A selection of views on alternative medicine is presented: "[W]e in conventional medicine can learn much from indigenous healers and healing systems. Some of the most important lessons involve the importance of time with the patient and quality of rapport." "What is objectionable in scientific medicine is reliance on anecdotal declarations rather than on facts." "The public's understanding of science is being dangerously undermined by the rise of 'integrated medicine.'" "Investigating the role that these psychosomatic links play in the outcome of alternative medicine remedies...could be...beneficial to scientific medicine." **And at the other end of the scale (of the universe), recent measurements of cosmic emissions at near infrared wavelengths and the implications of those measurements for galaxy formation and evolution are discussed.**

Alternative Views on Alternative Medicine

I would like to clarify and respond to the information about me that Eliot Marshall presented in his News Focus article "Bastions of tradition adapt to alternative medicine" (2 June, p. 1571). We physicians who are solidly a part of conventional medicine and who are also exploring alternative medicine work hard to maintain our reputation and credibility.

In the news article, it is implied that, at the behest of E. Patrick Curry, I had been investigated by the University of Pittsburgh Medical Center, found to have been engaging in questionable practices, and forced to resign. This is not the case.

To set the record straight, in the summer of 1998, Curry did write a letter complaining about my practices and views. In the fall of 1999, the University of Pittsburgh Medical Center created a commission to study the concept of complementary and alternative medicine within the entire system. This was never an investigation of me personally. I resigned in early 2000 from my position as medical director of the Center for Complementary Medicine to accept a position at Beth Israel Medical Center in New York City, a move that I considered quite advantageous. I continue to have good standing with the University of Pittsburgh, am still a clinical assistant professor there at the medical school, still do some teaching there, and still work part-time in the emergency department.

I am Native American and follow the spiritual traditions of my ancestors. Native American ceremonies were never part of our program at the University of Pittsburgh Medical Center, however, although we encouraged all patients to explore spirituality in their own traditions. Many others besides me are exploring the role of religion and spirituality in medicine. Religious commitment is an important contributor to health and well-being, and many physicians agree that it helps patients.

Marshall mentions a study I published on 5-year outcomes of patients who added an intensive program involving traditional Indian medicine to their conventional therapies (*1*). It is true that some of the cancer patients had massage. It is also true that every patient had and benefited from conventional medicine. The point of the study was to show that adding traditional Indian medicine provided patients with additional benefit. No effort was made to compare Indian medicine to conventional medicine or to force patients to choose between the two.

I have never proposed massage in lieu of conventional medical therapy. We at the Center for Complementary Medicine had an excellent relationship with the oncologists at the University of Pittsburgh Medical Center, and we had the reputation for finding ways for patients who were previously refusing conventional therapies to have both alternative and conventional treatment.

My message has been that we in conventional medicine can learn much from indigenous healers and healing systems. Some of the most important lessons involve the importance of time with the patient and quality of rapport. The world's traditional medicines (including Native North American) all stress the importance of all aspects of our lives in creating and healing illness. These cultures actually have more psychosocial orientation than conventional medicine and draw our attention to the importance of emotion, family, community, and even spiritual life in treating illness. Traditional healers believe that all aspects of the person must be addressed and that major illnesses may require major changes in many areas of life. These areas include diet, relationships, and even spirituality. Many of us feel that these are important issues for conventional medicine to consider. We believe that this is why, as Marshall puts it, alternative medicine is finding its way into the "bastions of academic medicine."

