

certified design of a standardized reactor. The licensing review of the standardized design is performed once, resulting in a Final Design Approval and a design certification for the particular standardized reactor. Thereafter a utility or other commercial entity would simply reference a previously certified design when applying for a license to construct and operate a nuclear plant. The only new information to be considered would be the applicant's site-related information, in that site data affect certain assumptions made in the previously certified design.

The Part 52 process is intended to simplify and speed licensing procedures in comparison with the old, Part 50 process. It will also permit public participation in the licensing process in advance of construction, so that safety concerns and emergency planning issues can be debated well in advance of construction activity.

I agree with Gibbons and Blair that decisions relating to nuclear waste disposal are required before there can be any revitalization of the nuclear option. Public perceptions of nuclear risks must be addressed. The issues indeed include high- and low-level radioactive waste management, radiological exposure standards and health protection, decommissioning and decontamination of commercial nuclear plants and facilities, and the competence of public officials and regulatory agencies to tackle and resolve these matters. The public and industry perception is that nuclear waste *regulation* itself is not a scrutable, equitable or efficient process.

I believe this disaffection is a chief obstacle—or “root cause,” to use a nuclear industry term—standing in the way of a new generation of advanced nuclear plants. Approximately a year ago the NRC proposed a policy intended to articulate its criteria for making consistent decisions when considering exemptions from some or all regulatory controls for practices involving very low levels of radioactive materials or wastes—a so-called Below Regulatory Concern policy. Practices for which exemptions would be granted, according to this policy, include decontamination of structures and lands, distribution of consumer products (such as smoke detectors), disposal of wastes at other than NRC-licensed facilities, and recycling of slightly contaminated equipment and materials. This BRC policy was unsuccessful, primarily because of public mistrust of the process by which it was established. In July 1991 the commission declared a moratorium on its earlier policy and

initiated a new *consensus-building* process to address BRC issues. I am hopeful that this “experiment,” by invoking greater public participation in developing decisions, will help point the way to establishing the foundation of trust between the public and regulatory authorities that is needed if the public is to accept the role of governmental institutions that are responsible for decisions on matters of future energy supply (including nuclear power).

Reference

1. US Nuclear Regulatory Commission, “Below Regulatory Concern: A Guide to the Nuclear Regulatory Commission’s Policy on the Exemption of Very Low-Level Radioactive Materials, Wastes and Practices,” NRC, Washington, D. C. (1990).

KENNETH C. ROGERS
Nuclear Regulatory Commission
8/91 Washington, DC

GIBBONS AND BLAIR REPLY: For the most part, it appears that Kenneth C. Rogers agrees with us that the prospects for a revitalized nuclear power industry in the US are clouded for a number of reasons. Rogers disagrees that sluggish licensing is a problem on the grounds that the Nuclear Regulatory Commission has proposed a revision in its procedures. The NRC’s proposal has merit, but it is not yet in effect, and industry may lack faith that it will stand up in court without Congressional sanction. Thus, while this proposal is a hopeful sign, the regulatory problem is far from fixed. Furthermore, it would be counterproductive to fix it in a way that would reduce public confidence even further. It is not entirely clear whether the NRC proposal would have that effect. Some industry proposals very likely would reduce public confidence.

As we noted in our article, the order in which the issues facing the nuclear industry are resolved may be very important. On one hand, if there is no progress in resolving the issues of nuclear waste and the perceived safety of current technology, a prolonged debate over licensing reform will be fruitless. If, on the other hand, the nuclear waste issue were resolved and new reactor designs were commercially available and shown to be responsive to public worries, licensing reform might be much easier to achieve.

JOHN H. GIBBONS
PETER D. BLAIR
Office of Technology Assessment
US Congress
9/91 Washington, DC

Is Immigration Act Alienating Americans?

I would like to comment on the letters on employment in the May 1991 issue (page 99). First, I’d like to thank Kevin Aylesworth for his work and massive efforts to make the government and professional science organizations aware of the employment crisis for scientists and engineers. I would also like to thank APS for allowing Aylesworth to hold a meeting of the Young Scientists’ Network, which some 75 concerned scientists attended, at its spring 1991 conference. Someone needs to help the unemployed and underemployed scientists and engineers.

My husband holds a PhD in physics and since graduating in 1984 has already been laid off once. His prospects of finding another position if he is laid off from his current job are bleak indeed! Since 1988 I have been doing research into the employment problems of scientists, and I can state without a doubt that the employment situation will only get worse beginning on 1 October 1991. Why? Because Congress passed the Immigration Act of 1990, which has several sections allowing businesses to recruit alien workers to make up for “shortages” in the sciences. Few Congressmen had the courage to stand up against this act, which, it has been stated, will force currently employed Americans into unemployment. All interested scientists should send Congressman Jack Brooks of Texas a thank-you note for having the courage to state that what the US lacks is jobs for its scientists, not scientists to fill jobs.

Jon Claerbout of Stanford University wrote in that Stanford’s job fair “turned up 26 students in geophysics to be interviewed by 25 industry recruiters looking for people with MS and PhD degrees.” Claerbout made this statement in support of his claim that there are jobs for those in solid-Earth geophysics. I would like to know if any students who interviewed received job offers from those companies, and at what salaries; if all 25 companies had actual job openings; if those companies had reduced their science staffs since 1988; and if any of the companies are planning to use the Stanford job fair to document that they could not find any qualified American scientists and thus need to hire aliens under the Immigration Act this fall.

