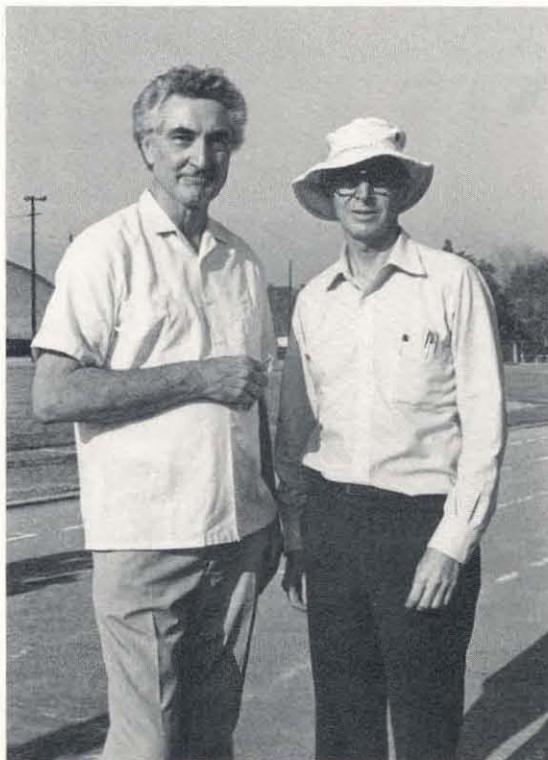


# Ghostbusters!

THEY DON'T WEAR FUNNY UNIFORMS, they don't store ectoplasm in the basement, and not one of them has ever been "slimed." They don't even have a video on MTV. Yet a recently formed group called the Southern California Skeptics (SCS), with a strong base of support among the Caltech community, has been remarkably successful in causing ghosts of one sort or another to evaporate. In so doing, they have literally walked through fire, and they have repeatedly exposed them-



The Skeptics society has several Caltech stalwarts on its board, among them Al Hibbs (BS '45, PhD '55) and Paul MacCready (MS '48, PhD '52).

selves to that most terrifying and voracious of modern apparitions — the American news media.

Affiliated with a national organization called the Committee for the Scientific Investigation of Claims of the Paranormal (aptly acronymed CSICOP), SCS has grown quickly in the few months of its existence. Its board of directors includes Caltech faculty members Murray Gell-Mann and Joseph Kirschvink, JPL's Albert R. Hibbs, professors from USC and UCLA, and professional magicians. The group's stated aim is to promote the fair and accurate investigation of claims of alleged paranormal occurrences and to disseminate the results of these investigations. SCS has staged a number of well-attended lectures and demonstrations on the Caltech campus on such subjects as psychic surgery, the Bermuda triangle, and Kirlian photography, and has received quite a bit of (mostly) favorable media attention.

*Glendower:* I can call spirits from the vasty deep.

*Hotspur:* Why, so can I, or so can any man;  
But will they come when you do call for them?

—Shakespeare, *Henry IV, Part I*

But there have been some growing pains. The Skeptics' first foray onto local television was not a notable success. KABC's *Eye on L. A.* program invited SCS chairperson Al Seckel and several members of the board — Dennis Marks and Sandy Spillman (both



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magicians) and Ronald Crowley (formerly a Caltech visiting associate in physics and now a Cal State Fullerton professor) — to investigate videotapes and still photographs, taken at a Westwood cemetery, that contained mysterious images of ghostly ectoplasm.

The videotape, made in dim light near a grave at the foot of a tree, showed odd fluctuations of light at the same time that a psychic who was present claimed to be sensing a lady ghost, dressed 1920s-style in a red hobble skirt. The still photograph, made near the same tree, contains several streamers of ectoplasmic light, apparently emanating from the grave itself. Given just 30 minutes to examine the evidence and interview the film crew before commenting, on camera, about their findings, the Skeptics were unable to find a simple explanation for the images. When the show was aired, the producers felt justified in calling the images not just “unexplained,” but “unexplainable.”

