

Hale-Bopp Comet Madness

Most of the excitement surrounding Hale-Bopp's approach has a legitimate scientific and popular basis, but other aspects of the "comet madness" are pseudoscientific and a glaring symptom of scientific illiteracy.

ALAN HALE

Due to its almost unprecedented intrinsic brightness at the time of its discovery by Alan Hale and Thomas Bopp in July 1995, Comet Hale-Bopp has stimulated enormous scientific and popular interest. The comet has also recently stimulated a goodly amount of irrational and pseudoscientific speculation. Astronomer and co-discoverer Alan Hale considers the comet's forthcoming nearest approach an opportunity for public education in science. We invited him to put the interest surrounding Comet Hale-Bopp into scientific perspective and to comment on the various sensational claims accompanying it. We also publish his "An Astronomer's Personal Statement on UFOs."

—Kendrick Frazier, Editor

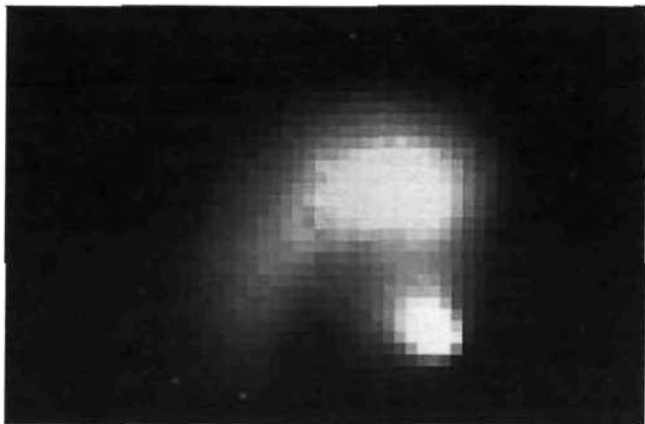
Few sights in the nighttime sky can be more awe-inspiring than that of a bright comet. Consisting of a bright, diffuse, circular patch of light—the head, or “coma”—accompanied by a ghostly tail which may stretch across a considerable span of the heavens, such objects definitely rank among the most noticeable, and the most beautiful, of any of the celestial phenomena we encounter. The relative rarity with which a bright comet may appear in our skies—about once every one to two decades, on the average—ensures that, when they do appear, attention is paid to them.

To our ancestors of a few centuries ago, who did not have available the knowledge of the universe’s workings that we have today, such a sight must truly have been remarkable. More often than not, a bright comet would almost seem to appear “out of nowhere,” be visible in the skies for perhaps two to four weeks, then disappear again “into nowhere.” It was only natural for our ancestors to associate the appearance of comets with whatever misfortunes were occurring on Earth—of which there is never a shortage—and to interpret them in line with their particular religious beliefs and mythologies. For example, a bright comet (apparently the Great Comet of 1680) caused a handbill bearing the following text to be circulated among the Christians in eastern Europe:

Herewith is represented the fearful celestial phenomenon and other events . . . by which Almighty God terrified dear Hungary, and at the same time admonished Christendom to penance. . . . The star pointed toward Moravia, its tail toward Turkey. The star was very large and bright, not like fire but white like moonlight. The tail was curved with serpentine bends like a lightning flash. It was pierced by several arrows, and toward the end of the tail was something like a Turkish feather fan. The tail itself terminated in seven points directed toward Turkey. There was a crown over the end of the tail, while another crown surrounded by clouds was to be seen below the midpart of the comet. Close by appeared the heads of two Turks and some moon-like faces that were partially ball-like. . . . We are sure that the celestial phenomenon was a terrible New Year’s admonition, the interpretation of which we will leave to Omniscient God, Whose grace gives us vigilant hearts, withdraws all miseries from our cottages, and Who turns the threatening arrows against the enemies of His church. . . .

We have learned much about these visitors in the centuries since the above handbill was issued. In the early eighteenth century the British astronomer Edmond Halley applied the laws of gravitation as worked out by his friend Isaac Newton and determined that at least one comet appeared to be making periodic visits to our skies, a supposition that was spectacularly verified when this comet returned in 1759. Since that time, well over a hundred other comets have been observed to make repeat appearances in our skies, and periodic elliptical orbits

Astronomer Alan Hale is co-discoverer of Comet Hale-Bopp and director of the Southwest Institute for Space Research, Cloudcroft, NM 88317. His book Everybody's Comet: A Layman's Guide to Comet Hale-Bopp (High-Lonesome Books of Silver City, New Mexico) has just gone into a second printing.