I am not a scientist but a third-year law student, and I have spent the last eight months researching the impact the Immigration Act of 1990 will have

on hiring and termination of American scientists. I feel sorry for those poor bright American scientists and students who have spent time, money and effort to become outstanding professionals, only to find out that no one is willing to hire them. Few of these scientists even know what Congress was busy doing to them last fall.

Scientists need to support such groups as the Young Scientists' Network to protect their employment rights! By the way, Dr. Aylesworth, America's scientists are retraining out of the sciences and into secondary education and law. Perhaps they also ought to run for political office in the US House or Senate. The salaries are great; you are employed for 2–6 years at a time; and you get lots of staff to do your work for you. With fewer lawyers and career politicians in office, perhaps more funding could be spent on research and development programs and on working with business to develop tax incentives for in-house research by private industry.

CYNTHIA A. WALSH

5/91 Albuquerque, New Mexico

CLAERBOUT REPLIES: I cannot speak on behalf of all 25 companies that sent representatives to our job fair to recruit students with MS and PhD degrees in geophysics, but I do know that some of those companies offered jobs that were accepted by some of our students. Several of the recruiters did express to me their concern that so few of our graduates are American citizens. Our problem is that despite the availability of fine fellowships and good employment prospects, we receive few applications from qualified American students.

JON F. CLAERBOUT
Stanford University
Stanford, California

7/91

Young Faculty's Plight, Older Faculty's 'Shame'

The article on the difficulties young university researchers face in obtaining funding and surviving in the academic physics community (February 1991, page 37) marks at least the 20th year of similar reporting in *PHYSICS TODAY*. A logical conclusion after all this time is that a decent-sized senior-level university constituency likes or at least doesn't mind the current overall system.

A production rate of PhDs that far exceeds steady state is guaranteed by the practice of having at least several graduate students study with each professor. Most of these PhD reci-

pients envision a teaching career, and many will give this course a try, regardless of salary or working conditions. And with an oversupply of willing participants, the university accommodates by maintaining an oversupply of faculty positions compared with an equilibrium case where positions are in balance with funding and other opportunities—hence the scramble for funding.

For years now the senior academic community has said "Tis a shame" regarding the situation. Then why does the production rate continue? Is it the pleasure of lecturing to large classes on esoteric subjects, the idea that at your retirement dinner it will be said that your name appears on hundreds of papers—mostly drafted by others—or a sense of worth from propagating knowledge on one's narrow interests? For many the rationale is a feeling that this approach is the only one that will assure adequate cream to reach the top, regardless of broader losses to society and the individual.

There is something senior faculty can do beyond saying "Tis a shame." You could advise your students of the probability of success in the academic community—you could advise them to get a parallel degree in engineering—you could advise them to marry someone rich. Any and all of these approaches are better than simply saying "Tis a shame" over another story in *PHYSICS TODAY*.

STEPHEN SACKS
Fairfax Station, Virginia

3/91

ELF Effects: Paradigm Shift or Fabric Rip?

I was surprised to see *Currents of Death*, by Paul Brodeur, and *Cross Currents*, by Robert Becker, reviewed by Indira Nair in *PHYSICS TODAY* (December 1990, page 70). In my library those books sit next to the works of Immanuel Velikovsky, J. B. Rhine and the latest on flying saucers.

Becker, an MD schooled in physics, he says, by one elementary college course, attributes all the ills of mankind—from AIDS through depression on to zymosis—to the minute electromagnetic fields in our environment. Similar views are expressed by Brodeur, whose science education seems to be even less extensive. Nair, whose accomplishments in science I consider no greater than Brodeur's, takes much the same line, praising the books of Becker and Brodeur by faint damnation.

In the course of presenting her own version of the Becker-Brodeur thesis, Nair wildly misstates the reasons why good scientists hold these very weak 60-Hz fields harmless. In fact, such fields are considered harmless because their effects on the cellular level are very, very much smaller than kT and thermal noise. And over larger regions, the fields are very, very much smaller than other, indigenous noise fields in the body.

No one has been able to reproduce the "cellular level" experiments that Nair claims have demonstrated the existence of biological effects of such weak fields. The epidemiological studies that she says link weak fields with leukemia and other cancers are neither statistically significant nor free from systematic biases—and there are many negative studies.

I find it ironic that this review is in the same issue where Philip Anderson (page 9) says, "Results that rip the fabric [of science] to shreds must be expected to be almost invariably wrong." But Nair and her colleagues explain the "rip in the fabric" by Becker, Brodeur and herself as a "paradigm shift," thus kidnapping Thomas Kuhn's interesting concept to justify illegitimate science.

ROBERT K. ADAIR
Yale University

1/91

New Haven, Connecticut

BECKER REPLIES: It is evident that Robert K. Adair's rejection of any biological effects from low-level electromagnetic fields rests entirely on the outmoded concept that kT must be exceeded for such effects to occur. This concept in turn rests upon the also outmoded biological concept that living things are simply chemical machines all of whose functions result from chemical reactions in an aqueous medium. The primary events in detection of light by the retina and in photosynthesis have for a long time clearly indicated that this is not so. Over the past few decades, additional capabilities of living things have been discovered that also violate the kT concept. These include microcrystalline magnetite deposits existing in conjunction with elements of the central nervous system that provide a sensing ability for very weak magnetic fields, and the sensitivity of the retina-pineal system to diurnal fluctuations in the geomagnetic field. At the cellular level, the evidence that extremely-low-frequency fields far below kT influence the kinetics of the cell cycle is overwhelming. Many thousands of humans with bone fractures that have failed to heal have