With just a little further investigation, however, the Skeptics were able to explain the unexplainable. The fluctuations in light in the videotape were caused by a camera operating below its threshold of sensitivity in

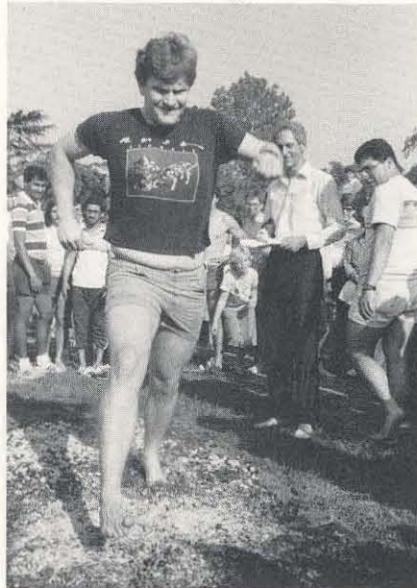
the dim light. At an amplification factor of 64, tiny fluctuations in available light caused large fluctuations in the image. And the streamers of light in the still photo were the result of this camera being jerked while its shutter stuck open. Despite repeated requests, however, the show’s producers refused to allow the Skeptics to present these findings.

Can one go upon hot coals, and his feet  
not be burned?

—Proverbs 6:28

The Southern California Skeptics received more favorable media coverage one recent spring Sunday when they staged a demonstration of firewalking at Caltech’s football field. The bleachers were filled with spectators as over a hundred people walked on an eight-foot bed of 1000° F coals, most emerging unscathed.

In recent months the airwaves have been filled with reports of firewalking exhibitions, staged by groups who, for fees ranging from a hundred to several thousand dollars, purport to teach participants the mind-over-body techniques that they claim are necessary for



*UCLA professors Bernard Leikind and William McCarthy decide who will walk first on the 1000° F coals. In the end, over 100 people performed this seemingly miraculous stunt, including (from left) Caltech students and former students Dan Harrison, Jeff Matus, Rod Schmidt, Brad Solberg, and Rajeev Krishnamoorthy.*

performing this apparently perilous stunt.

These firewalking seminars intrigued two UCLA professors — physicist Bernard J. Leikind and psychologist William J. McCarthy. Both members of the Southern California Skeptics, they were, well, skeptical to say the least and decided to put the seminar to the test. One evening last November McCarthy attended one of these seminars in Burbank while Leikind waited outside. And then *both* walked safely on the coals, proving that the intensive, six-hour motivational seminar was unnecessary.

It turns out that the ability to walk on hot coals can be explained by physical law; it isn't necessary to resort to mysticism or any mysterious psychological process. The explanation depends on the difference between *temperature* and *heat*. Imagine a cake baking in an oven at 450°. You can reach your hand into the oven and touch the cake without being burned, but you'll be burned instantly if you touch the aluminum pan it's baking in. The pan and the cake are at exactly the same temperature, but the cake has a low heat capacity and poor thermal conductivity, while the pan has a high heat capacity and good thermal conductivity. The wood coals used in firewalking demonstrations conduct heat poorly and, as long as a walker moves over them reasonably quickly, the feet will cool the coals more than the coals will heat the feet.

Skeptics laugh in order not to weep.

—Anatole France

Media attention has led to a rapid expansion in Skeptics society membership, but it has also led to more than a few crank calls.

