds as the servant of the concept of primacy of the natural laws of the singing voice and unit-transformation. Gustav Jenner's description of Brahms's concept of modulation applies here: "Here [in modulation] Brahms demanded that the reins be kept most tightly in hand, and that the utmost consistency be practiced. Even in the disposition of a very long song containing extended self-contained secondary passages, the basic key must always be fully expressed at the outset, and its dominance over all subsidiary keys must be preserved by establishing clear relationships, such that—if I may be permitted to put it this way—the sum of all the keys utilized in the piece appear as an image of the main key as it acts throughout the piece. The fact that allowing a key, even the main key, to remain indefinite can nevertheless be an excellent means of expression, is part and parcel of this discipline. . . . The grand freedom of Brahms's creative power has one of its chief roots in his instinctively sure sense of the unity of modulation; and the assertion that it is only under constraint that man can be truly free, finds a beautiful application here."

As Friedrich Schiller told his friend Christian Körner, "In respect to any great composition, it is necessary that the individual be limited, in order to let the whole take effect. If this limitation of the individual at the same time be an effect of its freedom, i.e., if it set this limit itself, then the composition is beautiful. Beauty is through itself subdued power; limitation out of power."[13]

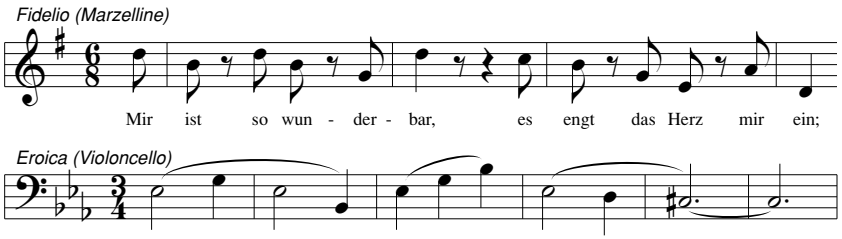
[13] Schiller to Körner, in: *Briefwechsel zwischen Schiller und Körner,* ed. Klaus L. Berghahn, Munich, 1973, p. 187. See also Friedrich Schiller, "Kallias, Or on the Beautiful," in: *Schiller—Poet of Freedom,* Vol. II, Washington, D.C.: Schiller Institute, 1988, p. 514.

Beethoven's 'Prometheus' Variations

Beethoven's successive treatments of the thematic material first presented as the final section of his ballet *The Creatures of Prometheus,* Op. 43, are useful for demonstrating a full-fledged exercise in what the composer must put himself through in order to prepare for the composition of even the simplest strophic *Lied.* The "Prometheus" theme extends from his original rondo treatment in the ballet, through the *15 Variations and Fugue,* Op. 35, and finally the "Eroica" *Symphony No. 3* in E-flat Major, Op. 55.

Beethoven's work on this material marks a tremendous leap in his creative powers during the years 1801–3. In the course of his work on pedal-point variation, he began to work from a conception of registral singularity which went beyond the shifting of particular voices from one register to the next in the space of a half-step, toward a more complex concept of an area of dense singularities represented by a confluence or apposition of register shifts of two or more different voice species.

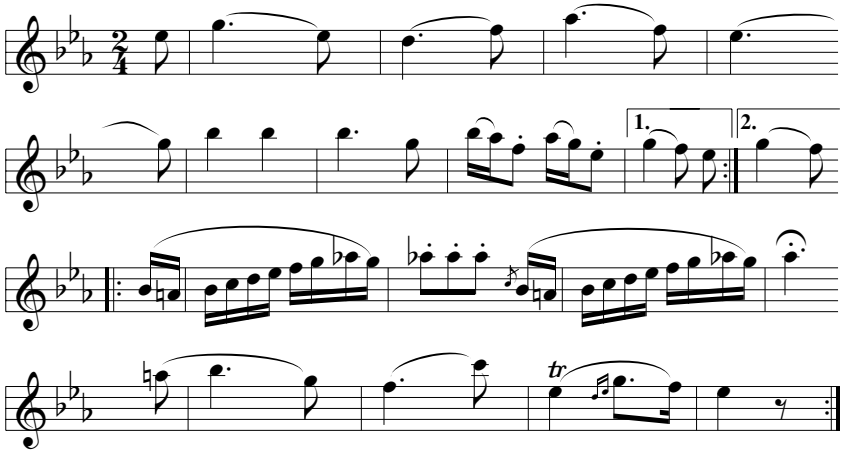
Figure 12.24 Beethoven, Comparison of "Mir ist so wunderbar" Canon from *Fidelio,* with Opening of *Symphony No. 3*



Although this series of compositions is for musical instruments and not for the human singing voice, they are firmly grounded upon the principles of bel canto singing; indeed, Beethoven's sketchbooks from the year 1803 show that his work on the "Eroica" Symphony proceeded simultaneously with his preliminary work on his opera *Leonore,* as can be seen, for example, in the striking poetic similarity between the canon "Mir ist so wunderbar" and the opening melody of the first movement of the symphony.

For our purposes here, we will consider the "Prometheus" series entirely from the standpoint of vocal polyphony, and with one exception, will leave out of consideration the special registration characteristics of musical instruments (see Book II).

Figure 12.25 Beethoven, *The Creatures of Prometheus,* Op. 43, Finale



Let us first examine the "Prometheus" theme as Beethoven presents it in *The Creatures of Prometheus*. The melody is sung as a soprano by the violins.

Taken as a poem, and disregarding the repeats, the melody can be treated as a single four-line strophe, with each line four measures long. The first line alternates between the soprano second and third register with an iambic motion, whereas the second line remains almost entirely in the third register, and introduces the characteristic triple stress on the three high B-flats. Following the repeat, the third line doubles the motion not only in the rising sixteenth-note figure, but also in the triple stress, which is now shifted to A-flat. The doubling of the motion introduces the "problem" of how to conclude the second rising sixteenth-note figure. A simple repetition of the preceding phrase with the concluding three A-flats would halt the motion of the poem, allowing it to descend from

humor to banality. Beethoven, in a way which was typical of him, "resolved" the problem with an ironic "joke," the A-flat held with a fermata, which, along with its B-flat pedal point, seems to bear the entire weight of the musical idea, as the "punch line" does for a well-prepared joke. But the melody is only complete with the last line, in which the previous A-flat moves to A-natural and then to B-flat, after which it resolves by descending back into the first register on the final E-flat, in motion similar to the opening line.