Comet photo: H.A. Weaver (Applied Research Corp.), P.D. Feldman (The Johns Hopkins University), and NASA.

have been computed for numerous others, establishing beyond all doubt that comets are *bona fide* members of the solar system, like the planets with which we are perhaps more familiar.

The advent of larger telescopes and, in the late nineteenth century, astrophotography has revealed that comets are far more common visitors than were first thought; up to two dozen or more may make their passages through the inner solar system during any given year. (The overwhelming majority of these are faint objects that require large telescopes in order to be detected, although well-equipped and knowledgeable amateur astronomers should be able to view two or three comets during any given clear night, on the average.)

The physical nature of comets was a matter of much conjecture for some time, with the most prevalent idea, proposed by American astronomer Fred Whipple in the early 1950s, being that a comet could be described as a “dirty snowball,” a solid object composed of a mixture of water ice, various other frozen volatile substances such as carbon monoxide, carbon dioxide, and others, and significant amounts of interplanetary dust grains. Recent detailed studies of comets, foremost among them being the flybys of Halley’s Comet in 1986 by the European Space Agency’s Giotto spacecraft along with several other missions, have revealed that Whipple’s “dirty snowball” model was essentially correct, with a variety of other substances, including various organic compounds, being present within the nuclei of comets as well. Most scientists today accept the idea that comets are “leftovers” from the solar system’s planetary formation process four and a half billion years ago, and, as a result, comets are now intensely scrutinized for any clues they might offer as to the physical and chemical conditions that were prevalent at that time.

With all the knowledge about comets that we have gained during the past few centuries, one would think that there would no longer exist any reasons to fear these visitors into the inner solar system. Unhappily, this has not been the case, as the twentieth century has seen its share of “comet madness.” The return of Halley’s Comet in 1910 sparked much mass panic, especially once astronomers pointed out the possibility that the earth might pass through a portion of the comet’s tail. While a comet’s tail does contain gases that might be consid-

ered "poisonous"—cyanogen, for example—the material in the tail is so rarefied that it would make a good vacuum by terrestrial standards. Although this was clearly pointed out to the general public in 1910, it did not prevent outbreaks of hysteria from erupting over parts of the world, nor did it prevent several enterprising entrepreneurs from earning brief fortunes by selling "comet pills" and the like. More recently, the appearance of Comet Kohoutek in 1973 inspired several apocalyptic proclamations by certain religious groups, statements which in retrospect seem even more ridiculous than they otherwise would have in light of the comet's failure to achieve its expected brilliance. (Comet Kohoutek, to be sure, was an exceptionally rewarding object from a scientific perspective, even if it did disappoint the casual viewer.)

We are now seeing a resurgence of "comet madness" accompanying the impending appearance of Comet Hale-Bopp. In some ways this object, discovered by myself and Arizona amateur astronomer Thomas Bopp in July 1995, is unusual; its intrinsic brightness appears to be one of the highest ever recorded for a comet, and its discovery when located well beyond the orbit of Jupiter and over a year and a half away from its passage through the inner solar system is almost unprecedented in the history of these objects. Nevertheless, a seven-foot-tall human being is still a human being, and likewise Comet Hale-Bopp, despite its apparent large size and brightness, is no less and no more of a "dirty snowball" than are any of the other two dozen or so comets that will pass around the sun in 1997. Many of the chemical constituents that were detected in previous comets have now been detected in Hale-Bopp, and the evolution of its activity level has more or less followed the expectations that were derived from studies of earlier comets.

Much of the "comet madness" associated with Comet Hale-Bopp focuses on the fact that its appearance coincides rather closely with the end of the second millennium which, despite the fact that this is an arbitrary point in time, is being viewed by a disturbingly large segment of the public as an omen of significant upheaval (see the article by Lee Loevinger in the January/February SKEPTICAL INQUIRER.) Several Christian fundamentalists have proclaimed that Hale-Bopp could be one of the "signs of the end times" as foretold in several New Testament prophecies, and some have gone so far as to suggest that Hale-Bopp might be the star "Wormwood" discussed in Revelation 8:10–11. (For the record, Hale-Bopp comes nowhere near the earth during its passage through the inner solar system; at closest approach, to occur on March 22, 1997, the comet is 1.3 astronomical units—122 million miles, or 197 million kilometers—from our planet.) Several New Age devotees have claimed they have found references to Comet Hale-Bopp within the writings of Nostradamus and within various Native American legends. Whatever the source of the "prophecy," Hale-Bopp's appearance three years before the end of the millennium is generating an apocalyptic

upswelling on a scale rarely seen since the era epitomized by the Hungarian handbill discussed above.