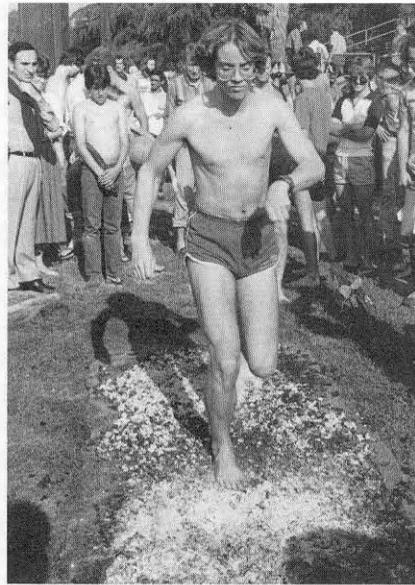
CSICOP founding member James Randi, the well-known magician who's also an SCS board member, has a standing offer of \$10,000 for proof of any paranormal, supernatural, or occult power demonstration under properly controlled conditions, and this too prompts some rather interesting conversations. One woman phoned SCS, for example, claiming to have the power to make it rain in her Seal Beach neighborhood within any 24-hour period without fail. She was challenged to make it rain the very next day, but the next day was dry. She called back to say that it hadn't rained in Seal Beach because she had mistakenly caused it to rain in Louisiana, and she asked for SCS's "certificate of approval" so that she could be sent to Africa to help relieve the drought.

Another caller claimed that his pencil was omniscient and directed his hand, writing what it wished. Al Seckel thereupon asked the pencil to solve a simple math problem: the derivative of  $x^2$ . The all-knowing pencil apparently never took calculus, since it couldn't come up with the answer.

And another caller claimed to know for a fact that Bigfoot was real. When Seckel asked why Bigfoot had never been shot, given the large number of hunters who have searched for him over the years, the caller replied that Bigfoot *had* been shot, and more than 500 times too. In that case, Seckel queried, why has a carcass never been found. "That's how we know he's paranormal," replied the caller.

The ultimate result of shielding men from the effects of folly is to fill the world with fools.

—Herbert Spencer



While debunking fraudulent or misguided claims is fun and receives the greatest amount of media attention, most of the Skeptics would agree that debunking is not the main goal of the society. Al Hibbs, a senior staff scientist at JPL and a member of the board of the Southern California Skeptics, says, "the major goal is to encourage people to think about seemingly marvelous, mystical, and miraculous phenomena rather than just accepting the notion that they're supernatural. We're trying to encourage people to adopt a scientific attitude, to investigate a little bit. We're not particularly interested in debunking things, although if it comes to that, fine. The primary thing we want to do is encourage people to adopt a way of thinking, a scientific attitude to what happens in daily life, to doubt whether the answer first presented is the right one, to examine alternative explanations." In his position at JPL, Hibbs manages a group engaged in research and instrument development for future unmanned space missions. Given his involvement in astronomy, it's understandable that he has a particular interest in investigating the subject of astrology. "I'm a Libra," he says. "Libras don't believe in astrology."

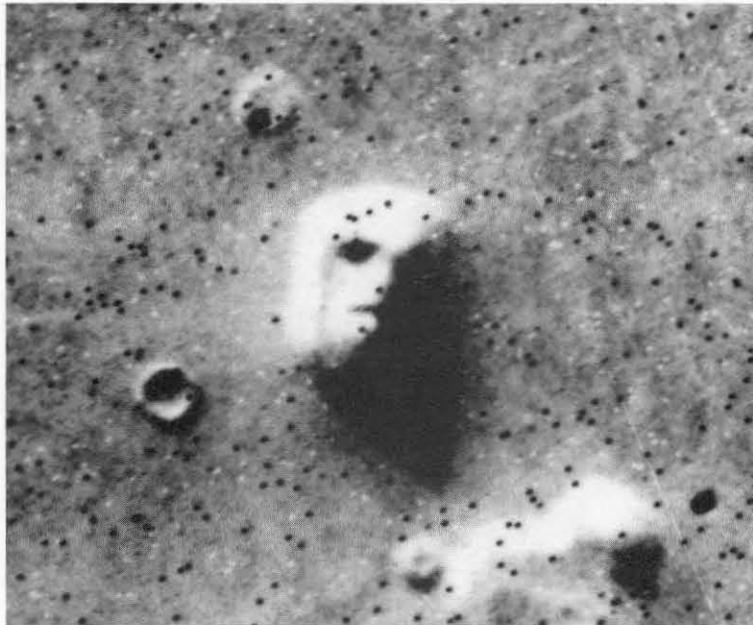
An interesting perspective on the proper goals of the skeptic is provided by Murray Gell-Mann, the Robert Andrews Millikan Professor of Theoretical Physics and a member of the boards of both SCS and CSICOP. He says, "My friends and acquaintances in this movement choose to designate their particular targets as 'claims of the paranormal.' Most of these people share with

