

THE CONSTRUCTION OF CERTAIN SEALS AND
CHARACTERS IN THE WORK OF AGRIPPA OF
NETTESHEIM

By Karl Anton Nowotny

In Albrecht Dürer's etching 'Melencolia I' there appears this magic square :

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

The mathematical and astronomical instruments depicted in this drawing symbolize the tendencies of the melancholic temperament.¹ The square is the magic square of Jupiter, placed here to counteract the melancholic temperament, which comes under Saturn. The artist did not himself construct the square, but chose of all the innumerable possible formulae one showing the year date he wanted (1514). There can be no doubt that it was taken from a treatise on magic squares, their relation to astrology and their magic influence when on talismans. A version of this treatise is bound in with the fifteenth-century Cracow manuscript of the *Picatrix*.² By order of Alfonso X, the *Picatrix* was translated into Latin from the Arabic in 1276. A later version, differing considerably in text, appears in the pseudo-Paracelsian *Archidoxis magica*³ printed in Bâle in 1572. It is obvious that these two versions are closely related as the same magic squares are to be found in each; they are considerably distorted in the *Archidoxis magica*.

In the period when Dürer designed his 'Melencolia' he was greatly interested in geometrical problems; his artistic style was going through a phase of decided change. He was clearly occupied at this time in the study of books on astrological magic. Magic squares and subjects of a similar nature, classed to-day under the heading "mathematical entertainments," were given a very different significance by prominent men of intellect in Dürer's day. At that very time Agrippa of Nettesheim was writing his *Philosophia occulta sive magia*, which will be referred to in greater detail. Agrippa's views on the magic squares coincided with those of the treatise mentioned above. He does not, however, put together a haphazard collection of squares such as that from which Dürer took his "Seal of Jupiter" in the 'Melencolia' etching, but shows ingeniously constructed, imaginative figures.

A magic square is a square divided into cells, the outstanding character-

¹ Cf. E. Panofsky and F. Saxl, *Dürer's 'Melencolia I.' Eine quellen- und typengeschichtliche Untersuchung* (Studien der Bibliothek Warburg, II), Berlin, 1923. A revised and enlarged English version of this book is in preparation.

² Codex 793. Cf. H. Ritter, *Picatrix*

ein arabisches Handbuch Hellenistischer Magie, (Vorträge der Bibl. Warburg 1921-22), Leipzig, 1923.

³ Theophrast von Hohenheim known as Paracelsus, *Collected Works*, published by K. Sudhoff, 14 vols., Munich, 1933.

istic of which is that numbers are inserted in such a way that if every row, column and diagonal is added up they all show the same total. Besides this, many other rules of a geometrical or arithmetical nature may be discerned.¹ As a rule, magic squares are made up from a series of consecutive numbers commencing from one; this, however, is just one possibility amongst many.²

It is the mathematical aspect of magic squares which, to judge by the literature on the subject, has so far received the greatest attention.³ Their historical significance, however, is far greater although of course they offer occasion for the study of many problems on permutations and combinations, and in the theory of numbers.

They came in with that wave of civilization from the East which, besides introducing Hellenistic cultural benefits in Arabian garb, brought with it chess and playing cards. To this day magic squares (*wafk*) are in use in Islamic countries.⁴ These are usually squares of nine or sixteen cells, but also frequently the so-called Latin squares. The top line of such a square is filled with the letters of a divine name or with the first letters of a verse from the Koran, the remaining lines containing permutations of these letters. As the letters have a numerical value the result is a more or less perfect magic square. Agrippa's method of constructing characters from magic squares—in which the starting-point is arithmetical, letters being fitted to the numerals—is simply the inversion of this principle.

Clues to the history of magic squares are to be found in Arabian sources. These go back to about 900 A.D. and appear in the Encyclopaedia of the "Faithful Brethren" of Basra in the latter half of the tenth century. According to Ruska, records go back to the Sabians of Harran, a pagan sect whose priests used the Syrian language and who practised star worship; they can be traced as late as the eleventh century. Mathematicians and those cultivating the secret sciences in the thirteenth century were especially interested in this subject. The only known particulars are derived from the writings of Al-Buni, who died in 1225. So, too, the application of the squares of the numbers 3 to 9 to the seven planets can only be traced to this period. This application occurred in a double form: upward, a system introduced into the West by Agrippa, and downward (the square of the number 3 assigned to the Moon, etc.) as practised in the West according to Cardan.⁵

Apart from the difficulties caused by the scarcity of historical records, there are many interesting problems still unsolved. Agrippa apparently obtained his information from translations from Arabic. Numbers, letters, and incomprehensible characters used for purposes of magic appear even in the Hellenistic magical papyri. Little is yet known of the changes that took place in these matters during the long intervening period. Agrippa did indeed endeavour to compile an encyclopaedia and synthesis. His friend Abbot Trithemius of Spon-

¹ B. Lehmann, *Zahlenfiguren auf Amuletten und Planetensiegeln*, Strelitz-Alt, 1925.

² B. Kletler, *Magische Zahlenquadrate*, Vienna, 1930.

³ S. Günther, *Vermischte Untersuchungen zur Geschichte der mathematischen Wissenschaften*, Leipzig, 1876.

⁴ J. Ruska, article *Wafk* in *Enzyklopädie des Islam*, 1933; E. Doutté, *Magie et religion dans l'Afrique du Nord*, Algiers, 1909; Ahrens and Bergsträsser in *Islam*, VII, 1916; XII, 1922; XIII, 1923.

⁵ *Practica arithmetica*, 1539.