Another source of the "comet madness" centered around Hale-Bopp is tied to the ongoing belief among a significant fraction of the public that Earth is being visited in large numbers by extraterrestrial aliens. (As one radio host recently and appropriately described to me, this seems to be the "new mythology" that is replacing the older religion-based myths.) Almost from the time of Hale-Bopp's discovery there have been claims that Hale-Bopp is some kind of alien "mother ship" or, at the very least, is "under intelligent control." Some of these claims have been based upon reputed "course corrections" that the comet has allegedly undergone since its discovery. Many of these claims have not been restricted to the tabloid media but instead seem to have undergone widespread dissemination among the more "mainstream" elements of the press and have

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consequently become fairly widespread among the public.

Like many such pseudoscientific claims, there is an element of truth contained within these. The "course-corrections" claim very possibly arose from the fact that the initial calculations of Hale-Bopp's orbit, based upon extremely limited data and labeled as "highly uncertain" when they were published, differed in some particulars from the more definitive orbits published subsequently. (This is not at all unusual, incidentally, and has happened with numerous other comets.) Also, cometary orbits do experience slight changes as a result of planetary perturbations and also through the process of outgassing, which tends to produce tiny rocket-like effects acting upon the comet's icy nucleus. To my knowledge, this phenomenon, described under the term "nongravitational forces," has not yet been observed in Hale-Bopp, although it surely must be occurring at a level too low for us to detect at this time.

A recent incident illustrates just how widespread this belief that aliens are associated with Hale-Bopp has become. On November 14, 1996, an observer in Houston obtained electronic images through his telescope showing an alleged "mysterious Saturn-like object" following the comet. That same evening, this individual appeared as a guest on the Art Bell radio show, a nationwide call-in program that could perhaps be charitably described as "tabloid" radio (see Robert Sheaffer's "Psychic Vibrations" column, this issue). There apparently was speculation on this program that the "Saturn-like object" was in fact an alien spacecraft, four times larger than Earth, following along behind the comet. Despite the absurd nature of these claims, this story was picked up by several elements of the "mainstream" press, and throughout the following day I was contacted by numerous radio and television stations from

around the country soliciting my comments on the "mysterious spacecraft" following "your comet."

My investigation of this took me first to the World Wide Web homepage of the Houston photographer, which contained several apocalypse-suggestive statements about Hale-Bopp as well as numerous allegations of government coverups and conspiracies (including references to known "fringe" writers like Richard Hoagland and Zecharia Sitchin). These strongly suggested that this individual was predisposed to come to "strange" conclusions about the comet. Even more

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important, once I was able to examine the images in question, and could match the surrounding star field with a photograph of the same region of the sky taken during the course of the Palomar Sky Survey in the early 1950s, I found that the location of the "Saturn-like object" coincided perfectly with a bright 8th-magnitude star that the comet just happened to be located next to on the night in question. The "Saturn-like rings" extending from the "object" were apparently nothing *more than a diffraction effect, a common occurrence with over-exposed stellar images on astronomical photographs.* (It has also recently come to light that the particular CCD—charge-coupled device, an electronic detector—camera used to take the photographs in question is of a type that is highly sensitive to infrared wavelengths, and that the star in question is a red giant and consequently more luminous in the infrared than in the visible part of the spectrum.)

