

The Burden of Skepticism **by Carl Sagan**

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What is Skepticism? It's nothing very esoteric. We encounter it every day. When we buy a used car, if we are the least bit wise we will exert some residual skeptical powers—whatever our education has left to us. You could say, "Here's an honest-looking fellow. I'll just take whatever he offers me." Or you might say, "Well, I've heard that occasionally there are small deceptions involved in the sale of a used car, perhaps inadvertent on the part of the salesperson," and then you do something. You kick the tires, you open the doors, you look under the hood. (You might go through the motions even if you don't know what is supposed to be under the hood, or you might bring a mechanically inclined friend.) You know that some skepticism is required, and you understand why. It's upsetting that you might have to disagree with the used-car salesman or ask him questions that he is reluctant to answer. There is at least a small degree of interpersonal confrontation involved in the purchase of a used car and nobody claims it is especially pleasant. But there is a good reason for it — because if you don't exercise some minimal skepticism, if you have an absolutely untrammelled credulity, there is probably some price you will have to pay later. Then you'll wish you had made a small investment of skepticism early.

Now this is not something that you have to go through four years of graduate school to understand. Everybody understands this. The trouble is, a used car is one thing but television commercials or pronouncements by presidents and party leaders another. We are skeptical in some areas but unfortunately not in others.

For example, there is a class of aspirin commercials that reveals the competing product to have only so much of the painkilling ingredient that doctors recommend most—they don't tell you what the mysterious ingredient is—whereas their product has a dramatically larger amount (1.2 to 2 times more per tablet). Therefore you should buy their product. But why not just take two of the competing tablets? You're not supposed to ask. Don't apply skepticism to this issue. Don't think. Buy.

Such claims in commercial advertisements constitute small deceptions. They part us from a little money, or induce us to buy a slightly inferior product. It's not so terrible. But consider this:

I have here the program of this year's Whole Life Expo in San Francisco. Twenty thousand people attended last year's program. Here are some of the presentations: "Alternative Treatments for AIDS Patients: it will rebuild one's natural defenses and prevent immune system

breakdowns — learn about the latest developments that the media has thus far ignored." It seems to me that presentation could do real harm. "How Trapped Blood Proteins Produce Pain and Suffering." "Crystals, Are They Talismans or Stones?" (I have an opinion myself.) It says, "As a crystal focuses sound and light waves for radio and television" — crystal sets are rather a long time ago — "so may it amplify spiritual vibrations for the attuned human." I'll bet very few of you are attuned. Or here's one: "Return of the Goddess, a Presentational Ritual." Another: "Synchronicity, the Recognition Experience." That one is given by "Brother Charles." Or, on the next page, "You, Saint-Germain, and Healing Through the Violet Flame." It goes on and on, with lots of ads about "opportunities" — ranging from the dubious to the spurious — that are available at the Whole Life Expo.

If you were to drop down on Earth at any time during the tenure of humans you would find a set of popular, more or less similar, belief systems. They change, often very quickly, often on time scales of a few years: But sometimes belief systems of this sort last for many thousands of years. At least a few are always available. I think it's fair to ask why. We are Homo sapiens. That's the distinguishing characteristic about us, that sapiens part. We're supposed to be smart. So why is this stuff always with us? Well, for one thing, a great many of these belief systems address real human needs that are not being met by our society. There are unsatisfied medical needs, spiritual needs, and needs for communion with the rest of the human community. There may be more such failings in our society than in many others in human history. And so it is reasonable for people to poke around and try on for size various belief systems, to see if they help.

For example, take a fashionable fad, channeling. It has for its fundamental premise, as does spiritualism, that when we die we don't exactly disappear, that some part of us continues. That part, we are told, can reenter the bodies of human and other beings in the future, and so death loses much of its sting for us personally. What is more, we have an opportunity, if the channeling contentions are true, to make contact with loved ones who have died.

Speaking personally, I would be delighted if reincarnation were real. I lost my parents, both of them, in the past few years, and I would love to have a little conversation with them, to tell them what the kids are doing, make sure everything is all right wherever it is they are. That touches something very deep. But at the same time, precisely for that reason, I know that there are people who will try to take advantage of the vulnerabilities of the bereaved. The spiritualists and the channelers better have a compelling case.