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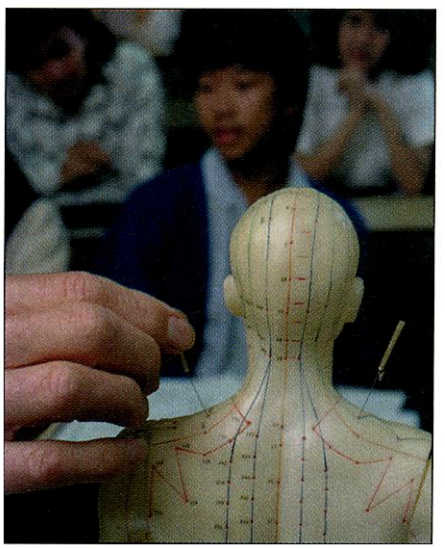
The News Focus articles on alternative medicine ("Stephen Strauss's impossible job," by Erik Stokstad, 2 June, p. 1568, as well as Marshall's article) do not address an underlying point. Many of the people who are advocating alternative therapies seem to believe that there is a body of treatments that the medical establishment has deliberately eschewed. This reasoning places the two systems in opposition, when in fact the history of medicine reveals that they are just the opposite. Many treatments have derived from lay observations; for example, digitalis and smallpox vaccination. What is objectionable in scientific medicine is reliance on anecdotal declarations rather than on facts.



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The main problem with alternative medicine is that the alternatives sought are those of causality. Its proponents demand that everything that has been suggested as therapy be evaluated. On the other hand, scientific medicine requires that there be some preliminary data before a major study is undertaken. It is this difference that underlies the gulf between "alternative medicine" and "evidence-based medicine." There may be a large collection of discarded crutches in Lourdes, but what we need is a demonstration that the lame are walking.

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Although they may ring some alarm bells, the News Focus articles on alternative medicine do not fully convey the dangers of this "integrated medicine" approach. Recently, a 10-year-old girl in Evergreen, Colorado, was smothered to death by four therapists practicing a New Age regression technique called "rebirthing." They wrapped this child in a blanket to simulate the womb, trying to reenact her birth to rebond her to her adoptive mother. They ignored her pleas for help, considering them a sign of the progress of the therapy. She died of suffocation.

The alternative medicine craze promises many dangers down the road. In Pittsburgh this past year, the press has reported two breast cancer deaths of young women who were drawn away from standard treatment by the pied pipers of alternative medicine. The Pittsburgh Poison Center has reported significant increases in poisonings due to herbs and dietary supplements. The public's understanding of science is being dangerously undermined by the rise of "integrated medicine."

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The support that alternative medicine has received from the U.S. Government, through the National Institutes of Health, which created the National Center for Complementary and Alternative Medicine and allocated almost $70 million (U.S. currency) this year for research, seems to be founded more on political and economic grounds than on scientific interest ("Stephen Strauss's impossible job," by Erik Stokstad). The fact that the industry behind it generates about $27 billion in annual sales and that around 42% of the U.S. population tries some sort of alternative medicine is enough for policymakers and economists to pay keen attention to this phenomenon. This trend is not restricted to the United States but is permeating most countries through industrial strategies, the Internet, and traveling practitioners. The scientific community is by and large skeptical about the advantages of investigating highly questionable healing recipes, but the phenomenon itself and the fact that most patients find at least some sort of consolation merit scientific investigation.

Many aspects of scientific medicine can deter patients, who instead opt for other types of therapies. Medical care is increasingly expensive, whereas alternative medicine is cheaper. The high-technology tests—such as computer tomography scans, magnetic resonance, endoscopies, radiotherapies, and biopsies—are often bothersome or painful, but traditional remedies are in general innocuous. Pharmacological treatments frequently have side effects such as allergies, vomiting, headaches, and others, whereas traditional remedies usually have none. And a situation frequently overlooked is the confusion and frustration patients experience in a modern hospital. They are often sent from one department to another and undergo various tests before any physician talks with them, and even then patients may receive little comfort or explanation of what is going on. Even the most care-conscious doctor is often unable to assure the patient of the outcome, providing only probabilities while reciting possible complications.