Numerous other astronomers who investigated this came to the same conclusion I did, and in an effort to redirect the flood of inquiries I was receiving I posted the results of my explanation, along with the appropriate photographs, on the Hale-Bopp homepage (<http://www.halebopp.com>). My explanation there apparently generated an enormous amount of discussion on the Art Bell program and elsewhere, and led to a large amount of surprisingly vicious "hate mail" being sent to www.halebopp.com, as well as numerous accusations that I am involved in the "conspiracy" that is "hiding information" about Hale-Bopp. (For the record, I continue to be an all-but-unemployed astronomer, and I have not received a single government paycheck for any involvement I have had with this comet!) This claim of an alien spacecraft following Hale-Bopp has refused to die since that time, with one persistent claim being that a "famous astrophysicist . . . affiliated with a top-ten university" has verified the existence of this object and would announce it via a major press conference (which has now been "imminent" for almost a month as of this writing). What I've found most fascinating are the numerous falsehoods that are being written about me—for example, the claim that I have "changed my story" and am no longer claiming that the "Saturn-like object" was a background star, but instead am offering some other "explanation."

Although I find this entire episode of the "Saturn-like object" and all the other pseudoscientific claims surrounding Comet Hale-Bopp quite amusing, the fact that claims such as these receive such widespread acceptance among large segments of the general public is not something that we scientists and rationalists should dismiss lightly. This whole phenomenon of "Hale-Bopp madness" strikes me as a glaring example of the scientific illiteracy that pervades our society and that has been addressed many times in the pages of this magazine and so eloquently by Carl Sagan in *The Demon-Haunted World*.

The numerous scientific and technological challenges that our society will be faced with during the years and decades ahead are too important and too complex to be adequately met and dealt with by a population that cannot distinguish

between legitimate science and the pseudoscience that is so prevalent now. It is imperative that we, the scientists and rationalists of today, diligently work toward alleviating this scientific illiteracy, a quest that has become even more important due to the recent losses of such prominent voices for rationalism as Isaac Asimov and Carl Sagan.

Fortunately, I believe that Comet Hale-Bopp provides a unique and perhaps unprecedented opportunity to work toward this goal. The comet is already attracting an enormous amount of attention from the nonscientific world, and this can only be expected to increase as it makes its passage through the inner solar system during the coming few months. (At this writing the comet is continuing to brighten more or less "as it should," and thus the prospects for a spectacular display continue to be encouraging, although one should keep in mind that a Kohoutek-like performance is still very much within the realm of possibility.)

When Hale-Bopp is brightest, it should be easily visible to the unaided eye of anyone in the world, and at that time perhaps the best thing we can do is to encourage everyone simply to *look!* I have challenged numerous "believers" of an extraterrestrial object following Hale-Bopp not to take my word for anything, but to go out and look at the comet for themselves and see if there is indeed any "object" accompanying it. (As I write this, the comet is slightly beyond the orbit of Mars, and already any spacecraft "four times larger than Earth" would be among the brightest objects in the nighttime sky.)

And while we're at it, let's encourage those who are gazing cometward to take a few moments to look at some of the other wonders of the universe around us and point out to them that there is far more to be in awe of in the real world than there could ever be in the pseudoscience we are encountering today. Recently, on a radio talk show where I had asserted that there is no spacecraft following Hale-Bopp and that if any listeners doubted me they should go look at the comet for themselves, the program's host told me that I was "taking all the fun out of this." Hale-Bopp is an opportunity to show our fellow citizens of Earth that the pursuit of knowledge of the real world and universe around us is far more "fun" than pseudoscience could ever be. □

An Astronomer's Personal Statement on UFOs

ALAN HALE

When I am confronted with beliefs about UFOs or other paranormal phenomena—or, for that matter, just about *anything*—I am guided by three basic principles, to wit:

1) *Extraordinary claims require extraordinary evidence.* The discovery that there are other intelligent beings in the universe—and, as a corollary, that life and intelligence can and has evolved at locations other than Earth—and that, moreover, these beings are visiting Earth on a semi-regular basis in spacecraft that seem to defy the laws of physics as we now know them, would unquestionably rank as the greatest discovery in the history of science, and most definitely is an extraordinary claim. Therefore, in order for me to accept it, you must produce extraordinary evidence. What might *this evidence be?* For one thing, the aliens themselves. Not some story where someone says that someone says that someone says that they saw aliens, but the actual physical aliens themselves, where I and other trustworthy and competent scientists and individuals can study and communicate with them. I'd like to examine their spacecraft and learn the physical principles under which it operates. I'd like a ride on that spacecraft. I'd like to see their star charts and see where the aliens

come from. I'd like to know the astronomical, physical, chemical, and biological conditions of their home world and solar system, and how they compare with and contrast with ours. If possible, I'd like to visit their home world, and any other worlds that might be within their sphere of influence. In other words, I want the aliens visible front and center, where there can be *no reasonable doubt* as to their existence. Stories about "lights" or "things" in the sky do not impress me, especially when such reports come from people who have no idea of the vast array of natural and man-made phenomena that are visible in the sky if one would only take the time to look.