Or take the idea that by thinking hard at geological formations you can tell where mineral or petroleum deposits are. Uri Geller makes this claim. Now if you are an executive of a mineral exploration or petroleum company, your bread and butter depend on finding the minerals or the oil: so spending trivial amounts of money, compared with what you usually spend on geological exploration, this time to find deposits psychically, sounds not so bad. You might be

tempted.

Or take UFOs, the contention that beings in spaceships from other worlds are visiting us all the time. I find that a thrilling idea. It's at least a break from the ordinary. I've spent a fair amount of time in my scientific life working on the issue of the search for extraterrestrial intelligence. Think how much effort I could save if those guys are coming here. But when we recognize some emotional vulnerability regarding a claim, that is exactly where we have to make the firmest efforts at skeptical scrutiny. That is where we can be had.

Now, let's reconsider channeling. There is a woman in the State of Washington who claims to make contact with a 35,000-year-old somebody, "Ramtha" — she, by the way, speaks English very well with what sounds to me to be an Indian accent. Suppose we had Ramtha here and just suppose Ramtha is cooperative. We could ask some questions: How do we know that Ramtha lived 35,000 years ago? Who is keeping track of the intervening millennia? How does it come to be exactly 35,000 years? That's a very round number. Thirty-five thousand plus or minus what? What were things like 35,000 years ago? What was the climate? Where on Earth did Ramtha live? (I know he speaks English with an Indian accent, but where was that?) What does Ramtha eat? (Archaeologists know something about what people ate back then.) We would have a real opportunity to find out if his claims are true. If this were really somebody from 35,000 years ago, you could learn a lot about 35,000 years ago. So, one way or another, either Ramtha really is 35,000 years old, in which case we discover something about that period — that's before the Wisconsin Ice Age, an interesting time—or he's a phony and he'll slip up. What are the indigenous languages, what is the social structure, who else does Ramtha live with — children, grandchildren — what's the life cycle, the infant mortality, what clothes does he wear, what's his life expectancy, what are the weapons, plants, and animals? Tell us. Instead, what we hear are the most banal homilies, indistinguishable from those that alleged UFO occupants tell the poor humans who claim to have been abducted by them.

Occasionally, by the way, I get a letter from someone who is in "contact" with an extraterrestrial who invites me to "ask anything." And so I have a list of questions. The extraterrestrial are very advanced, remember. So I ask things like, "Please give a short proof of Fermat's Last Theorem." Or the Goldbach Conjecture. And then I have to explain what these are, because extraterrestrials will not call it Fermat's Last Theorem, so I write out the little equation with the exponents. I never get an answer. On the other hand, if I ask something like "Should we humans be good?" I always get an answer. I think something can be deduced from this differential ability to answer questions. Anything vague they are extremely happy to respond to, but anything specific, where there is a chance to find out if they actually know anything, there is only silence.

The French scientist Henri Poincaré remarked on why credulity is rampant: "We also know how cruel the truth often is, and we wonder whether delusion is not more consoling." That's what I

have tried to say with my examples. But I don't think that's the only reason credulity is rampant. Skepticism challenges established institutions. If we teach everybody, let's say high school students, the habit of being skeptical, perhaps they will not restrict their skepticism to aspirin commercials and 35,000-year-old channelers (or channelees). Maybe they'll start asking awkward questions about economic, or social, or political, or religious institutions. Then where will we be?

Skepticism is dangerous. That's exactly its function, in my view. It is the business of skepticism to be dangerous. And that's why there is a great reluctance to teach it in the schools. That's why you don't find a general fluency in skepticism in the media. On the other hand, how will we negotiate a very perilous future if we don't have the elementary intellectual tools to ask searching questions of those nominally in charge, especially in a democracy?

I think this is a useful moment to reflect on the sort of national trouble that could have been avoided were skepticism more generally available in American society. The Iran/Nicaragua fiasco is so obvious an example I will not take advantage of our poor, beleaguered president [Reagan] by spelling it out. The Administration's resistance to a Comprehensive Test Ban Treaty and its continuing passion for blowing up nuclear weapons — one of the major drivers of the nuclear arms race — under the pretense of making us "safe" is another such issue. So is Star Wars. The habits of skeptical thought CSICOP encourages have relevance for matters of the greatest importance to the nation. There is enough nonsense promulgated by both political parties that the habit of evenhanded skepticism should be declared a national goal, essential for our survival.