The theme melody suggests several potential voice types. Certain features of the poem seem to be expressed well as register shifts in the soprano voice: the contrast between the first and second poetic line, and the broad distinction between the tonic E-flat in the second register and the triple stresses on B-flat and A-flat. However, the soprano's register shifts seem to play no role in the crucial turning point of the melody, in that there is no soprano register shift in the area of B-flat and A-flat around which the entire melody revolves. Perhaps the musical idea would be better expressed by some other voice species.

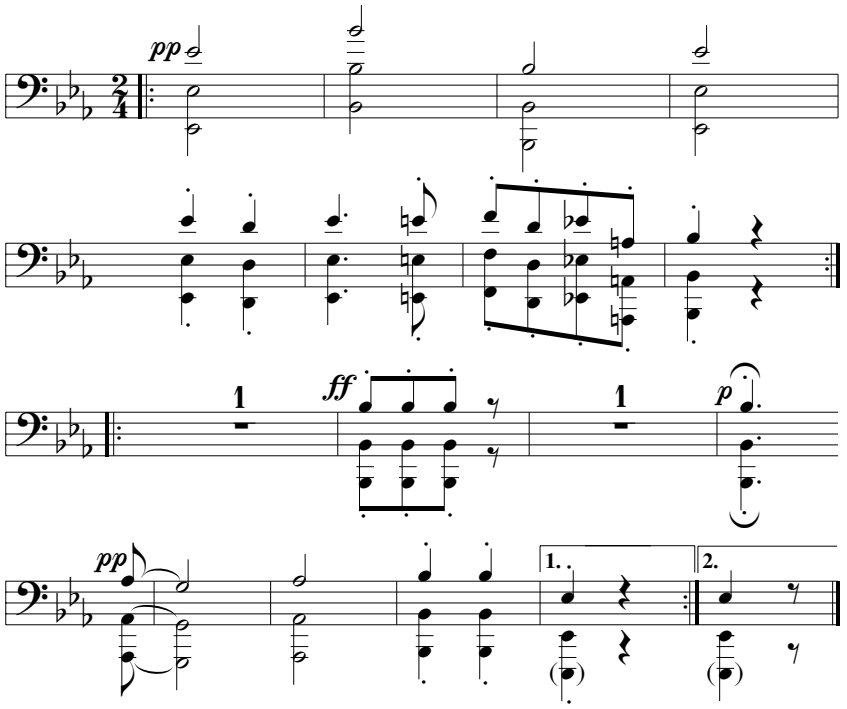
That question leads us to consider the major shift of emphasis which Beethoven made when he reworked the "Prometheus" material for variations and fugue.

Figure 12.26 Beethoven, *The Creatures of Prometheus,* Op. 43, Finale

In the ballet, the theme is treated in rondo form, with variation on the melody alone. The first variation, for instance, is merely a simple downward inversion of the ascending sixteenth-note figure in the third line of the original melody.[14]

[14] The passage also highlights the comic element in the "Prometheus" theme as presented in the original ballet, supplied by a dialogue between the string choir, and the clarinet and flute choir, in which the clarinet voice predominates, especially in its rich first register, as shown in the passage cited here. The clarinet, with its characteristic A-flat–A-natural first-to-second register shift, is featured in this dialogue, instead of the less comic double reeds.

Figure 12.27 Beethoven, *15 Variations and Fugue,* Op. 35, Introduction

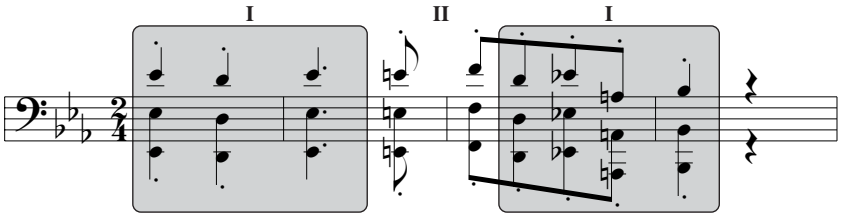


But the tables are entirely turned in the piano variations: Before introducing the melody, Beethoven presents the *bass line* alone, followed by three variations on that bass line, in two, three, and four voices respectively.

This bass line presents a different set of poetic singularities which overlap, but also partially conflict with the melody line. The first poetic line, with its four half-notes, not only presents the simplest fifth and octave relationship, but also, with its four long stresses, lays the basis for a progressive acceleration of motion in the second line, from the three quarter-notes E-flat–D–E-flat (reflected in the three B-flats in the melody line), followed by the eighth-note motion. The third line not only reinforces the melody's "joke," but also represents what emerges in the course of the piece as the implicit primary pedal point of the entire composition.

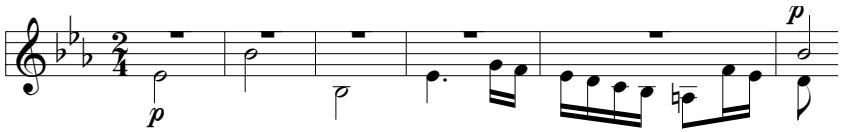
The concluding fourth line contains its own more subtle "joke," which plays a crucial role in driving the development: Namely, the fourth line's first note, A-flat, is dissonant with the corresponding note in the melody line, A-natural. This dissonance also serves to underscore our earlier observation that the primary singularities of the piece seem to revolve around movement into and out of the area around A-flat and B-flat.

Figure 12.28 Beethoven, *15 Variations and Fugue,* Op. 35, Introduction



With all the foregoing kept in mind, it is now possible to identify the characteristic voice species for both the melody line and the bass line. In the bass line, the rising fifth from E-flat to B-flat crosses a register in four of the six voice species—soprano, mezzosoprano, baritone, and bass. A baritone or bass voice might seem to be the most logical species to sing this line. However, the increasing motion over the course of the first two lines is uniquely represented by the motion from E-flat to E-natural, i.e., by the *mezzosoprano's* shift from first to second register.

