LETTERS

SETI Program

In his letter objecting to an observational Search for Extraterrestrial Intelligence (SETI) program, Frank J. Tipler (14 Jan., p. 110) creates (and demolishes) a "strawman" that represents neither the statements contained in "Extraterrestrial intelligence: An international petition" (Letters, 29 Oct., p. 426) nor the realities of the proposed NASA SETI microwave observing program. Since I signed the petition and have helped to define the observing program, I would like to set the record straight.

The petition authored by Carl Sagan stated: "Using current radioastronomical technology, it is possible for us to receive signals from civilizations no more advanced than we are over a distance of at least many thousands of light years." This is merely saying there is a pragmatic limitation on the minimum detectable signal flux that we believe it is possible to search for in a systematic way, in the near future, with existing radio telescopes and SETI-specific backend hardware. In particular, the minimum detectable flux for narrow-band signals originating in the direction of the nearest 773 solar-type stars will be somewhere between 1 and 20×10^{-27} watts per square meter, depending upon the telescope, the integration time, and the frequency and site-dependent interference actually encountered. At a distance of 1000 light years, this requires a transmitter with an equivalent isotropic radiated power of 1 to 20×10^{12} watts. Since the most powerful terrestrial transmitter is the planetary radar at the Arecibo Observatory, rated at 10^{13} watts, the petition correctly concludes that no major extrapolation of our own technology is required to permit a successful detection.

Success is not guaranteed in SETI. Indeed, the signers of the petition state that "We represent a wide variety of opinion on the abundance of extraterrestrials, [and] on the ease of establishing contact. . . . [b]ut we are unanimous in our conviction that the only significant test of the existence of extraterrestrial intelligence is an experimental one." This is precisely the approach that makes SETI a valid scientific discipline. The signers of the petition support the initiation of a systematic radio search because "[t]he results—whether positive or negative—would have profound implications for our view of our universe and ourselves." But Tipler says that a negative result will never be convincing to SETI supporters. Nonsense! A systematic radio search would produce compelling positive or negative results. The number and scope of hypotheses that will have to be discarded because they contradict the experimental results will depend on the scale of the observational program actually conducted. This is perfectly proper science, and no one should be surprised that profound and sweeping conclusions require significant experimental efforts. Hypotheses that can be discarded will be discarded at every stage in the process. SETI is now, and has been for decades, a scientific endeavor.

JILL C. TARTER
Space Sciences Laboratory, University of California, Berkeley 94720

Natural Gas Resources

The letter of Craig Bond Hatfield (7 Jan., p. 10) certainly would not lead the reader to suspect that there is presently a real "glut" of natural gas in the United States. His statement that there has been a large decrease in the nation's proved reserves of natural gas during the past 10 years is misleading. During the first part of this time interval, no gas at all would have been discovered had it not been that it is difficult to bring in much oil without finding gas along with the oil. This resulted from the price of some 40 to 50 cents per 1000 cubic feet imposed by a federal regulatory agency. When this agency proposed to raise the price to $1.40 (still about one-fourth the price of the same number of BtU's from petroleum), consumer groups went to court to try and block the increase. After passage of the Natural Gas Act of 1978, which made it profitable to drill for gas, there was an immediate surge of "new" gas brought in, so there are literally thousands of wells that are capped for lack of a market. Other wells are producing intermittently, as the pipeline companies seek to juggle their "take or pay" commitments. During 1981, some of the gas from deep wells (below 15,000 feet) was contracted at prices as high as $9 per 1000 cubic feet, since it was unregulated. The "glut" has now reduced such prices dramatically.

In summary, there is now more natural gas than the market can consume, and the evidence is convincing that this supply of gas will continue to increase for many years. Furthermore, there is little doubt that the partial deregulation of the gas price by the 1978 act and the full deregulation of oil prices in this country are responsible for our present welcome abundance of both these critical commodities. In addition, "geopressured methane" is present under lands in the United States in quantities sufficient to meet our needs for natural gas for some 150 years. Although new technology will be required, this nation should have little difficulty bringing this vast resource to market.

JAMES CASON
Department of Chemistry, University of California, Berkeley 94720

Math Archive

As one who has profitably explored the Humanities Research Center (HRC) of the University of Texas at Austin, I was surprised by the unsympathetic tone of your News and Comment article "Math archive in disarray" (25 Feb., p. 940). My research in modern literature has required travel to the HRC in Austin and follow-up correspondence.

The curators and staff impressed me with efficiency, friendliness, and profound scholarship. The HRC has made Austin a crossroads for serious investigators of history, literature, fine printing, theatre, film, photography, and painting. It is a miracle of organization that the HRC comprises a mountain of historical treasures and not a bottomless pit.

After phoning HRC director Decherd Turner, *Science* reporter Gina Kolata portrayed his position unfairly. When he said that the math archives are "a peripheral item," I am sure Turner meant peripheral to the *humanities*, the focus and weighty charge of the HRC. Mathematicians may be miffed at Turner, but he is busy at a Gargantuan banquet of the arts and may not want to bite off more than he and his staff can chew (that is, mathematics). The verbatim inclusion of the terms "honey" and "dear" from a telephone interview, which might suggest flippancy, condescension, or sexism to readers unfamiliar with Turner's amicable Southern diction, is also unfair to this gentleman and scholar.

Mathematicians and historians of science would be superbly served were a national archive of mathematics endowed with a facility as accommodating as the HRC at Austin. I hope the eventual math archive will be blessed with a curator as dedicated to science as Decherd Turner is to art.

JOHN KIDD
Literature Board, University of California, Santa Cruz 95064