I want to say a little more about the burden of skepticism. You can get into a habit of thought in which you enjoy making fun of all those other people who don't see things as clearly as you do. This is a potential social danger present in an organization like CSICOR. We have to guard carefully against it.

It seems to me what is called for is an exquisite balance between two conflicting needs: the most skeptical scrutiny of all hypotheses that are served up to us and at the same time a great openness to new ideas. Obviously those two modes of thought are in some tension. But if you are able to exercise only one of these modes, whichever one it is, you're in deep trouble.

If you are only skeptical, then no new ideas make it through to you. You never learn anything new. You become a crotchety old person convinced that nonsense is ruling the world. (There is, of course, much data to support you.) But every now and then, maybe once in a hundred cases, a new idea turns out to be on the mark, valid and wonderful. If you are too much in the habit of being skeptical about everything, you are going to miss or resent it, and either way you will be standing in the way of understanding and progress.

On the other hand, if you are open to the point of gullibility and have not an ounce of skeptical sense in you, then you cannot distinguish the useful as from the worthless ones. If all ideas have equal validity then you are lost, because then, it seems to me, no ideas have any validity at all.

Some ideas are better than others. The machinery for distinguishing them is an essential tool in dealing with the world and especially in dealing with the future. And it is precisely the mix of these two modes of thought that is central to the success of science.

Really good scientists do both. On their own, talking to themselves, they churn up huge numbers of new ideas and criticize them ruthlessly. Most of the ideas never make it to the outside world. Only the ideas that pass through rigorous self-filtration make it out and are criticized by the rest of the scientific community. It sometimes happens that ideas that are accepted by everybody turn out to be wrong, or at least partially wrong, or at least superseded by ideas of greater generality. And, while there are of course some personal losses – emotional bonds to the idea that you yourself played a role inventing – nevertheless the collective ethic is that every time such an idea is overthrown and replaced by something better the enterprise of science has benefited. In science it often happens that scientists say, "You know that's a really good argument; my position is mistaken," and then they actually change their minds and you never hear that old view from them again. They really do it. It doesn't happen as often as it should, because scientists are human and change is sometimes painful. But it happens every day. I cannot recall the last time something like that has happened in politics or religion. It's very rare that a senator, say, replies, "That's a good argument. I will now change by political affiliation."

I would like to say a few things about the stimulating sessions on the search for extraterrestrial intelligence (SETI) and on animal language at our CSICOP conference. In the history of science there is an instructive procession for major intellectual battles that turn out, all of them, to be about how central human beings are. We could call them battles about the anti-Copernican conceit.

Here are some of the issues:

We are the center of the Universe. All the planets and the stars and the Sun and the Moon go around us. (Boy, must we be something really special.) That was the prevailing belief-Aristarchus aside-until the time of Copernicus. A lot of people liked it because it gave them a personally unwarranted central position in the Universe. The mere fact that you were on Earth made you privileged. That felt good. Then along came the evidence that Earth was just a planet and that those other bright moving points of light were planets too. Disappointing. Even depressing. Better when we were central and unique.

– But at least our Sun is at the center of the Universe. No, those other stars, they're suns too, and what's more we're out in the galactic boondocks. We are nowhere near the center of the Galaxy. Very depressing.

– Well, at least the Milky Way galaxy is at the center of the Universe. Then a little more progress in science. We find there isn't any such thing as the center of the Universe. What's more there are a hundred billion other galaxies. Nothing special about this one. Deep gloom.

– Well, at least we humans, we are the pinnacle of creation. We're separate. All those other creatures, plants and animals, they're lower. We're higher. We have no connection with them. Every living thing has been created separately. Then along comes Darwin. We find an evolutionary continuum. We're closely connected to the other beasts and vegetables. What's more, the closest biological relatives to us are chimpanzees. Those are our close relatives-those guys? It's an embarrassment. Did you ever go to the zoo and watch them? Do you know what they do? Imagine in Victorian England, when Darwin produced this insight, what an awkward truth it was.

