

Briefings

edited by DAVID P. HAMILTON

Efficient Bulb Sees (Most of) the Light

Making light from incandescent bulbs is an inherently wasteful process. For instance, when the tungsten filament in the inner bulb of a halogen light is heated to its ordinary operating temperature of 2600°C, nearly 75% of its electric power is consumed producing infrared light—more commonly thought of as plain old heat.

Theoretically, at least, the solution is a simple one: coat a bulb with a thin film that reflects heat back at the filament while transmitting visible light (a technique described more than a century ago by the British physicist Lord Rayleigh). The

problem has been figuring out how to fabricate a uniform film only tens of microns thick that can stand up to the temperatures in high-performance light bulbs.

Engineers at General Electric have managed to do just that. Using chemical vapor deposition, a process ordinarily associated with the fabrication of microcircuits, they have developed a multilayer metal oxide film for the company's line of 60-watt halogen bulbs. Company spokespeople say the new bulbs produce as much visible light as conventional 90-watt halogens, at an additional cost of only \$1 to \$3 a bulb.

Because the bulb's efficiency depends on the precision with which infrared waves are focused back on the filament, GE engineers say their new technique will work only in lights with uniform geometries, such



No sweat. A GE engineer examines the heat-reflective inner bulb of a halogen lamp.

as the cylindrical inner bulb of halogen lamps. GE's next challenge? To develop halogen bulbs for use in standard household lighting—and then to convince consumers to buy them.

Recruiting the Next Academic Generation

The David and Lucile Packard Foundation last month announced the award of \$10 million worth of research fellowships to 20 young scientists and engineers at 20 major universities around the country. Each investigator will receive \$100,000 a year for 5 years.

Foundation chairman David Packard, co-founder and chairman of Hewlett-Packard Co., says the aim of the fellowships program, begun in 1988, is to nurture university research at a time when many young scientists are being lured to industry. Fellows are selected from names submitted by university presidents. By 1992, the foundation plans to be supporting 100 scientists and engineers to the tune of \$10 million a year.

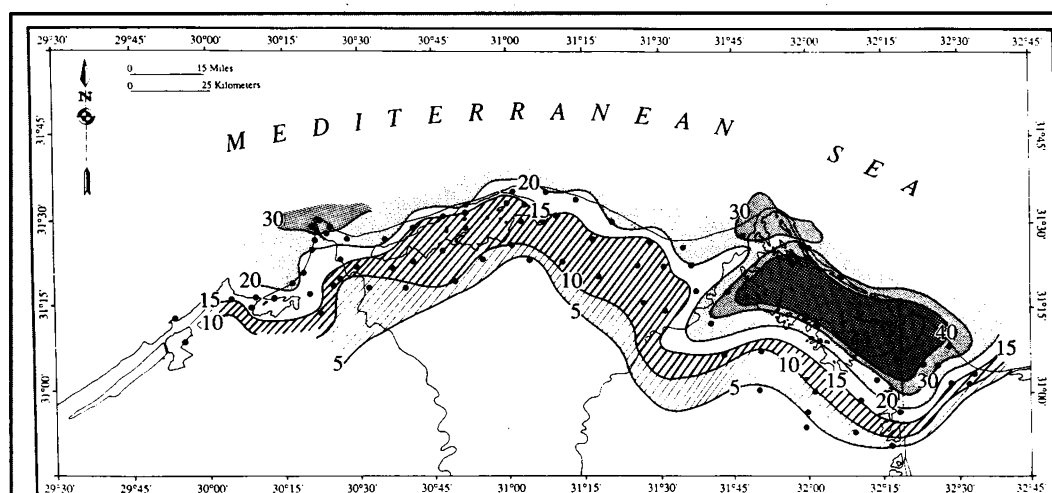
The Packard Foundation, in Los Altos, California, was established in 1964 to support arts, community, education, and health programs.

Court Bars Shortcut in Nuclear Licensing

Worried because the nuclear industry hasn't constructed any new power plants in more than a decade, the Nuclear Regulatory Commission decided a year and a half ago to change its licensing process to speed their construction. But early this month, the NRC's attempt at regulatory streamlining bit the dust when a federal appeals court ruled that the agency had violated existing law.

Under NRC's proposed reform, utilities would have been able to obtain a "one-step" construction and operating license before breaking ground. Then-NRC chairman Lando Zech hailed the demise of the "two-step" process, in which an already constructed plant must obtain a separate operating license, as "the most important change in our licensing process in more than 30 years."

But it wasn't to be: the federal appeals court declared the



Slipping away. Parts of the Nile Delta (shaded area) are sinking into the Mediterranean Sea.

Death of the Nile Delta?

Drilling expeditions conducted in the Nile Delta over the past 5 years show that a large part of the northern delta area is sinking and tilting toward the Mediterranean—a trend that could have a devastating impact on the area's agriculture and urban development. Most of Egypt's 50 million people live in the delta.

International expeditions sponsored by the Smithsonian Institution and the National Geographic Society have collected more than 100 core samples of mud and silt from between 20 and 60 meters below the surface. They show that the weight of the sediments, compaction of deeply buried strata, and recent faulting are causing eastern parts of the delta to sink by as

much as 0.5 centimeter per year.