Figure 12.29 Beethoven, *15 Variations and Fugue,* Op. 35, Finale

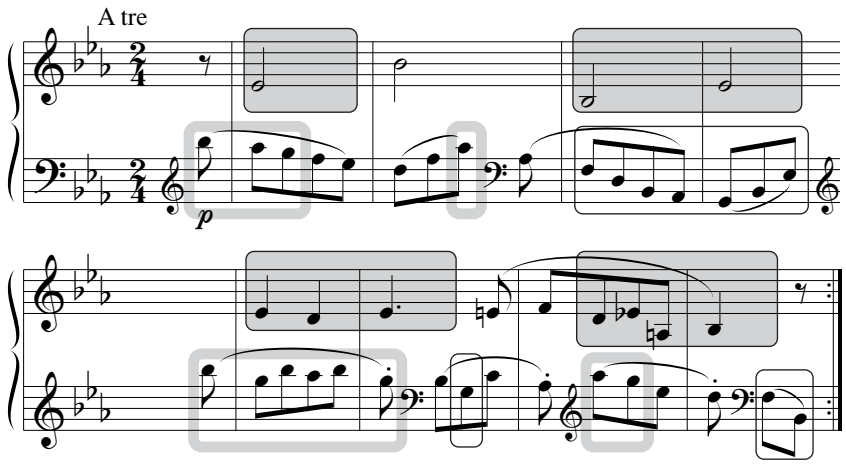


Beethoven's mezzosoprano reference for this voice is further corroborated in the concluding three-part fugue, where the mezzosoprano voice is the first voice to enter, on precisely the same four notes as the opening bass line.

Similarly, when Beethoven introduces the inversion of this theme later in the fugue, it enters in the mezzosoprano voice, as it also does in the corresponding fugal inversion section in the "Eroica" Symphony's last movement.

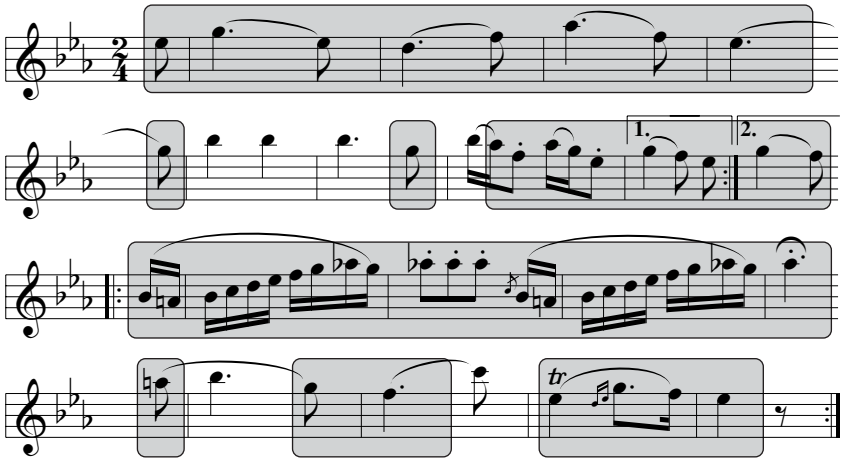
The opening two lines of the bass theme can therefore be best heard as a mezzosoprano line which is echoed in the lower octave by a bass or baritone voice. The second two lines reverse this relationship, with the downward half-step motion from A-flat to G best represented by a shift of the bass voice from second to first register.

Figure 12.30 Beethoven, *15 Variations and Fugue,* Op. 35, Introduction



Beethoven is therefore dealing not only with rigorously defined voice species, but also with ironic transpositions of those voice species into different octaves. He broadly hints at this intention in his three-voice variation on the bass line, in which the soprano and bass voices, moving in eighth-note motion against the "mezzosoprano" bass line, give the effect of a single vocal line.

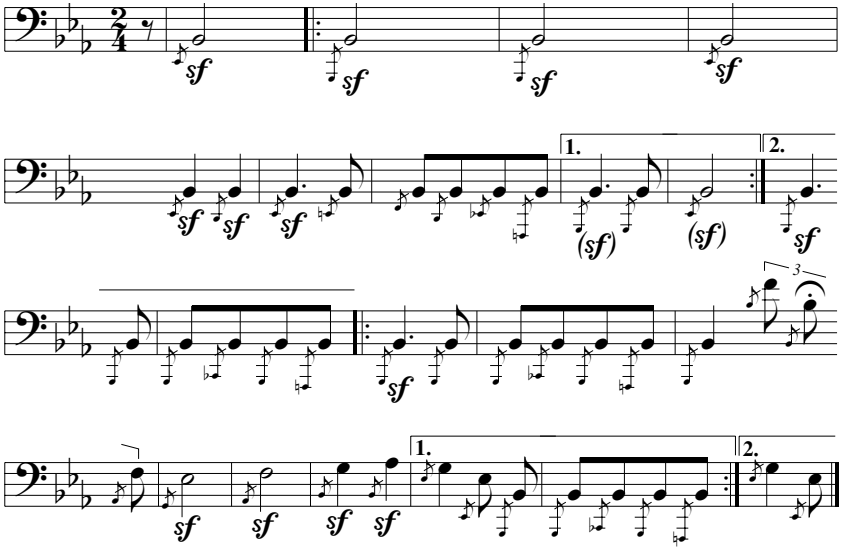
Figure 12.31 Beethoven, *The Creatures of Prometheus,* Op. 43, Finale



Turning to the melody line, the question of singing it as a strictly soprano voice now begins to come into focus. Of all the human voice species, it is the *baritone* voice's register shift from first to second register which best represents the crucial A-flat–B-flat turning point identified earlier. (Of the non-human musical instruments, it is noteworthy that the B-flat clarinet uniquely possesses a register shift from A-flat to A-natural. See Figure 12.59.)

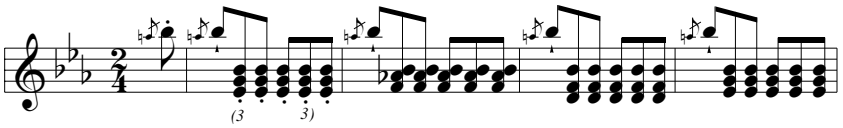
The dissonance between A-natural in the melody line, and the A-flat in the bass line, can therefore be characterized as an area of maximum tension created by the crossing over of the baritone voice moving into the second register from A-natural up to B-flat, while the bass shifts out of the second register and into the first register between A-flat and G—a kind of doubly-connected register shift. Another way of describing the same relationship is to point out the three levels of pedal-point action as Beethoven unfolds them over the course of the variations. The initial level of pedal point presented is the bass line itself, as cited in Figure 12.27. But already implicit in the repeated B-flats is a continuous B-flat pedal point which extends throughout the first three poetic lines of the respective variations.