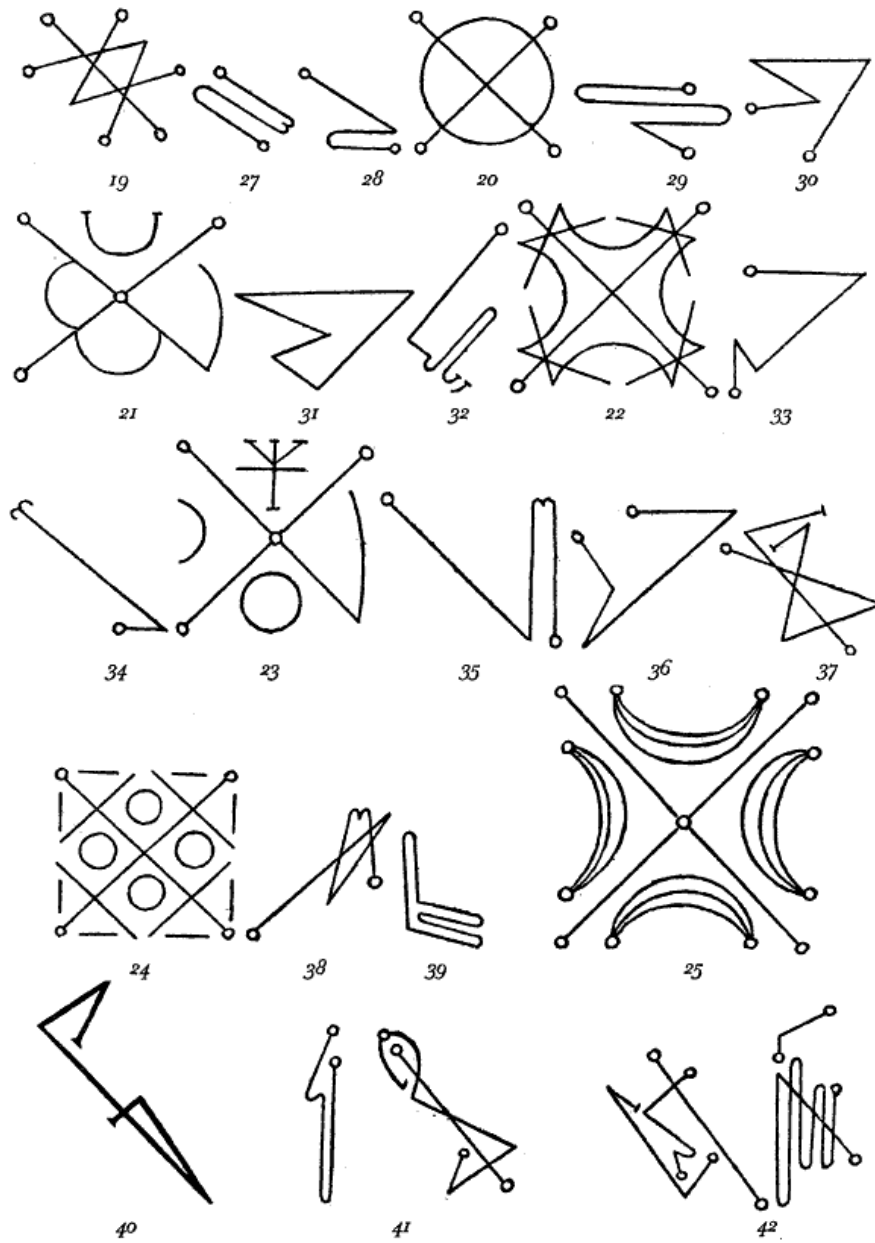


Fig. 1—The “Signacula” and “Characteres” in Agrippa’s *Occulta Philosophia*, Lyons, 1533
 The numbering corresponds with that of figs. 19-25 and 27-42 on Plate 21

heim,¹ who was one of Paracelsus' teachers, devoted himself to cryptography. He used, for this purpose, elaborate magic formulae which earned him a reputation as arch-magician. Agrippa distinguished between seals derived from the geometrical pattern of the distribution of numbers in the squares, and characters from cryptographic names of the planet angels.² Whether, in following this method, he was relying on ancient tradition or was influenced by Trithemius has not, so far, been established.

The names given by Agrippa to the angels present another interesting problem. The fact that he chose Hebrew names may be accounted for by his adopting the cabbalistic philosophy, and also by the belief that Hebrew was the original language of antiquity. Angels and demons would, naturally, be assumed to make use of this language. An examination of the words employed with their fragments of Greek might give rise to interesting conclusions. Agrippa's magic squares are constructed both from Arabic numbers and from Hebrew letter numerals.³

Subsequent developments are also of great interest. Mathematicians,⁴ astrologers, and cabbalists such as Robert Fludd, all concerned themselves with magic squares. Astrological amulets made of the metals of the seven planets attained special importance during the seventeenth and eighteenth centuries.

* * *

The symbols of a cabbalistic nature, which occur very frequently on astrological medallions, seem in many cases to have originated with Agrippa of Nettesheim (fig. 1).⁵ The manner in which such symbols can be taken from magic squares is shown by Agrippa in an elaborate chiasmus: "Qualiter autem elicantur signacula et characteres cum stellarum tum spirituum ex istis mensulis, sagax scrutator, et qui harum mensularum verificationem intellexerit, facile invenire poterit." Thus, the *signacula* are related to the construction of the tables; the characters, on the other hand, are to be discovered by calculation.

The construction, however, is not easy to discern. Hardly any of the readers of Agrippa's skilful Latin have comprehended correctly its hidden meaning. In following Agrippa's directions one must first of all obtain a clear understanding of the construction of the square shown by him. This is in no sense a question of mathematics, of the many possible variations or similar problems. Agrippa uses very simple magic squares which are obtained by

¹ *Steganographia*, Lyon, 1531; Darmstadt, 1606; Mainz, 1676; Nürnberg, 1721.

² F. Maak (*Die astrologische Bedeutung des magischen Quadrates*, Vienna, 1925) sought to explain these symbols by means of complicated mathematical expositions. The accuracy of the explanation given below is proved by the fact that the symbols can be divided into as many parts as there are words in the names in question, that they have as many ends and corners as there are letters in the words, and that words having the same first and last letters correspond to characters

in a reverse direction.

³ W. Ahrens, *Hebräische Amulette mit magischen Zahlenquadraten*, Berlin, 1916.

⁴ P. Tannery, *Le Traité manuel de Moschopoulos sur les carrés magiques*, Paris, 1886; Michael Stifel, *Arithmetica integra*, 1544.

⁵ Henricus Cornelius Agrippa ab Nettesheim, *De Occulta Philosophia Libri Tres*, 1533, Lib. II. De Planetarum mensulis, earum uirtutibus & formulis, & quae illis praeficiantur, diuina nomina, intelligentiae & daemonia. Caput XXII. (Cf. fig. 1.)

means of simple changes and permutations from squares made up of numbers in their natural consecutive order. The squares are assigned to the seven planets in the order of their velocity. Three kinds of magic squares can be distinguished according to the number of units in a side: those containing an uneven number; those with an even number whose halves are uneven; and those containing an even number whose halves are even. The lowest number of units used to form one side of a magic square is three.

The magic square of the numeral 3, the table of Saturn (fig. 2),¹ is derived from the natural square (fig. 3) numbered from left to right, as in the construction of all uneven squares, by a turn of 45° to the right and the insertion of the numerals thus left on the opposite sides (fig. 4). The seal of Saturn (fig. 19) does not coincide with this construction, it simply shows the numerals of the square in their consecutive order (1-2-3, 4-5-6, 7-8-9). Small rings have been introduced at the ends of the lines. This seal corresponds to the construction of the square of the numeral 3 as interpreted by the "Faithful Brethren" in terms of the moves of chess-men.