me the belief that there is no such thing as the paranormal. That is to say, whatever actually happens in fact can be described within the framework of science. If something new is found that doesn't fit with our present laws of science, we wouldn't throw up our hands. What we would do is to enlarge or otherwise modify the laws of science to incorporate the new phenomenon.

"That puts us in a strange logical position if what we are doing is investigating claims of the paranormal, because in the end nothing is paranormal. It means, basically, that what we are doing is encouraging the skeptical examination of screwy phenomena in general, and some of them are bound to turn out to be basically genuine. So the debunking spirit, while it's entirely appropriate for most of these things, is not a perfectly satisfactory general approach.

*Some of the firewalkers did end up with hot feet. Here, Caltech senior Jeannine St. Jacques cools her tootsies after her attempt.*





*The unskeptical have made much of this top photo, taken by the Viking 1 Mars Orbiter. Intelligent Martians, they say, must have carved the humanoid features into this huge rock formation. Appearances can be deceiving, though. The face's right nostril, its chin dimple, and much of its right eye are dropped data bits, not actual surface features. The human brain has a propensity for perceiving faces, even in random patterns. Another example is a Martian lava flow (bottom) that looks like Kermit the Frog. If the Martians sculpted Kermit, why'd they leave out Miss Piggy?*



“There’s a classification of genuineness that’s useful here. First of all there are things that turn out to be caused by conscious fraud — psychic surgery, things of that kind. Next, we have results of error but not demonstrably conscious fraud.” According to Gell-Mann, many superstitious beliefs fall into this category and have as their basis, “poor or mistaken observations, a tendency to remember evidence in favor of a hypothesis, bad statistics, and lack of care in searching for natural explanations.

“Then we can go on from these classes of claims that are basically false to claims that turn out to be true. Some of them have simple explanations from physical science, as turned out to be the case for firewalking.

There, the most important result is that firewalking is perfectly possible. It’s not a false claim; it’s not a psychosomatic effect; it’s simply a physical one.

“But there are some phenomena that apparently *are* of the psychosomatic category. The placebo effect (in which objectively worthless treatments help in fighting serious disease) is the most famous. To reduce something to the placebo effect is not to show that it’s unimportant or not there. The placebo effect is one of the most important in medicine and needs to be better understood. There are, of course, also some remarkable genuine effects that are biological or psychological in character but not psychosomatic.

“To go further, what about claims that would require, if they were substantiated, some quite novel ideas that are unfamiliar to science? And those claims I would attempt to classify into two kinds: those that involve very complicated environmental situations where we don’t know for sure what the results of the fundamental underlying laws of science would be, and those that seem to require the revision of the most fundamental laws.”

In the first of these categories, Gell-Mann puts the famous historical case of the meteorites. For hundreds of years scientists scoffed at the seemingly ridiculous idea that rocks could fall from the sky. This disbelief persisted until 1803, when an undeniable shower of stones fell on L’Aigle, a town close to Paris and close, therefore, to the leading scientists of the day. According to Gell-Mann, a modern example of this may be, “the persistent, although rare, reports of falls of fish and other relatively large creatures from the sky. The anecdotal reports are relatively consistent, come from reliable observers, and may well be true. And meteorology contains enough richness that they can probably be explained. We should not, in such a complicated situation, reject the possibility of something being true because we can’t think of a mechanism based on the fundamental laws we know. We shouldn’t try to debunk it. We should go out and study the evidence and see if there is such a thing. We should be skeptical, of course, but there’s no reason to adopt what I call the ‘debunking mode.’