Figure 12.32 Beethoven, *15 Variations and Fugue,* Op. 35, Variation IX



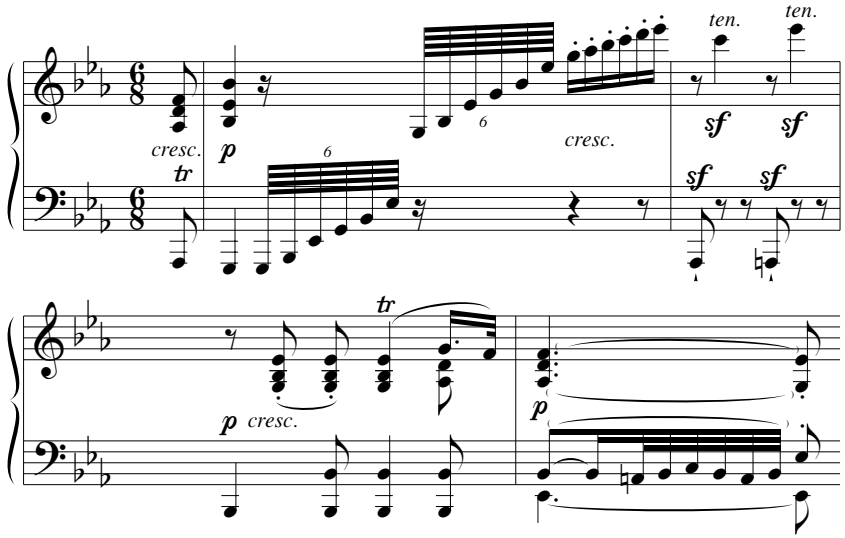
Beethoven makes this explicit in Variation IX, in which the notes of the original bass line become grace notes.

Figure 12.33 Beethoven, *15 Variations and Fugue,* Op. 35, Variation XIII



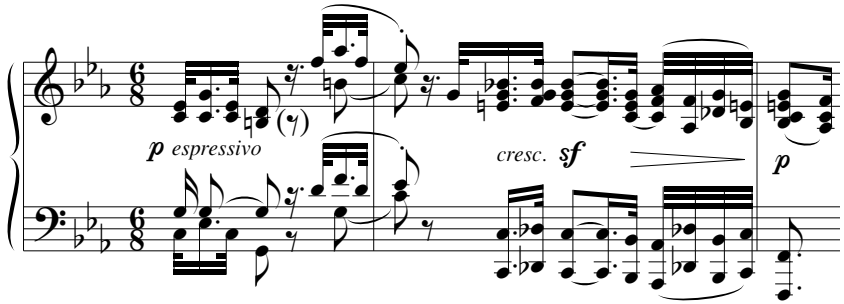
In variation XIII, Beethoven transposes this repeated B-flat pedal point upwards two octaves, thereby finding a way to lawfully introduce the troublesome dissonant A-natural.

Figure 12.34 Beethoven, *15 Variations and Fugue,* Op. 35, Variation XV



The A-natural is then re-introduced in turn into the bass line itself in Variation XV.

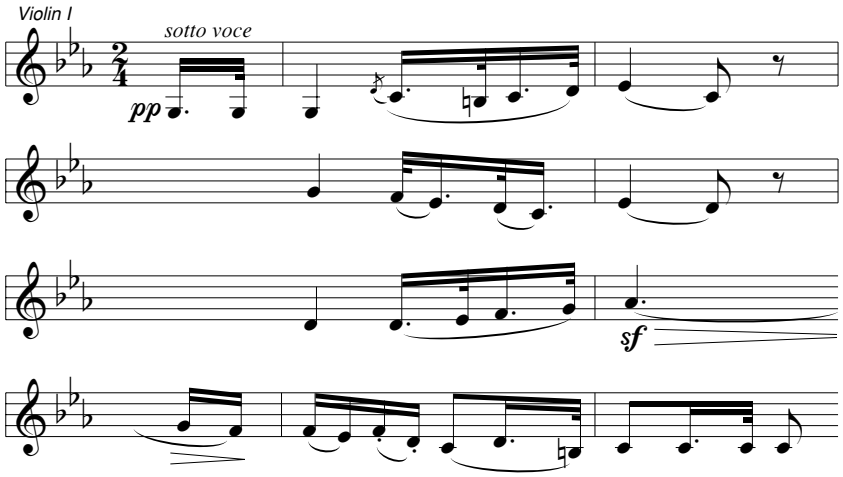
Figure 12.35 Beethoven, *15 Variations and Fugue,* Op. 35, Coda



A fully developed theme and variations such as this one cannot possibly stand as a unit-conception unless the implicitly double-fugal nature of the melody in conjunction with the pedal point is fully developed in polyphonic fugal form. In this regard, Beethoven makes explicit his tribute to the fugal method of his predecessor J.S. Bach, by his addition of an eight-measure coda section following Variation XV and immediately preceding the fugue.

The coda section returns to the key C minor, which had already been introduced in Variation VI; yet here, the reference to the Bach's C minor *Musical Offering* and the subsequent elaboration of the same material by Mozart in such works as the C minor Piano Sonata K. 457 and the C minor Fantasy K. 475, is clear enough (see Figures 12.18–12.22 above).

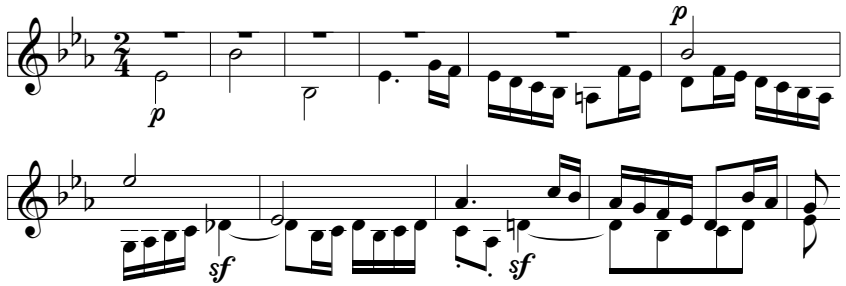
Figure 12.36 Beethoven, *Symphony No. 3 ("Eroica"),* Funeral March (Second Movement)



At the same time, Beethoven's coda section supplies a crucial seed-crystal for his composition of the "Eroica" Symphony, as can be heard most clearly by comparing the opening of the coda section to the symphony's second movement, the C minor Funeral March.