4	9	2
3	5	7
8	1	6

Fig. 2

1	2	3
4	5	6
7	8	9

Fig. 3

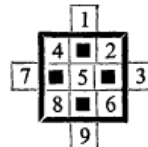


Fig. 4

The magic square of the numeral 4, the table of Jupiter (fig. 5), is formed by leaving in position one half of the numerals of the natural square (fig. 6— as in the case of all even squares, the sequence is from right to left) and turning the other half by 180° , as shown in the diagram of fig. 7. The seal of Jupiter (fig. 20) joins together the numerals left in position by means of a St. Andrew's cross with rings at the end, and the numerals turned round by means of a circle.

4	14	15	1
9	7	6	12
5	11	10	8
16	2	3	13

Fig. 5

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

Fig. 6

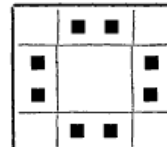
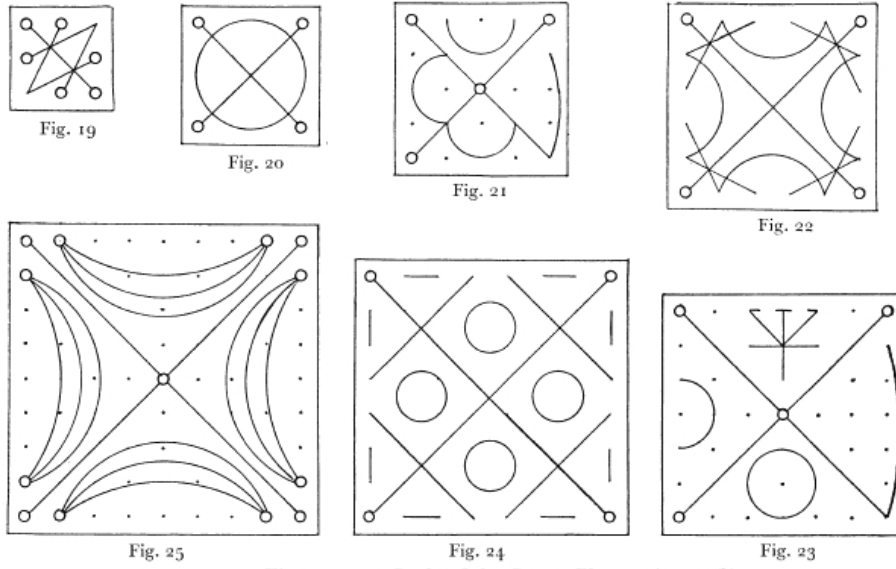


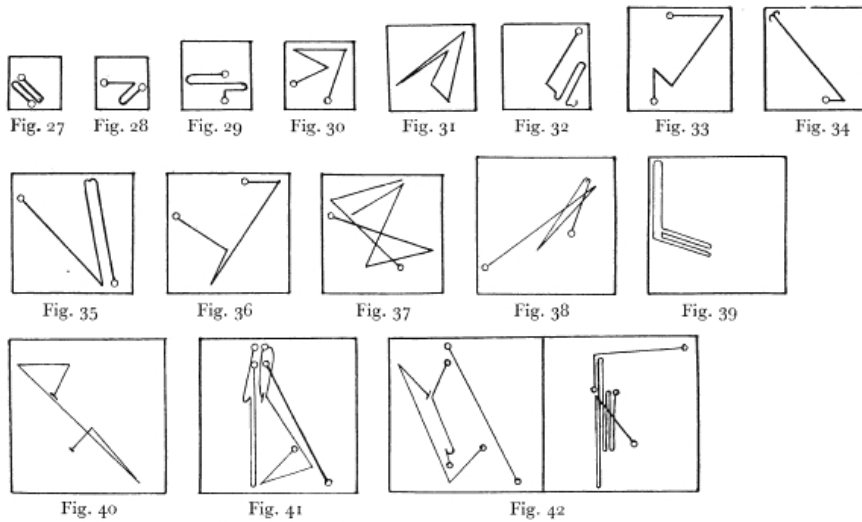
Fig. 7

The square of the numeral 5, the table of Mars (fig. 8), is formed in the same manner as the square of the numeral 3 from its natural square (fig. 9), as shown in the diagram of fig. 10. The seal of Mars (fig. 21) is more difficult to explain. The plan of construction of the uneven squares shows a chequered field like that of a chess board. The cells of the diagonals are joined by a St. Andrew's cross with rings on the ends and another in the centre as there is a numeral there also. The hook on the right connects the

¹ For explanation of the use of heavier 16, 18 below, see p. 55. type in this diagram and figs. 5, 8, 11, 15,



Figs. 19-25—Seals of the Seven Planets (*p.* 50 f.)

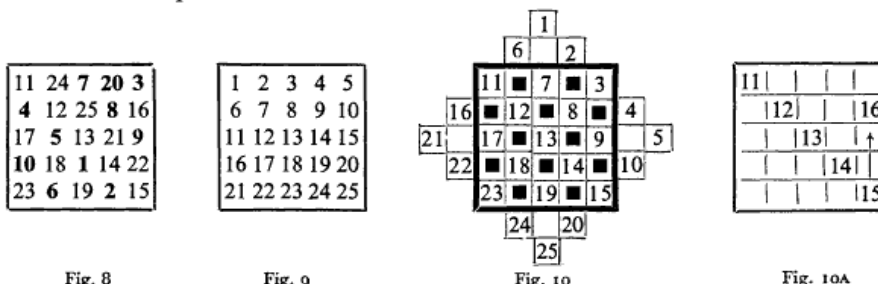


Figs. 27-42—Characters of the Intelligences and Demons of the Planets (*p.* 53 f.)

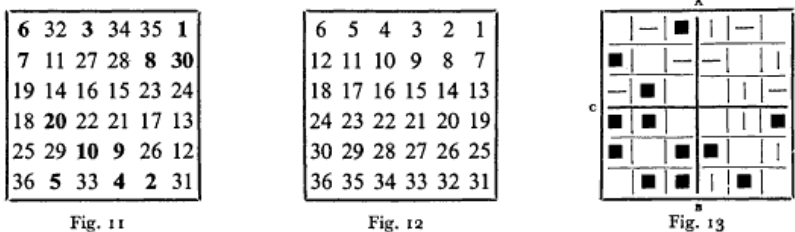


Fig. 43a Fig. 43b Fig. 44a Fig. 44b
 Figs. 43a, b—Sun Talisman (*p.* 56) Figs. 44a, b—Moon Talisman (*p.* 56)
 Münzkabinett, Vienna

two widely separated numbers 15 and 16. The significance of these numbers is at once made clear if one takes the trouble to join up all the numerals in this magic square.¹ The three half circles connect cells of the same colour in the chessboard pattern referred to above.