“Finally we get to the last category — those phenomena that seem, as far as we can tell, to contradict the most fundamental principles and would require, if genuine, really major revisions of scientific law. For these, of course, we must have a very healthy dose of

skepticism. Probably most phenomena that would be described by the name extrasensory perception would be in this category if they turned out to be true, which I think is extremely unlikely. But these reports, persistent as they are, should be examined, to see what comes out of them. And, of course, the usual methods of the skeptic have to be applied. Although it's likely that phenomena of that sort will dissolve under skeptical examination, we should bear in mind the possibility that some might survive and find explanation in new scientific laws.

"Suppose, for example, it turned out to be true, as is often claimed, that pairs of people linked by special bonds, such as identical twins or mother and daughter, can communicate with each other telepathically, almost independently of distance, in moments of stress. We would have to start formulating and testing scientific hypotheses about how that could occur. Is there, for example, some new kind of material cord connecting such people, which gets 'twitched' at times of great anguish? Of course, it is most likely that nothing is there except chance and selective recollection.

"The whole notion of dealing with the paranormal dissolves a little bit under this analysis. We should encourage the study of all kinds of claims, with different doses of skepticism in different cases, and try to see what comes out of careful observation. When it looks as if conscious fraud is involved, with people being exploited to their harm, as in the case of psychic surgery, debunking is the right mind set, the right tone of voice. In other cases, it's a question of showing how thin the evidence is. In still others, we may want to pursue the matter vigorously to see if there is not really something in it, whether simple natural science, sophisticated natural science, complex environmental science, or (what is very improbable) a major revision of fundamental scientific laws. In certain cases, it is the gullibility or trickiness of people involved that turns out to be interesting, or the preference for supernatural over scientific explanations, or the deliberate sensationalism of the news media.

"In all cases, though, I believe our emphasis should be on trying to understand what is going on."

The fact that a believer is happier than a sceptic is no more to the point than the fact that a drunken man is happier than a

sober one. The happiness of credulity is a cheap and dangerous quality.

—George Bernard Shaw

The most costly of all follies is to believe passionately in the palpably not true. It is the chief occupation of mankind.

—H. L. Mencken

Why *do* people seem to prefer supernatural explanations? This is a question that interests many of the Skeptics. Gell-Mann says, "Great numbers of people believe in all these things with insufficient evidence either because they falsely believe there is sufficient evidence or, in more cases, because evidence is not an important criterion to their belief. In fact, many people state the matter in the following way: that one should believe what it makes one feel good to believe. This is not to say that such belief is worthless. Faith in things that are probably not true can be very powerful; it can, in some cases, give people strength or courage or a relaxed and confident attitude that permits them to accomplish tasks that would otherwise be too difficult. I would like to think that the same kinds of results can be achieved without belief in the *supernatural*." Hibbs advances the answer that magical thinking is a shortcut way of dealing with the world. "If you can make something happen just by thinking about it, that's much easier than having to go to work." And he also says, "Psychic phenomena have, always off there in the background, immortality, life after death, that magic thinking."

But those who have studied science realize that scientific explanations of natural phenomena are often far more elegant and far more beautiful than the most fanciful, magical, or supernatural interpretations that people have concocted over the centuries. Perhaps the best thing to do is to recite, each night before going to bed, the ancient Scottish supplication that might be called the Skeptic's Prayer:

From ghoulies and ghosties and long-  
leggety beasties,  
And things that go bump in the night,  
Good Lord deliver us! □

— RF

For more information on the Southern California Skeptics or CSICOP, contact SCS at P.O. Box 7000-39, Redondo Beach, CA 90277, 213-540-0915.