The coda section in the variations therefore points both backward and forward, and by virtue of that quality it is an indispensable component of the composition as a whole, as can be readily demonstrated by performing, or running through one's mind, the composition alternately with and without the coda section. At the same time, the coda's chorale-like counterpoint, with its obvious four voice species (soprano, mezzosprano, tenor, and bass), serves to firmly re-establish recognition of the voice species after the drastic registral inversions and transpositions of the preceding variations.

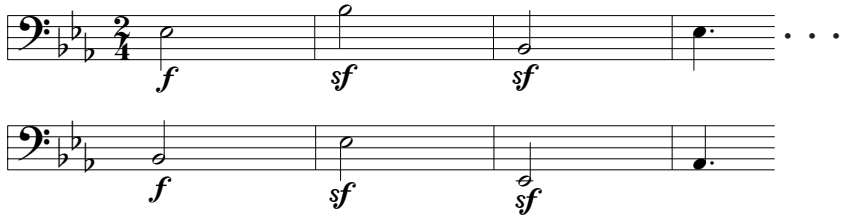
Figure 12.37 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



The fugue has three voices: soprano, mezzosoprano, and baritone. The mezzosoprano enters with the the first three notes of the pedal point, followed by a descending sixteenth-note figure which is the precise inversion of the ascending sixteenth-note figure of the melody (see Figure 12.25).

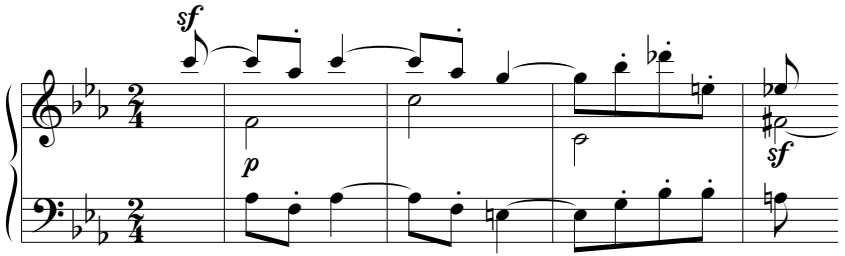
Note that whereas the original sixteenth-note passage ends on A-flat, the inverted passage incorporated into the fugue subject is so arranged that its final weight falls on A-natural. Thus, the opening statement of the fugue provides a "resolution" to the A-flat–A-natural dissonance discussed above. Some measures later, a resolution likewise begins to emerge for the overall tension between the rising baritone line against the descending bass line as discussed above.

Figure 12.38 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



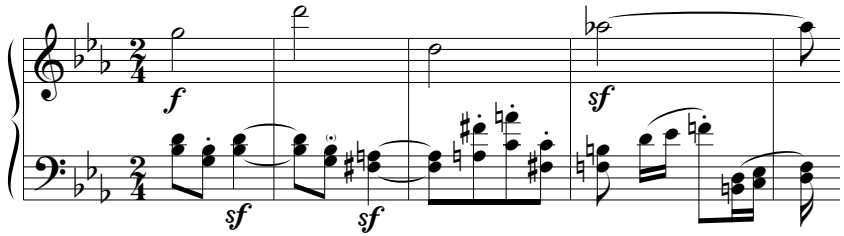
Although the fugue formally has three parts, there is such a stark contrast between the first entrance of the lowest (baritone) voice and the second entrance, that the second one, with its weight on A-flat, could more properly be thought of as a *fourth* fugal *bass* voice, instead of a mere linear continuation of the third (baritone) voice.

Figure 12.39 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



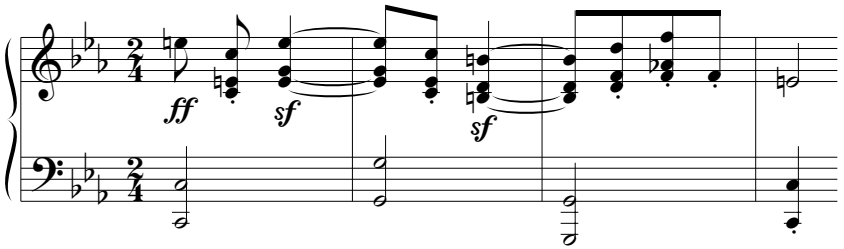
In the subsequent development, which is aimed toward the introduction of the fugal subject in inverted form, an A-flat pedal point is established on an equal footing with the B-flat pedal point which is implicit throughout the entire composition. This begins with measure 52 (last bar of the figure above), where the fugal subject is first altered, by dividing the C–C octave by F-sharp—yet another reference to J.S. Bach's *Musical Offering*. At the same time, the tension is increased by introducing a rhythmic alteration of the first bars of the original melody.

FIGURE 12.40 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



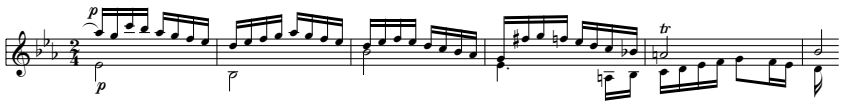
This establishes the basis for the next entrance of the fugal subject, in the soprano voice, which marks area of greatest creative "problem-solving" in the entire composition. Not only the A-flat, but also the soprano fourth-register D—the highest note reached by any statement of the fugal subject proper—begins an additional shift in the way the mind hears the original melodic statement: Namely, instead of the poetic stress falling on the first and third measures of the original bass line (see Figure 12.25), such that in the melody line one implicitly hears the sequence G–A-flat most prominently, the stress is shifted toward the second and fourth measures of the bass line, thereby giving equal prominence to the sequence D–E-flat.