The magic square of the numeral 6, table of the Sun (fig. 11), is difficult to make. The numbers of the diagonals in the natural square (fig. 12) remain; the cells filled in with black in the diagram (fig. 13) are turned by 180°. The cells marked with a vertical line are mirrored in AB and those with a horizontal line are mirrored in CD. The construction of the larger even squares with uneven halves is still more complicated (cf. fig. 14—even wider variants of the square of the numeral 10 are possible). The lines of the seal of the Sun (fig. 22) join up the numbers of the diagonals. The mirrored numbers are connected by means of the characteristic hooks, as are the numbers which were only turned.



The construction of the square of the numeral 7, the table of Venus (fig. 15) follows the same principle as that of the uneven squares mentioned above. The seal of Venus (fig. 23) again shows the diagonals connected as in the square of the numeral 5, as well as the hooks joining the widely separated numbers 28 and 29. The circle at the bottom and the half-circle at the left-hand corner form links between cells of the same colour in the chess-board pattern of the diagram. In the top corners these cells are connected by a cross and a triangle. The figures resulting from this arrangement may have symbolic significance.

¹ When one starts the construction of the magic square by writing the diagonal in its natural order, the only problematic step is from 15 to 16 (see fig. 10A) and this must be repeated at 20, 25, 5, 10. Cf. W. W. Rowse Ball, *Mathematical Recreations and Essays*, 10th ed., London, 1931, chapter VII, p. 139.

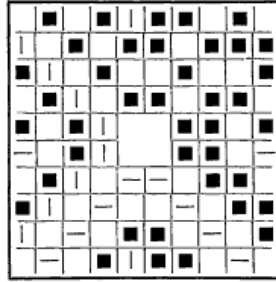


Fig. 14

22	47	16	41	10	35	4
5	23	48	17	42	11	29
30	6	24	49	18	36	12
13	31	7	25	43	19	37
38	14	32	1	26	44	20
21	39	8	33	2	27	45
46	15	40	9	34	3	28

Fig. 15

The square of the numeral 8, table of Mercury (fig. 16), is formed in the same manner as that for the numeral 4. There are three variants of analogous diagrams. The example given (fig. 17) shows, after the interchange of the stationary and turned cells, the formula *a b b a* on a half turn. The variants *a a b b* and *a b a b* are also possible. The seal of Mercury (fig. 24) shows the stationary numbers in the diagram fig. 17 joined together by a St. Andrew's cross with rings on the ends and by four straight lines cutting through the arms of the cross. The turned numbers are joined by four circles and eight short lines.

8	58	59	5	4	62	63	1
49	15	14	52	53	11	10	56
41	23	22	44	45	19	18	48
32	34	35	29	28	38	39	25
40	26	27	37	36	30	31	33
17	47	46	20	21	43	42	24
9	55	54	12	13	51	50	16
64	2	3	61	60	6	7	57

Fig. 16

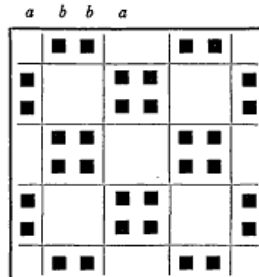


Fig. 17

37	78	29	70	21	62	13	54	5
6	38	79	30	71	22	63	14	46
47	7	39	80	31	72	23	55	15
16	48	8	40	81	32	64	24	56
57	17	49	9	41	73	33	65	25
26	58	18	50	1	42	74	34	66
67	27	59	10	51	2	43	75	35
36	68	19	60	11	52	3	44	76
77	28	69	20	61	12	53	4	45

Fig. 18

The square of the numeral 9, the table of the Moon (fig. 18), is formed in the same way as the uneven squares already referred to. The seal of the Moon (fig. 25) again shows the St. Andrew's cross with rings at the ends and at the point of intersection. Cells of the same colour in the chessboard pattern are connected by triple crescents with rings on the ends. This form must certainly have been chosen with direct reference to the Moon.

Thus, the interpretation of the seals of the planets is to be sought, as Agrippa says, in the construction of the tables. This is especially evident in the squares with an even number of cells. In the squares containing sides with uneven numbers, besides the lines inherent in the diagram, symbolic figures are drawn over the chessboard pattern indicating the nature of the planet.

* * *

The characters (*characteres*) are formed very differently. In the first place,

the names of angels are selected, the letters of which give the numbers of the magic squares.¹ The numbers contained in the magic squares assigned to the seven planets are as follows:

	<i>No. of units in a side</i>	<i>No. of cells</i>	<i>Sum along any line²</i>	<i>Total</i>
Saturn	3	9	15	45
Jupiter	4	16	34	136
Mars	5	25	65	325
Sun	6	36	111	666
Venus	7	49	175	1225
Mercury	8	64	260	2080
Moon	9	81	369	3321

The names of the angels or spirits assigned to the planets are as follows:

Intelligentia Saturni

Agiel אגיאל $30 + 1 + 10 + 3 + 1 = 45$
(Cf. fig. 27)

Daemonium Saturni

Zazel זאזל $30 + 7 + 1 + 7 = 45$
(Cf. fig. 28)

Intelligentia Iovis

Iophiel יהפיאל $30 + 1 + 10 + 80 + 5 + 10 = 136$
(Cf. fig. 29)

Daemonium Iovis

Hismael הסמאל $30 + 1 + 40 + 60 + 5 = 136$
(Cf. fig. 30)

Intelligentia Martis

Graphiel גראפיאל $30 + 1 + 10 + 80 + 1 + 200 + 3 = 325$
(Cf. fig. 31)

¹ The numerical values of the Hebrew letters are as follows:

1 א	alef	10 י	jod	100 ק	qof
2 ב	b, bh	20 כ	k, kh	200 ר	res
3 ג	g, gh	30 ל	lamed	300 ש	s, s
4 ד	d, dh	40 מ	mem	400 ת	t, th
5 ה	he	50 נ	nun	500 ך	Final-kaf
6 ו	waw	60 ס	samekh	600 ם	Final-mem
7 ז	zain	70 ע	‘ain	700 ן	Final-nun
8 ח	ch	80 פ	p, f	800 ף	Final-pe
9 ט	ṭeth	90 צ	ṣade	900 ץ	Final-ṣade

² The “sum along any line” is known as the Magic Constant of the square. It is $\frac{1}{2}n(1+n^2)$ for a square of n units in a side. The Total of all the numbers in the square is $\frac{1}{2}n^2(1+n^2)$.