2) *The burden of proof is on the positive.* If you are making an extraordinary claim, the burden is on you to produce the extraordinary evidence to prove that you are correct; the burden is not on me to prove that you are wrong. Furthermore, you must prove your case by providing the direct and compelling evidence for it; you can't prove it by eliminating a few token explanations and then crying, "Well, what else can it be?"

3) *Occam's Razor: If one is confronted with a series of phenomena for which there exists more than one viable explanation, one should choose the simplest explanation which fits all the observed*

facts. It is an undeniable fact that many people have seen, or at least claimed to see, objects in the sky and on the ground for which they have no explanation. But it is also an undeniable fact that people can make mistakes about their observations. It is an undeniable fact that reports can come from people who are unaware of the various phenomena that are visible in the sky and from people who are not equipped or trained at making reliable scientific observations. It is an undeniable fact that a person's preconceived notions and expectations can affect his/her observations. It is an undeniable fact that some people will lie and will create hoaxes for any one of various reasons. Taking all these undeniable facts together, the simplest explanation—to me, anyway—for the UFO phenomenon is that every report is either a hoax or is a mistake of some sort. If this explanation is incorrect, then you have to increase the sphere of undeniable facts; and for this, see points 1) and 2) above.

To me, it seems extremely likely that life has started and evolved at other sites throughout the universe, quite possibly in a great number of places. It also seems rather possible that, at some of those sites, evolution has created

an intelligent species which has developed technology far in advance of our own and which might be capable of interstellar space flight. Despite the incredible distances between stars, and despite the vast dispersion in evolutionary states that must exist throughout the sphere of races that have achieved some sort of sentience, it is possible—although, to me, extremely unlikely—that one or more of these races has visited Earth within the relatively recent past. Indeed, I would be absolutely ecstatic if any such visits have taken place. No one would be happier than me to meet with and converse with these beings and, I dare say, there are very few people who are better prepared intellectually and emotionally to deal with this prospect if it were to occur. But again, I want the direct evidence for their existence; I want the aliens themselves. I don't want to hear stories about some "thing" that some person somewhere might have seen.

As a lifelong amateur astron-

omer, as a professional astronomer, as someone who has read countless science fiction stories and scientific essays, I have devoted my life to unraveling the secrets of the universe and to pushing humanity and humanity's knowledge as far into space as I can. (This is my reason for claiming that there are few people in the world who are better prepared than I am to meet with an alien race; if there is any human being who *could* meet with alien beings, it would be someone like me.) At the same time, I suspect there is hardly anyone who watches and studies the sky more than I do, and while I have almost continuously observed the sky for most of my lifetime, I have yet to see a single object for which there was not a prosaic explanation. I have seen such diverse phenomena as: fireballs, rocket launches, satellite re-entries, comets, auroras, bright planets, novae, orbiting satellites, ionospheric experiments, high-altitude balloons—all of which have been reported as "UFOs" by

uninformed witnesses. If indeed there are alien spacecraft flying around Earth with the frequency with which UFO devotees are claiming, then I must ask how come I have never seen anything remotely resembling such an object, while at the same time I have managed to see all these various other types of phenomena.

In summary, I consider it likely that there are advanced alien races somewhere "out there," and I remain open to the possibility that, unlikely as it may seem, one or more such races could be visiting Earth. But if so, where are they? If they possess the technology capable of traveling interstellar distances, then they are so far ahead of us that there can be no reason for them to be afraid of us. If they wish to hide from us, they could do so easily; if they don't wish to, then they have no need to play games with us and only show themselves to a few unwitting individuals. Let them reveal themselves to humanity at large, to our scientists, and to me. □

SPEAKERS / PANELISTS

DOUGLAS BAMFORTH • HAZEL BARNES

MERRI LY SCHADE BROWN

JUDITH CRANDALL • BARBARA EISENSTADT

GINA GREEN • PAUL KURTZ

STEVEN LEKSON • ELIZABETH LOFTUS

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Fax 303-447-9713 E-mail cfirockies@aol.com

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