FIGURE 12.41 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



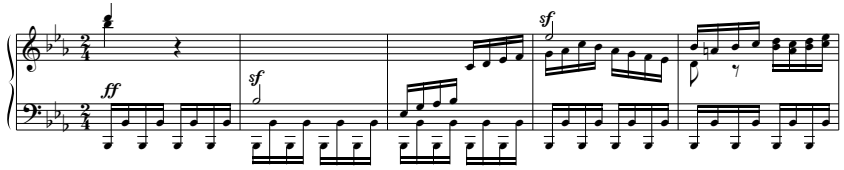
Beethoven does not neglect to make very explicit his intention to achieve this poetic shift, by using rhythmic diminution, placing *sforzandos* on the second beat of each measure and shifting the melodic statement accordingly.

FIGURE 12.42 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



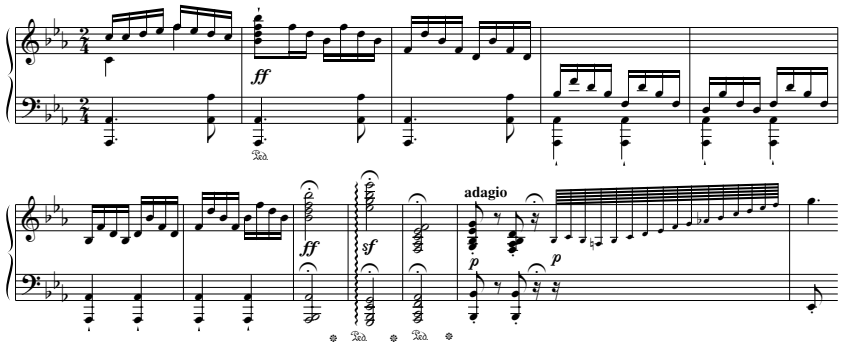
With all the major rhythmic and registral inversions now developed, the formal introduction of the inverted fugal theme does not require extensive development.

FIGURE 12.43 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



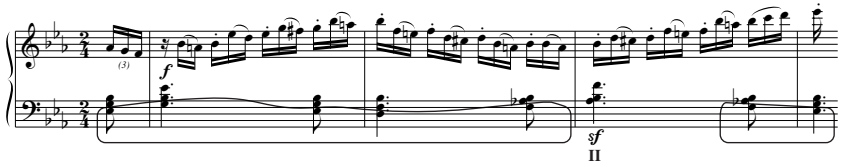
Beethoven proceeds directly to his double organ pedal point for the fugue's conclusion. First comes the B-flat pedal point.

FIGURE 12.44 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



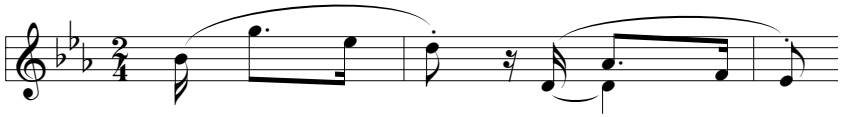
A few measures later, this is followed the A-flat pedal point, concluding with both together, followed by the resolution back to E-flat in the topmost voice of the arpeggiated chord. Note how the lowermost voice in the concluding four measures of this figure is nothing other than the concluding notes of the original bass pedal point.

FIGURE 12.45 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



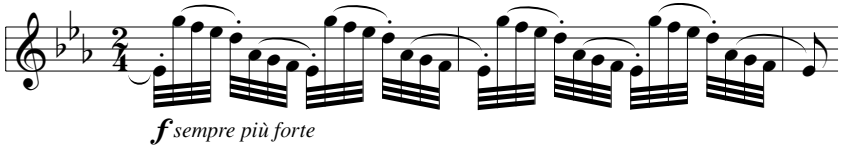
The final section celebrates the work accomplished, with extended trills on the B-flat pedal point. And at last, Beethoven presents the transposition of the melody into the actual octave of the baritone and bass voice, in the lowest line of the keyboard's left hand, which sings triumphantly with the human bass register shift from G to A-flat, underscored with a *sforzando*. (See Figure 12.59 for the equivalent passage sung by the orchestral basses in the "Eroica" Symphony.)

FIGURE 12.46 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



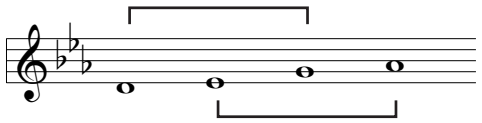
But the work is not yet quite done. The final eight measures of the composition constitutes a second coda, in which all the crucial features of the development become concentrated in the single two-measure dialogue between soprano and mezzosoprano, as shown in this figure.

FIGURE 12.47 Beethoven, *15 Variations and Fugue,* Op. 35, Finale



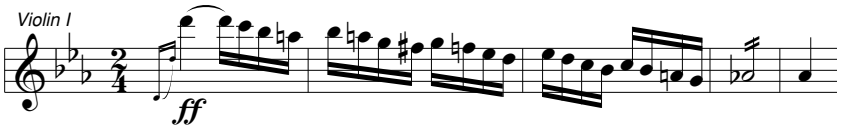
The dialogue is then accelerated, eventually into thirty-second notes.

FIGURE 12.48 Schematic of "Envelope" for Beethoven "Eroica" Variations



This leaves the mind with a kind of "envelope" of relationships, with the interval D–A-flat encompassing two different fourth intervals, G–D and A-flat–E-flat.

Figure 12.49 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



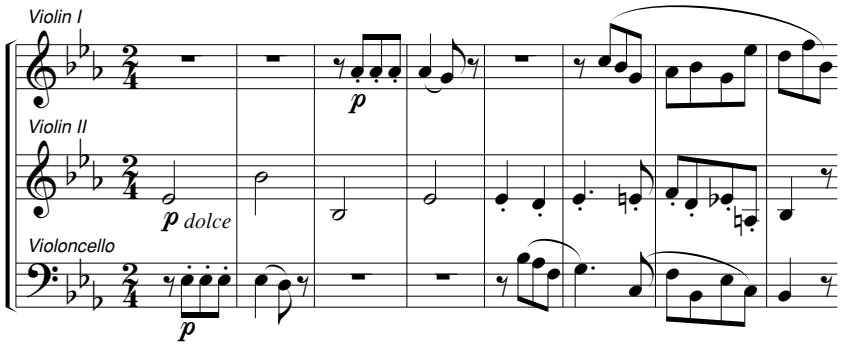
The significance of that final bit of work becomes immediately clear when one turns to the final movement of *Symphony No. 3*. There is no mystery in Beethoven's decision to begin the movement with an extended sixteenth-note flourish starting on D and modulating into E-flat.