- Daemonium Martis
Barzabel ברצאבאל $30 + 1 + 2 (+ 1) + 90 + 200 + 2 = 325 (+ 1)$
(Cf. fig. 32)
- Intelligentia Solis
Nachiel נכיאל $30 + 1 + 10 + 20 + 50 = 111$
(Cf. fig. 33)
- Daemonium Solis
Sorath סורת $400 + 200 + 6 + 60 = 666$
(Cf. fig. 34)
- Intelligentia Veneris
Hagiel הניאל $30 + 1 + 10 + 3 + 5 = 49$
(Cf. fig. 35)
- Daemonium Veneris
Kedemel קדמאל $30 + 1 + 40 + 4 + 100 = 175$
(Cf. fig. 36)
- Intelligentiae Veneris
Bne Seraphim בני שרפים $600 + 10 + 80 + 200 + 300; + 10 + 50 + 2 = 1252 (!)$
(Cf. fig. 37)
- Intelligentia Mercurij
Tiriell טיריאל $30 + 1 + 10 + 200 + 10 + 9 = 260$
(Cf. fig. 38)
- Daemonium Mercurij
Taphthartharath תפתרתרת $400 + 200 + 400 + 200 + 400 + 80 + 400 = 2080$
(Cf. fig. 39)
- Daemonium Lunae
Hasmodai חשמודאי $10 + 1 + 4 + 6 + 40 + 300 + 8 = 369$
(Cf. fig. 40)
- Daemonium daemoniorum Lunae
Sched barschemoth Schartathan שד ברשהמעח שרתתן $700 + 400 + 400 + 200 + 300; + 400 + 70 + 40 + 5 + 300 + 200 + 2; + 4 + 300 = 3321$
(Cf. fig. 41)
- Intelligentia intelligentiarum Lunae
Malcha betharsitim hed beruach schehakim מלכא בתרשיתים עד ברוח שחקים $600 + 10 + 100 + 8 + 300; + 8 + 6 + 200 + 2; + 4 + 70; + 600 + 10 + 400 + 10 + 300 + 200 + 400 + 2; + 1 + 20 + 30 + 40 = 3321$
(Cf. fig. 42)

The characters are formed by joining the numerical values of the letters forming the names of the angels in the tables of the planets; this can easily be confirmed by a comparison of the angels' names given above with figs. 27 to 42. The numbers in the construction employed in this manner are printed in heavy type in the planet tables in order to facilitate comparison (figs. 2, 5, 8, 11, 15, 16, 18).

The tens and hundreds are often expressed by ones, even where the numeral ten is already given. Ones, on the other hand, may be shown as tens. The same method occurs in a fairly widely distributed cryptographic writing, mentioned by Agrippa (cf. fig. 26). Letters having the same numerical value but varying in position are expressed by the same angle signs and distinguished only by diacritic dots, if at all.

ש	ג	ל	ש	ב	כ	ר	א	י	ק
ס	ו	ס	מ	ה	נ	ך	ד	מ	ת
ץ	ט	צ	ץ	פ	ה	ף	ע	ן	ן



Fig. 26

The joining of the numbers is by no means consistent. The main idea was, apparently, to produce characters as pleasing as possible to the eye. Small rings are usually placed at the ends of the lines; where there is no room for rings these are replaced by cross strokes (figs. 40, 41, 42). If a word terminates with two letters having the same numerical value the character is sometimes completed by a double hook (figs. 32, 34). Two letters having the same numerical value occurring in a word are sometimes represented by an indentation (figs. 27, 35, 38, 41, 42), sometimes not at all (figs. 29, 31); sometimes, however, in cases where the position-value of the numbers is different, they are joined by lines (figs. 33, 36, 41, 42). In cases where the words begin and terminate with the same letters the characters, quite logically, are turned inward on themselves (figs. 31, 39). Two of the characters appear in the old woodcuts in reversed positions (cf. figs. 28 and 32 with fig. 1). One character shows a superfluous twist (fig. 32). The two words in the character of fig. 37 are not separated by rings or slanting lines as they form a double word. In this character the name of the angel is wrongly assigned to Venus, as the numerical value is 1252 and not 1225.

Apart from these irregularities, there are obvious mistakes in the characters of the Moon. This may be accounted for by their very complicated nature. In the character of the Demon of the Moon, for instance, the symbol of Mem (40) has been omitted; a ring is missing, also, from one of the ends. In the character of the Supreme Demon of the Moon one line is incorrectly crossed through, and the symbol for He (5) is missing. In the character of the Supreme Intelligence of the Moon a Final-Mem is given instead of a simple Mem, and so one hairpin-like loop too many has been drawn. The character of the word Malcha, in the old woodcuts, is in the wrong position in its relation to the other character. It may be, however, that it was constructed of Mem (40), Lamech (30) and Final-Kaf (500). The extremely

complicated outlines of the Supreme Intelligence of the Moon necessitates the use of two characters or of two juxtaposed magic squares. In the old woodcuts the second character is correct, apart from an incorrect cross stroke.

Agrippa's seals and characters frequently occur, with many other signs, on post-mediaeval medallions and seem usually to be taken from his works. The examples reproduced (figs. 43a, b and 44a, b) are from the Münzkabinett in Vienna. The medallion of the Sun shows (fig. 43a) the Sun in his astrological house, the Lion, as on the coat of arms of Persia. On the reverse (fig. 43b) there appear the character of the Intelligence of the Sun (Nachiel—cf. fig. 33), the zodiacal sign of Leo, and the sign of the "heart of the lion" (Cor leonis), i.e., the bright fixed star Regulus. This sign appears also in Agrippa's book, and moreover, Dürer depicted it in the portrait of Kleeberger in Vienna;¹ for Kleeberger was born in this significant conjunction of the Sun and Regulus (Sol in Corde leonis). The medallion of the Moon (figs. 44a, b) is a good example of the interconnection of astrology and astronomy. It shows the picture of the Moon as it might have been seen in a telescope, with a little figure of Luna within it (fig. 44a); the magic square of the Moon (fig. 44b); and, divided between the two sides, a distorted version of the character of the Supreme Intelligence of the Moon (Malcha betharsitim hed beruach schehakim—cf. fig. 42). The other characters and names of angels originate from the *Heptameron* of Petrus de Abano and from the *Clavicula Salomonis*.