There are other important examples-privileged reference frames in physics and the unconscious mind in psychology-that I'll pass over.

I maintain that in the tradition of this long set of debates-every one of which was won by the Copernicans, by the guys who say there is not much special about us-there was a deep emotional undercurrent in the debates in both CSICOP sessions I mentioned. The search for extraterrestrial intelligence and the analysis of possible animal "language" strike at one of the last remaining pre-Copernican belief systems:

– At least we are the most intelligent creatures in the whole Universe. If there are no other smart guys elsewhere, even if we are connected to chimpanzees, even if we are in the boondocks of a vast and awesome universe, at least there is still something special about us. But the moment we find extraterrestrial intelligence that last bit of conceit is gone. I think some of the resistance to the idea of extraterrestrial intelligence is due to the anti-Copernican conceit. Likewise, without taking sides in the debate on whether other animals-higher primates, especially great apes-are intelligent or have language, that's clearly, on an emotional level, the same issue. If we define humans as creatures who have language and no one else has language, at least we are unique in that regard. But if it turns out that all those dirty, repugnant, laughable chimpanzees can also, with Ameslan or otherwise, communicate ideas, then what is left that is special about us? Propelling emotional predispositions on these issues are present, often unconsciously, in scientific debates. It is important to realize that scientific debates, just like pseudoscientific debates, can be awash with emotion, for these among many different reasons.

Now, let's take a closer look at the radio search for extraterrestrial intelligence. How is this different from pseudoscience? Let me give a couple of real cases. In the early sixties, the Soviets held a press conference in Moscow in which they announced that a distant radio source, called CTA-102, was varying sinusoidally, like a sine wave, with a period of about 100 days. Why did they call a press conference to announce that a distant radio source was varying? Because they thought it was an extraterrestrial civilization of immense powers. That is worth calling a press conference for. This was before even the word "quasar" existed. Today we know that CTA-102 is a quasar. We don't know very well what quasars are: and there is more than one mutually exclusive explanation for them in the scientific literature. Nevertheless, few seriously consider that a quasar, like CTA-102, is some galaxygirdling extraterrestrial civilization, because there are a number of alternative explanations of their properties that are more or less consistent with the physical laws we know without invoking alien life. The extraterrestrial hypothesis is a hypothesis of last resort. Only if everything else fails do you reach for it.

Second example: British scientists in 1967 found a nearby bright radio source that is fluctuating on a much shorter time scale, with a period constant to ten significant figures. What was it? Their first thought was that it was something like a message being sent to us, or an interstellar navigational beacon for spacecraft that fly the spaces between the stars. They even gave it, among themselves at Cambridge University, the wry designation LGM-1-Little Green Men, LGM. However (they were wiser than the Soviets), they did not call a press conference, and it soon became clear that what we had here was what is now called a "pulsar." In fact it was the first pulsar, the Crab Nebula pulsar. Well, what's a pulsar? A pulsar is a star shrunk to the size of a city, held up as no other stars are, not by gas pressure, not by electron degeneracy, but by nuclear forces. It is in a certain sense an atomic nucleus the size of Pasadena. Now that, I maintain, is an idea at least as bizarre as an interstellar navigational beacon. The answer to what a pulsar is has to be something mighty strange. It isn't an extraterrestrial civilization, it's something else: but a something else that opens our eyes and our minds and indicates possibilities in nature that we had never guessed at.

Then there is the question of false positives. Frank Drake in his original Ozma experiment, Paul Horowitz in the META (Megachannel Extraterrestrial Assay) program sponsored by the Planetary Society, the Ohio University group and many other groups have all had anomalous signals that make the heart palpitate. They think for a moment that they have picked up a genuine signal. In some cases we have not the foggiest idea what it was; the signals did not repeat. The next night you turn the same telescope to the same spot in the sky with the same modulation and the same frequency and band pass everything else the same, and you don't hear a thing. You don't publish that data. It may be a malfunction in the detection system. It may be a military AWACS plane flying by and broadcasting on frequency channels that are supposed to be reserved for radio astronomy. It may be a diathermy machine down the street. There are many possibilities. You don't immediately declare that you have found

extraterrestrial intelligence because you find an anomalous signal.