Note how the modulation is accomplished by a the sequence A-natural–G–A-flat. The entire string section plays in unison here, in imitation of a full vocal chorus singing in unison; but the descent of the line gives prominence to the bass voice, which sings the opening D in the third register and later shifts into the first register between A-flat and G.

Beethoven's sketchbooks of 1803 show that he was clear about the need for this opening flourish long before he began to work out the details of the movement.

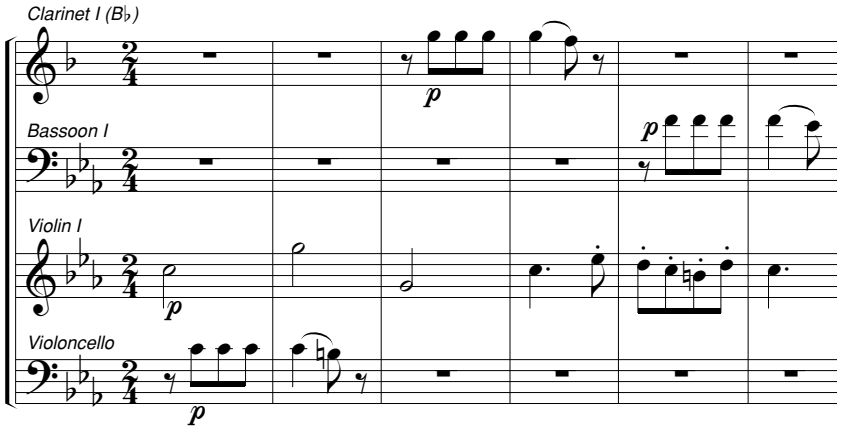
When the same flourish is introduced at the beginning of the movement's final coda section, it enters not on D, but on G—once again in keeping with the "map" presented in Figure 12.48.

Figure 12.50 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



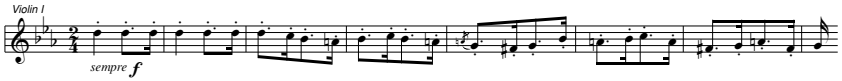
The "map" also quite straightforwardly supplies the most obvious added element in the symphony movement: the rhythmic counter-subject to the pedal-point line. With Beethoven's typical humor, he puts the first four notes in the violoncello line, even though they would more properly be an octave higher, in the soprano's first register. Similarly, the second four-note group in the first violins is more properly a bass voice.

Figure 12.51 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



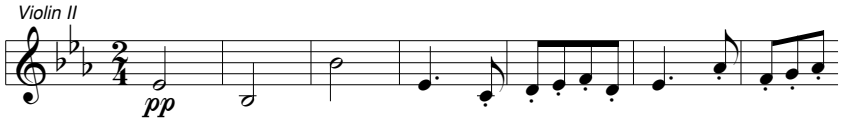
When the same figure introduces the C minor fugato section, the other two choral voices, tenor and soprano, are used. Note here also, how the fugato subject in the violins has been altered according to the work accomplished in the second, Funeral March movement (see Figure 12.36).

Figure 12.52 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



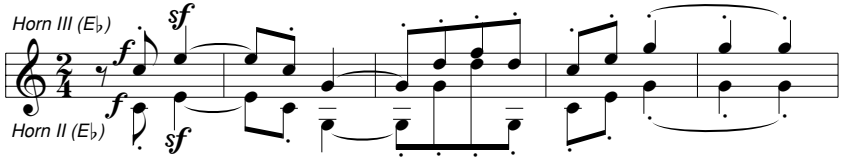
The rhythmic element of the Funeral March is introduced soon thereafter, in the form of a second countersubject to the pedal point.

Figure 12.53 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



This prepares the way for the introduction of the intense development in the second fugato section, which is based on the pedal point in inverted form, and is introduced in its most natural voice, the mezzosoprano.

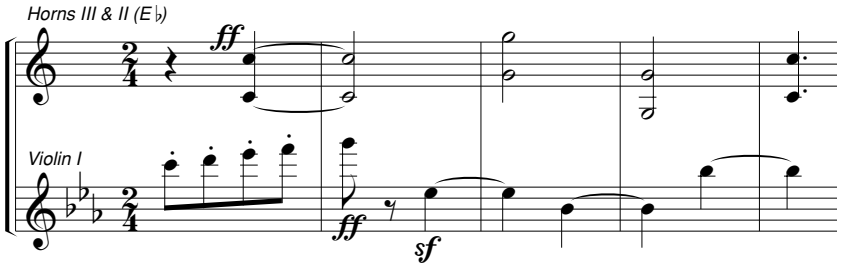
Figure 12.54 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



Unlike in the piano variations, it is only *after* the inverted subject is introduced, that the first bars of the original melody are reintroduced, by the horns, in rhythmically offset form.

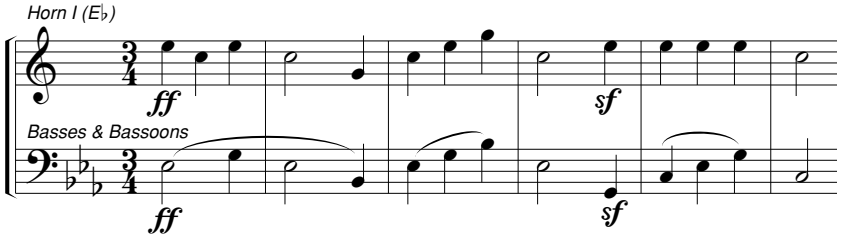
By doing this, Beethoven achieves the effect of a strict fugal stretto passage, but at the same time maintains the freedom to focus on the unity of the entire symphony.

Figure 12.55 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



For example, the fugato section ends with a triumphant reassertion, by the entire brass and woodwind section, of the pedal point in its original form.