Agrippa credits his planet tables with the well-known influences, both for good and evil, ascribed to the seven planets. Referring to the working of these influences at the opening of Chapter XXII of Book Two, he gives expression to Neo-Platonic views which are of the very essence of his "occulta philosophia, sive magia." Hence he laid great stress on their significance:

Traduntur insuper a magis quaedam numerorum mensulae, planetis septem distributae, quas planetarum sacras tabulas vocant multis admodum magnisque coelestium virtutibus insignatas, quatenus repraesentant divinam illam coelestium numerorum rationem a divinae mentis ideis per rationem animae mundi coelestibus impressam, illorumque suavissimam coelestium radiorum harmoniam, secundum effigierum proportionem, intelligentias supramundanas consignantium, quae aliter exprimi non possunt, quam per notas numerorum et characterum. nihil enim materiales numeri et figurae possunt in mysteriis rerum abditarum, nisi repraesentative per numeros et figuras formales, quatenus reguntur et informantur ab intelligentiis et numerationibus divinis, quae nectunt extrema materiae atque spiritus ad voluntatem animae elevatae per magnum affectum operantis coelesti virtute potestatem accipiens a deo, per animam universi et coelestium constellationum observationes in materiam applicatam ad formam convenientem, dispositis mediis solertia et scientia magicali.

¹ A. Lochr, "Astrologie in der Numismatik," *Berliner Münzblätter*, 52, Nos. 349, 350, Berlin, 1932; *idem*, "Sol in Corde leonis," *Numismatische Zeitschrift*, Vienna, 1947.

The magic squares must arouse great interest, whether regarded as a preparation of the human mind for later triumphs in the exact sciences, or considered from an historical standpoint as the transition from magic thought to scientific thought.

The theory of the magic squares as maintained by Agrippa in the early sixteenth century is a particularly illuminating example of a bold compromise between the two points of view such as could only have existed in that period of transition. This blending of ideas is here far more clearly discernible than, for example, in the theory of the relation of the planets to metals, colours, etc. These theories also are the result of compromise, but their development began at such an early period and continued so gradually that it is more difficult to perceive them.

Agrippa's views in regard to magic influence are still quite in accord with those of the ancient magicians, in that he connects it with an angel (Intelligence or Demon) who can be summoned by the use of his name.

This philosophy, however, is combined with that ascribing all influences to the forces of Nature, which it seeks to probe. It assigns to the planets a series of squares involving mathematical problems and arranged in the order of their velocity. These numbers and lines seem to reveal the laws of the harmony of the spheres. The construction of this harmony is on rational lines. To a contemporary observer it would appear that only the absence of a key to the harmony of these squares conceals from him a knowledge of the final solution.

bring him to Rome in fetters, or slaughter him outright."¹

A streak of personal vanity in Hutten's behaviour cannot be denied. He enjoyed playing this half-imaginary part of an equal partner in a struggle with the head of the Church. A few days before he wrote the present letter, he proudly announced to Erasmus that his Roman adversaries "were said to have offered" him fairly decent conditions for a peace, if he would condescend to discuss it.² The new letter lifts the curtain a little; all that had happened was an admonition from Capito to take steps towards a reconciliation. Hutten counters with the remark that he would not think of this and would not even discuss peace terms, "if they were offered," as long as Germany were under the heel of the Roman "curtsiani." The "Romanists" evidently had not taken any steps to come to terms with him.

Stylistically the letter is a typical product of Hutten's pen; amiable and elegant in its first part, in the characterization of Crotus; over-emphatic and artificially monumental in the discussion of Hutten's own political problems. Even with all allowances made for the literary taste of the period, Kalkoff's remark about "the monotony of Hutten's excited rhetoric" is justified by a perusal of the letters and manifestoes of 1520.

RICHARD G. SALOMON

A NOTE ON MAGIC SQUARES IN THE PHILOSOPHY OF AGRIPPA OF NETTESHEIM

Among the many great advances made during the seventeenth century in the Theory of Numbers were some of the earliest attempts to generalize the mathematics of magic squares. "Je ne sais guère rien de plus beau en arithmétique que ces nombres que quelques-uns appellent 'planetarios' et les autres 'magicos'," wrote Fermat.³ But this new approach which, Fontenelle declared, would redeem magic squares from their regrettable reputation of being merely "une vaine pratique de faiseurs de talismans, ou de devins," inevitably robbed them of those very qualities which had previously lent them magical and even philosophical importance.⁴

¹ Böcking no. 198.

² Böcking no. 184=Allen no. 1135.

³ To Mersenne, April 1, 1640; Fermat, *Oeuvres*, ed. Tannery and Henry, II, 1894, p. 194.

⁴ A modern mathematician describes these illusory

They ceased to be mysteriously isolated phenomena which could only be constructed more or less empirically, by non-mathematical devices,⁵ the "significance" of which was, therefore, apparently only to be discovered by recourse to that symbolism of numbers which had been developed, not only by Neo-Platonists, to relate and interpret all objects to be found in mind and nature. Thus the fact that no four-celled magic square is possible was held to be explained by the realization that such a square represents, or is perhaps the cause of, the imperfection of the four elements taken by themselves. Similarly "meaningful" was the knowledge that no single-celled square can be imperfect; and the monad, measuring yet qualitatively distinct from number, symbolizes Eternity since its unity is unchanged by "squaring."

Agrippa opens the second book of *De Occulta Philosophia* with the statement that mathematics and magic are so intimately connected that nothing successful can be achieved in the latter without knowledge of numbers. He cites a "Pythagorean axiom" to the effect that numbers are more "formal," more "pure," than physical objects, and, consequently, more "actual"; moreover as they are independent in their essence of these physical objects, and do not derive from them, their operations possess in their own right similar qualities and powers to those of the particulars which exemplify them in nature. Agrippa argues that every philo-

or irrelevant properties as "un vocabulaire à faire frémir même les sceptiques et qui peut faire croire un à commerce de sorcellerie, un mystère de procédé, l'empirisme des méthodes, la complication des résultats, l'isolement apparent de cette doctrine." (M. Kraitchek, *Traité des Carrés Magiques*, 1930, Preface.) But although these qualities proved stumbling blocks to later scientific treatment, they were not the product of perverse or random obscurity, but served at one time to connect the subject organically with a general system of thought.