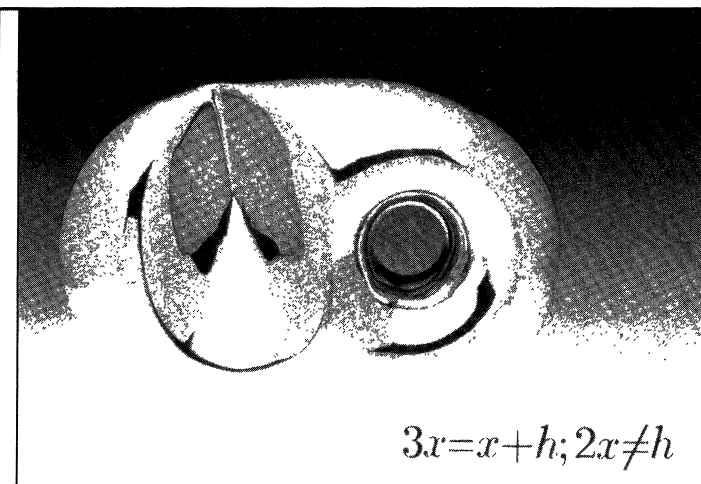
Smithsonian oceanographer Daniel J. Stanley reports that the resulting coastal erosion and encroachment of saltwater are already "severely limiting agricultural development" in the northern delta plain, Egypt's primary breadbasket. Stanley says sediment losses caused by the 1964 closure of the Aswan High Dam and some irrigation projects are compounding the problem, adding that the situation will be further aggravated by the projected rise in world sea levels. Unless Egypt moves promptly with new coastal protection measures, the sea may advance inland by as much as 30 kilometers in the next 100 years, Stanley predicts.

one-step process at odds with the "plain language" of the Atomic Energy Act, which, in the words of the court, calls for "a post-construction, pre-operation finding that a nuclear plant will operate in conformity with the Act." That doesn't necessarily mean the end for licensing reform, since the judge noted that "ultimate responsibility for such reforms ... lies not with the [NRC], but with the Congress."

Soviets Reinvited into Drilling Program

A 4-year, seesaw battle over whether to let the Soviet Union participate in the National Science Foundation-sponsored Ocean Drilling Program apparently ended on 2 November when presidential science adviser D. Allan Bromley formally invited the Soviets to join the program. If they accept, the Soviets will be the 20th country to participate in this international program that studies the earth's oceanic crust.

The invitation is actually the second to be put forth. In February 1987, the United States was set to sign an agreement bringing the Soviets into the program. But literally hours before a delegation was to leave for Moscow, everything was put on hold when Defense Department officials raised last-minute objections. Their concern was that the Soviets would gain access to sensitive underwater



More than just pretty curves. Mathematician-sculptor Helaman Ferguson, a Brigham Young University professor currently at the Supercomputing Research Center in Bowie, Maryland, believes he can communicate the aesthetics of math to the general public via art works that embody mathematical equations. This silicon bronze sculpture, "Torus With Cross Cap," he says, "contains the germ of the fundamental theorem of the topology of surfaces." The sculpture represents the left equation. $3x = x + h$ means that three Möbius strips, when "sewn" together, can be deformed to equal one strip sewn together with a torus. The right equation, $2x \neq h$, looks contradictory. But it's not: it simply means that two Möbius strips sewn together (known as a Klein bottle) is not the same as a torus. An exhibit of Ferguson's work is currently on display at the Mathematical Association of America in Washington, D.C.

technology if they were allowed to participate (*Science*, 8 May 1987, p. 659). After several months of interagency bickering, President Reagan sided with the military, and the Soviets were disinvented.

But oceanographers, unhappy with the snub, worked steadily to reinvite them, and this summer it began to look as if the lobbying would pay off. Bruce Malfait, who handles the drilling program for NSF, says the

new decision to let the Soviets join has been subjected to months of review, and he doesn't expect any last-minute surprises.

The Soviet Union has still not informed NSF whether it will accept ODP membership. Full members pay \$2.75 million per year to support the program, and in exchange get to send two scientists aboard the drilling ship *JOIDES Resolution*.

The Economic Toll of Mental Problems

The annual costs to U.S. society of mental illness and substance abuse reached \$273.3 billion in 1988, according to the latest government estimates.* To be more specific, that's \$129.3 billion for mental illness, \$85.8 billion for alcohol abuse, and \$58.3 billion for drug abuse.

These figures are extrapolated from statistics collected in 1985, the most recent year for which reliable data are available, using inflation and other factors. In addition to costs of treatment (24% of the total), they include those related to lost productivity, law enforcement, crime, traffic accidents, and fires.

But even these numbers almost certainly underestimate the true magnitude of the problem. These are "rock bottom estimates," said Frederick K. Goodwin, administrator of the Alcohol, Drug Abuse, and Mental Health Administration, which released the study on 6 November. The financial impact of the crack epidemic, for example, is not included because it hit after 1985. Furthermore, mental disorders and health effects from addictions are consistently underreported because of insurance problems and the stigma associated with these conditions.

*Economic Costs of Alcohol and Drug Abuse and Mental Illness: 1985, National Clearinghouse for Alcohol and Drug Information, Box 2345, Rockville, MD 20852.

The Ethics of AIDS Care

A poll of 317 physicians shows that "doctors are far less certain about the nature of [AIDS] and the threat it poses than are other segments of our population," reports the November issue of *MD* magazine. The poll found that 64% of respondents now have AIDS patients, but many doctors don't feel they know enough about the disease. Nonetheless, 58% think the danger of AIDS infection to physicians has been understated. There is also considerable division of opinion and uncertainty regarding ethical and privacy issues.

Do physicians have a duty to treat AIDS patients?

Have you been provided with sufficient information from professional and public health organizations to permit optimal treatment of AIDS?

Should we institute quarantine measures for HIV-positive patients in general?

Especially for sociopathic drug abusers?

If HIV-positive patients are unwilling to inform their sex partners, do physicians have any further obligation in the matter?

Does the government?