And if it were repeated, would you then announce? You would not. Maybe it's a hoax. Maybe it is something you haven't been smart enough to figure out that is happening to your system. Instead, you would then call scientists at a bunch of other radio telescopes and say that at this particular spot in the sky, at this frequency and bandpass and modulation and all the rest, you seem to be getting something funny. Could they please look at it and see if they got something similar? And only if several independent observers get the same kind of information from the same spot in the sky do you think you have something. Even then you don't know that the something is extraterrestrial intelligence, but at least you could determine that it's not something on Earth. (And that it's also not something in Earth orbit; it's further away than that.) That's the first sequence of events that would be required to be sure that you actually had a signal from an extraterrestrial civilization.

Now notice that there is a certain discipline involved. Skepticism imposes a burden. You can't just go off shouting "little green men," because you are going to look mighty silly, as the Soviets did with CTA-102, when it turns out to be something quite different. A special caution is necessary when the stakes are as high as here. We are not obliged to make up our minds before the evidence is in. It's okay not to be sure.

I'm often asked the question, "Do you think there is extraterrestrial intelligence?" I give the standard arguments-there are a lot of places out there, and use the word billions, and so on. And then I say it would be astonishing to me if there weren't extraterrestrial intelligence, but of course there is as yet no compelling evidence for it. And then I'm asked, "Yeah, but what do you really think?" I say, "I just told you what I really think." "Yeah, but what's your gut feeling?" But I try not to think with my gut. Really, it's okay to reserve judgment until the evidence is in.

After my article "The Fine Art of Baloney Detection" came out in Parade (Feb. 1, 1987), he got, as you might imagine, a lot of letters. Sixty-five million people read Parade. In the article I gave a long list of things that I said were "demonstrated or presumptive baloney"-thirty or forty items. Advocates of all those positions were uniformly offended, so I got lots of letters. I also gave a set of very elementary prescriptions about how to think about baloney-arguments from authority don't work, every step in the chain of evidence has to be valid, and so on. Lots of people wrote back, saying, "You're absolutely right on the generalities; unfortunately that doesn't apply to my particular doctrine." For example, one letter writer said the idea that intelligent life exists outside the earth is an excellent example of baloney. He concluded, "I am as sure of this as of anything in my experience. There is no conscious life anywhere else in the Universe. Mankind thus returns to its rightful position as center of the Universe."

Another writer again agreed with all my generalities, but said that as an inveterate skeptic I have closed my mind to the truth. Most notably I have ignored the evidence for an Earth that

is six thousand years old. Well, I haven't ignored it; I considered the purported evidence and then rejected it. There is a difference, and this is a difference, we might say, between prejudice and postjudice. Prejudice is making a judgment before you have looked at the facts. Postjudice is making a judgment afterwards. Prejudice is terrible, in the sense that you commit injustices and you make serious mistakes. Postjudice is not terrible. You can't be perfect of course; you may make mistakes also. But it is permissible to make a judgment after you have examined the evidence. In some circles it is even encouraged.

I believe that part of what propels science is the thirst for wonder. It's a very powerful emotion. All children feel it. In a first grade classroom everybody feels it; in a twelfth grade classroom almost nobody feels it, or at least acknowledges it. Something happens between first and twelfth grade, and it's not just puberty. Not only do the schools and the media not teach much skepticism, there is also little encouragement of this stirring sense of wonder. Science and pseudoscience both arouse that feeling. Poor popularizations of science establish an ecological niche for pseudoscience.

If science were explained to the average person in a way that is accessible and exciting, there would be no room for pseudoscience. But there is a kind of Gresham's Law by which in popular culture the bad science drives out the good. And for this I think we have to blame, first, the scientific community ourselves for not doing a better job of popularizing science, and second, the media, which are in this respect almost uniformly dreadful. Every newspaper in America has a daily astrology column. How many have even a weekly astronomy column? And I believe it is also the fault of the educational system. We do not teach how to think. This is a very serious failure that may even, in a world rigged with 60,000 nuclear weapons, compromise the human future.

I maintain there is much more wonder in science than in pseudoscience. And in addition, to whatever measure this term has any meaning, science has the additional virtue, and it is not an inconsiderable one, of being true.