⁵ The "planet seals" served as mnemonic keys to the construction of their respective squares (cf. E. Cazalas, "Les sceaux planétaires de C. Agrippa," *Revue de l'histoire des religions*, CX, 1934, p. 66 ff.). That often these were empirical by choice (thus according better with the general symbolism used), seems indicated by the fact that a "correct" derivation of some squares at least was certainly not beyond the powers of pre-17th-century mathematics. One must not underrate the hampering effect of the lack of any flexible notation, such as was provided by early 17th-century advances in algebra; yet in the case of the square of three, for instance, it is obvious, almost on inspection, that such a magic square can be constructed from any nine numbers falling into a simple sequence based on two arithmetical progressions.

sopher, pagan or Christian, has ascribed to numbers some efficacy for good or evil, and invokes a usual list of Neo-Platonist authorities in support of the thesis that everything that exists does so in consequence of some number or combination of numbers, from which it draws all its virtues.¹ Thus the properties of the cinquefoil in counteracting poisons, curing fevers, and expelling evil spirits all result from the quinary which it embodies.²

This doctrine, which played a considerable part in the study or practice of many special arts and sciences,³ was a logical development from the Neo-Platonic attempt to interpret the qualitative diversity of nature in the uniform terminology provided by quantitative analysis—which was to grow up eventually into Newtonian science; combined with a belief that “scientific” laws were not a mere statistical summary of particular happenings or even accurate conceptual, yet also fictional, representations of blind though orderly natural forces, but proceeded from, or even were, the direct thoughts of a governing Creator. This granted, it seemed to follow that the intellectual expression of such a law was a closer approach to divine truth, and hence of greater reality and power, than its physical manifestations. Symbols, whether numbers, words or figures, if they truly designated things, did not therefore only represent them, but were themselves more nearly the “reality” of which the natural object imperfectly partook.⁴ Such mathematical phenomena as magic squares which had no apparent counterparts in observed nature were assumed to stand in a relation to

entities and truths existing in a higher realm than the sensible; the very absence of any physical analogies to them placed them pre-eminently amongst those purely abstract numbers and numerical operations, the study of which, because they “can be apprehended by the understanding and in no other way,” “wholly draws us towards Being.”⁵

This is borne out by Agrippa’s analysis of the types of magic⁶ appropriate to the various objects to be operated upon. From the doctrine that the elements of the soul are mingled in arithmetic proportion, those of the body in geometrical and those of animals “harmonically,” he concludes that it is numbers themselves—which term includes such arrangements as magic squares—which act directly upon the soul, while the derived geometrical figures have peculiar powers over man’s body, and spoken words are the most effective procedure when the magic concerns animals.

Agrippa gives various details as to the meanings of particular types of numbers. As for instance, in divinations, simple numbers represent divine things, denaries celestial, centenaries terrestrial and millenaries events of a succeeding age. But chiefly important is his warning that it is not the natural numbers as we know them, and as commonly used by merchants and others pursuing material occupations, that possess these powers, but those “formal and rational numbers” which directly represent divine ideas. They can be conceived only *through* the natural numbers, which are however but faint reflections of these true essences. If magic is to succeed it must join the natural numbers in some way to their “formal and rational” counterparts and “temper them to the same consonance.”⁷ Magic squares and allied constructions, it would seem, effect this: they are attempts to consider numbers only in themselves, and also so to order them as to reveal or emphasize their relationship to Divine Ideas of

¹ *De Occulta Philosophia*, lib. 2, cap. 2.

² *Ibid.*, lib. 2, cap. 3.

³ It is very clear in that Hippocratic medical tradition which did not accept Galen’s partially physical explanation of critical days. Thus its practitioners up to the 17th century frequently state explicitly that the numerical description that can be made of the course of a disease (hours, days, etc. of the various stages) is not an incidental product of the development of the malady; but that the numbers themselves are the primary cause of the bodily effects observable. (Louis Taisnier, *Du Symbolisme en Médecine jusqu’au XVII^e Siècle*, 1914.)

⁴ Synesius, whose work on dreams Agrippa knew and drew upon (e.g. *De Occ. Phil.*, lib. 1, cap. 4a) held, on Neo-Platonic reasoning, that anything which was a sign of another object was also part of it, and had magic power over it. The wise man would hold under his control what was near as a pledge for what was far away, and working by sounds, material substances or forms, could utilize the powers of the distant objects, producing effects on or by means of them. (Synesius, *De Insomnis*, cap. III.)

⁵ Plato, *Republic*, Book VII.

⁶ *De Occ. Phil.*, lib. 2, cap. 3.

⁷ The analogy of harmonic vibrations is frequently used, of course, to express such a relation as the present. Synesius, in the passage previously referred to, compares the production of effect on, or by means of, one thing, by the action of some other at a distance, with the striking of one part of the lyre, when other parts will sound with it; for the universe is correlated and interdependent in the same fashion as the lyre. Certain musical sounds Agrippa believes excite the influence of the stars by this same sympathetic action, for they can imitate very powerfully the “functions” of the stars. (*De Occ. Phil.*, lib. 2, cap. 24 f.)

Number. When they were made "correctly," they would of course be susceptible of bearing Cabbalistic interpretation, which is therefore at once a valid development from them, and a test of their "truth."¹

This distinction between natural and formal numbers has its illuminating parallel in alchemy. From the time of Geber, who gave explicit and influential statement to this view, it was not usually believed that the names of the materials to be used in the preparation of the Stone referred to the known chemical substances bearing those names, but to perfect essences to which these were the nearest earthly correspondences. The perfect spiritual mercury, lead, or silver, which it was necessary to employ in transmutation, could however be eventually attained by submitting its sensible equivalent to a long series of calcinations, distillations, etc., which purified it of its material dross. The relation between the divine and natural substance, the possibility of attaining one by means of the other and then abandoning the lower, was expressed by the symbol of the eagle in the air attached by a cord from its leg to a tortoise, creeping on the ground. The emblem is identical in spirit with Agrippa's conception of the relation between natural numbers and those true numbers whose properties are utilized in magical operations.

The linking of magic squares with the planets was a natural and easy step within a system which ordered Nature according to the consequences deducible from the symbolism employed and not the other way about.¹ An earlier Arabic system which ascribed the magic squares from three onwards to the planets in the order of their distance from the earth, and employed the

square of ten for the zodiac, seems to correspond with the planet-efigies in a Sabian temple, where Saturn's pedestal had nine steps, Jupiter's eight, and so on down to the Moon's which possessed three.² But the system which considered the planets in the reverse order, from Saturn downwards to the earth, and which, as used by Agrippa, became general in Europe, had more specific advantages. Thus the numerical value of the Arabic name for Saturn was 45 (Zuhal=ZHL=7+8+30) which is the sum of the numbers, used in the square of three. Another feature probably regarded as advantageous, is the according of the magic square of four to Jupiter. For Jupiter, Agrippa observes,³ is but the Heathen's shadowy conception of Jehovah, to whom the number four is most proper, on account both of the divine Tetragrammaton, and of the "Pythagorean axiom" that four is the perpetual source of nature and its maintainer. Four appears to Agrippa the supreme number in all matters of divinity.