In strong contrast, the practitioner of alternative medicine takes care directly of patients and gives them confidence and assurance. These practitioners serve what seems to be a more spiritual role in the lives of their patients compared with the role traditional doctors play, and many patients seem to approach alternative medicine with a religious-like faith. Many remedies act through this psychological attitude, perhaps via a neuroendocrine-immune pathway that has just begun to be unraveled (*1*). Even the well-known placebo effect could be due to a similar phenomenon. Investigating the role that these psychosomatic links play in the outcome of alternative medicine remedies and in the placebo effect could be far more beneficial to scientific medicine than the double-blind, placebo-controlled trials of rattlesnake powder or coffee enemas.

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Looking Behind the Stars

In his Perspective "An infrared look behind stars" (*Science*'s Compass, 14 Apr., p. 281), Craig J. Hogan discusses recent developments (*1, 2*) in measuring the total cosmic emission at near infrared wavelengths, based on data from the Diffuse Infrared Background Experiment (DIRBE) on the Cosmic Background Explorer (COBE) satellite. This emission, otherwise known as the cosmic infrared background (CIB), is the sum total of the redshifted light emitted by early generations of evolving and forming galaxies. The Perspective contains a couple of inaccuracies that warrant further discussion.

First, the near infrared CIB has been uncovered by us (*3*) from the DIRBE data using a fluctuations analysis technique, and our results precede those of Wright and Reese and of Gorjian *et al.* (*1, 2*). In this method, one looks for the CIB by measuring its spatial structure, or fluctuations, resulting from the clustered distribution of distant galaxies. Because of the strength of galaxy clustering, the levels of the fluctuations on the DIRBE beam angular scale of ~0.5° are expected to be about 10 to 20% of the CIB mean level. Within the statistical uncertainties, the numbers we found for the CIB fluctuations agree with the later investigations at 2.2 and 3.5 μm that Hogan discusses, but our detections cover a larger range of wavelengths: 1.25, 2.2, 3.5, and 4.9 μm. This provides more information about the spectral energy distribution of the CIB. Our numbers have also been corroborated by the data from Japan's Infrared Telescope in Space (*4*), from which the angular spectrum of the CIB fluctuations over a substantial range of angular scales has been resolved. The mean levels of the CIB from these data are also in agreement with the DIRBE data analysis reported in (*1, 2*), as is a substantially earlier analysis of the DIRBE data at 3.5 μm (*5*). These findings suggest that distant galaxies must contribute to a measurable CIB, and they also refine our understanding of how galaxies have evolved in brightness, and in clustering, through much of the history of the universe.

Second, Hogan says that "the measured strength of the [near infrared] background is close to theoretical estimates." However, the opposite is true: The near infrared CIB seems to be substantially larger than what is expected from theoretical analysis (*6, 7*). Similar conclusions are reached when the CIB flux is compared directly with the cumulative radiation from galaxy populations seen in deep galaxy surveys. For example, at the wavelength of 2.2 μm (K band) the mean CIB level is about 23 nanowatts per square meter per steradian (nW m^{-2} sr^{-1}), with 20 to 25% uncertainty. The integrated flux produced by the observed galaxies in deep galaxy surveys out to the given K-band brightness level expressed in the astronomical "magnitude" system is plotted in the figure. [The astronomical magnitude is proportional to the logarithm of the radiation flux (F) at that band (m_K), with band K centered at 2.2 μm]. What the figure shows is that the total flux contributions continue to increase, but saturate at magnitudes near $m_K < 20$.

The cumulative CIB flux from all galaxies observed to date out to $m_K = 24$ turns out to be 8.7 nW m^{-2} sr^{-1}, with a few percent uncertainty [see, for example, (*8*)]. [Galaxies at $m_K = 24$ are located at cosmological red-shifts $z >> 1$ (*6*)]. Thus, the observed galaxies contribute only 30 to 40% of the total CIB flux at 2.2 μm. CIB fluctuation numbers are a little more difficult to interpret theoretically, but lead to essentially similar conclusions (*3*). What these high levels of the near infrared CIB imply