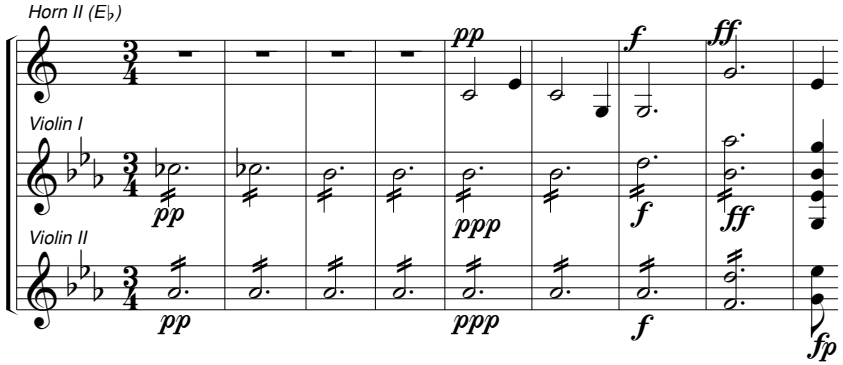
Figure 12.56 Beethoven, *Symphony No. 3 ("Eroica"),* First Movement



This immediately recalls to mind the full brass and woodwind statement of the opening theme of the first movement.

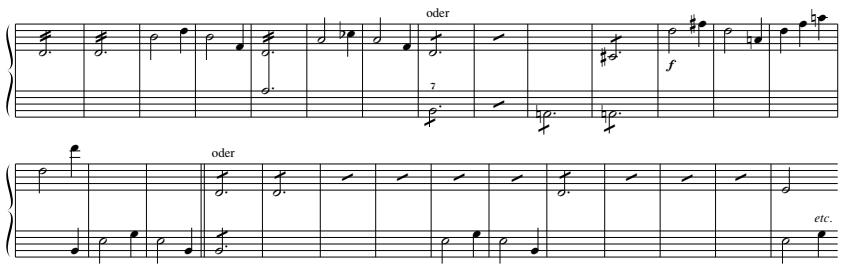
Returning to Figure 12.54, Beethoven deliberately heightens this effect by having the winds and brass voices "interrupt" the motion by entering one beat "too early"—a method which foreshadows the "montage" approach which Beethoven uses freely in his later works beginning with the Ninth Symphony.

Figure 12.57 Beethoven, *Symphony No. 3 ("Eroica"),* First Movement



Indeed, Beethoven's intention of utilizing an "interruption" as a means of subsuming the opening theme of the first movement is already evident at a crucial turning point of the first movement, the transition passage to the movement's third section which restates the opening.

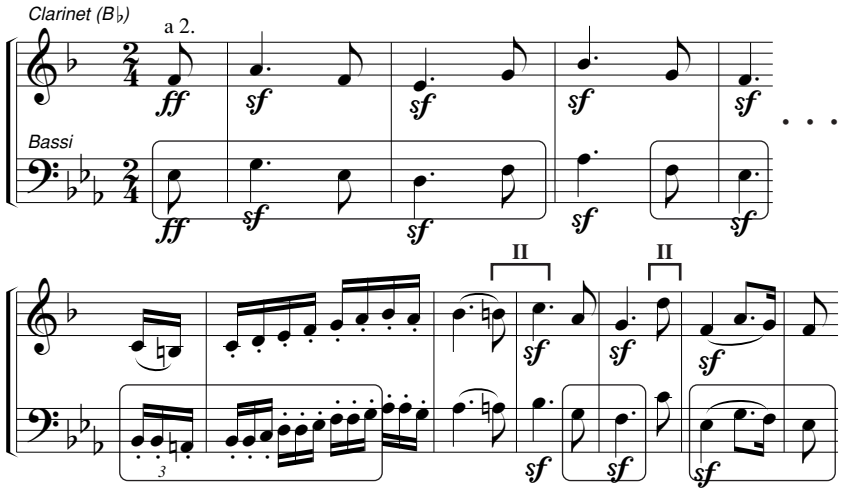
Figure 12.58 Beethoven, sketch for *Symphony No. 3,* First Movement



The dissonance betweem the horn and the violins shown in Figure 12.57 led some careless nineteenth-century commentators to make the absurd claim that Beethoven must have made some mistake here. But Beethoven's sketchbook from 1803 shows that he not only desired this dissonance, but had considered an even more dissonant entrance in D major, before rejecting it for the final version.

The rejected transition in D is highly suggestive of the way Beethoven in fact introduces the fourth movement on D, as already discussed above.

Figure 12.59 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)

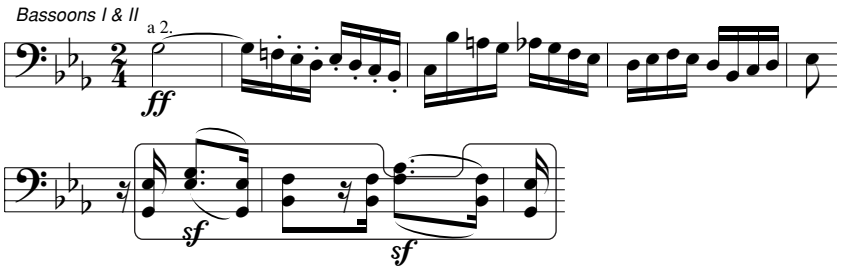


At the *poco andante,* the penultimate section of the fourth movement, marked by Beethoven in his preliminary sketches as a crucial component of the symphony, Beethoven brings the original soprano "Prometheus" theme into virtually all the instruments of the orchestra, transposed to a variety of registers.

Here, he creates the stretto/celebration analogous to the Finale of the Op. 35 variations (see Figure 12.45). The treble theme, appearing mainly as soprano in higher instruments in the fourth movement, but alluding to the bass G–A-flat register shift, finally appears in the orchestral basses, making concrete his joke, "the bass voice enters at last." The bass register shift is underlined with *sforzandi* in the basses, clarinets, bassoons, and most of the brass instruments.

In this passage, the B-flat clarinets, the only instrument in the orchestra with a major register shift at the treble theme's motion from A-flat to A-natural, sing the melody for the first time. (This precise register shift is not found in any human voice.) Up until this passage, the clarinets are confined to the bass theme (which lacks the A-flat–A-natural singularity), and ornamentation of the bass. For the clarinet, this register shift is a very audible one, most comparable to that between the female soprano's first and second registers (see Chapter 3, and Book II regarding woodwind instrumental registers).

FIGURE 12.60 Beethoven, *Symphony No. 3 ("Eroica"),* Finale (Fourth Movement)



The symphony concludes with a celebration in precisely the same mode as in the concluding measures of the piano variations. Following the flourish beginning on G, full poetic closure is achieved by placing the concentrated musical "map" in the bass voice species in the bassoons, such that the stresses alternate between G in the first register and A-flat in the second register.