Magic squares were thus, on the basis of a belief in the objective existence and powers of mathematical truths and by means of a symbolism of number, assimilated to a general system which attempted to interrelate all branches of knowledge, by interpreting them in common images. They had thus received sufficient definition to allow logical examination to be made of their potentialities for use in astrology, medicine, alchemy, divination, etc. We are not concerned here with the practical application made of planetary amulets bearing magic squares, which appeared in great numbers even as late as the eighteenth century;⁴ it has been sufficient to indicate their position as a direct and legitimate consequence of theoretical principles such as Agrippa's, and therefore, as Ahrens pointed out, that they differ from many other

¹ All deductive reasoning could, however, be charged with doing precisely this. The procedure has been held to be legitimate when some system of symbols such as mathematics is accepted as an absolutely non-contradictory system and some portion of what it represents is accepted as having a known objective existence in nature. Agrippa's "symbolism" is of course bewilderingly rich and varied, and considered as a formal system not very strictly ordered, but the method does not lack modern exemplification. Thus to-day Hilbertian formalism, rejecting all empirical limitations of mathematical procedure or objects of knowledge, in its attempt to establish mathematics as an entirely and eternally self-consistent system, seems also to assert that for every non-contradictory set of axioms some sets of objects can be found to correspond; for every mathematically correct statement becomes also an existence proposition, if mathematical truth and operations are not man-made but only man-discovered.

² W. Ahrens, "Magische Quadrate und Planetenamulette," *Naturwissenschaftliche Wochenschrift*, 1920, N.F. 19, No. 30. Only Cardan in the West makes mention of this system. The professedly pagan astrological doctrines of the Sabians were nevertheless fairly widely known through the writings of Thebit ben Currat, acclaimed by Roger Bacon as "the supreme philosopher amongst all Christians."

³ *De Occ. Phil.*, lib. 2, cap. 7.

⁴ In general they seem to follow closely Agrippa's prescription. They were struck when possible from the appropriate planetary metal, and bore usually the effigy of the personified planet with the correctly pointed star and planetary sign on the one side, and on the reverse, the magic square, with some of the derived seals and characters, and sometimes the Hebrew names of the planet's Angel or Intelligence.

types of talisman in that "sie nicht aus dem Volk und seinen naiven Aberglauben hervorgegangen, sondern . . . die Erzeugnisse einer ausgeklügelten 'Wissenschaft,' die Erfindung der 'Gelehrten,' ebenjener in ihrer Art höchst gelehrten Priester der geheimen Wissenschaften, gewesen und erst durch diese Gelehrten und ihre Jünger unter das Volk gebracht sind, das diese Dinge im einzelnen überhaupt nie verstehen gelernt haben kann und wird."¹

Much later, writing on the Vanity of the Sciences, concerned to show the uncertain foundations of man's knowledge in all but theology, Agrippa repudiates his earlier work on Occult Philosophy,² the study of which subject has only taught him to warn others from that path; but in the general condemnation of all man's arts there are a number of significant reservations to be found. Thus though Cabbalism as taught and practised is "a mere rhapsody" of superstition, Agrippa does not doubt that its principles are true and were revealed to Moses, though none now knows how to apply them.³ Natural magic remains for him a force set above nature and serving as its active principle;⁴ and he allows that mathematical magic "produces wonderful works, without the assistance of natural agencies, but only from the teaching of mathematics and by the aid and influence of the Stars."⁵ He lists a considerable number of its achievements—chiefly mechanical—and to these practical applications of a possibly true, but unknowable science, he is more than usually tolerant; such products of the various arts he usually condemns as distracting the soul from its proper goal, but these, he states, although they do not partake directly of Truth or Divine Being, are imitations closely akin to both. Agrippa would thus seem never to have abandoned faith in a divine numerical order, superior to the Nature in which it was evidenced;⁶ it is a faith perhaps perennial

among mathematicians, though its later fruits may seem only remotely related to Agrippa's magic squares.⁷

I. R. F. CALDER

ANTOINE CARON'S MASSACRE PAINTINGS

Certain lines by Théodore de Bèze make it possible, perhaps, to clarify the history of Antoine Caron's paintings representing "The Massacres of the Triumvirate," which have been studied so opportunely in these latter years by M. Lebel and M. Ehrmann.⁸ M. Ehrmann in a recent article does, indeed, recognize that some political allusion to the wars of religion is to be seen here, but as he cannot date the prototype in this series, which he places before 1562, he does not venture to commit himself.

Now in 1561, Théodore de Bèze was in Paris: as leader of the French Protestants, he was participating in the Colloquy of Poissy, and with the Prince de Condé, one of the princes of the blood lately converted to Calvinism, was urging the Queen Mother to deal tolerantly with the Reformers. But the Triumvirate (Montmorency, Guise, St. André) was rousing the Catholics to violence—"pressing all day long with great insistence for a resort to arms"—and in fact isolated massacres of Protestants were to occur in December at Amiens, and especially in the South. If we may trust Théodore de Bèze, it was in this atmosphere that the first of Caron's Massacre pictures was painted, for he writes of the year 1561: "There were then brought to the Court three large pictures, excellently painted, representing the bloody and more than inhuman executions once performed in Rome, during the proscription by the Roman Triumvirate. . . . These pictures were

¹ W. Ahrens, "Planetenamulette," *Das Weltall*, 11/12 Hft., 1920.

² *De Incertitudine et Vanitate Scientiarum et Artium atque excellentia Verbi Dei declamatio*, cap. 48.

³ *Ibid.*, cap. 47.

⁴ *Ibid.*, cap. 42.

⁵ *Ibid.*, cap. 43. Earlier Agrippa dismisses the zodiacal signs as used by astrologers as fables of the poets (cap. 30), but from the above phrase he would seem only to doubt the accuracy of the descriptions of them, and not the celestial influences themselves.

⁶ This is supported by the fact that Agrippa chose to publish for the first time his early Occult Philosophy (sent to Trithemius in 1510) in 1531—the year after he had published *De Incertitudine*.

⁷ Cf. a recent statement by a prominent mathematician: "At the time when I wrote the 'Principles,' I shared with Frege a belief in the Platonic reality of Numbers, which in my imagination peopled the timeless realm of Being. It was a comforting faith which I later abandoned with regret." (B. Russell, new Preface to the 2nd edition of *Principles of Mathematics*, 1932.)

⁸ Gustave Lebel, articles in *Bulletin de la Société de l'Histoire de l'Art Français*, 1937, 1940, and in *L'Amour de l'Art*, Dec. 1937, Sept. 1938; Jean Ehrmann, "Massacre and Persecution Pictures in 16th-century France," *Journal of the Warburg and Courtauld Institutes*, VIII, 1945.