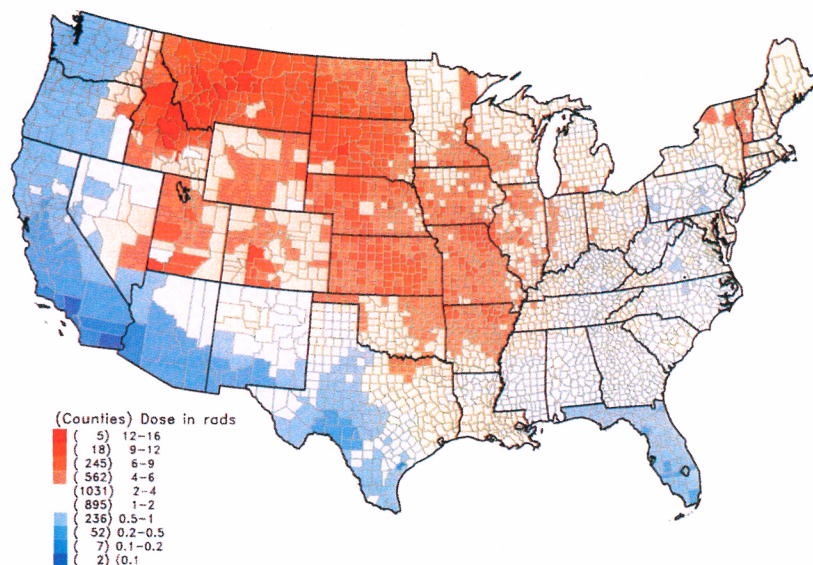




EXPOSURES TO I-131 FALLOUT: Map shows per capita doses received from atmospheric nuclear tests in 1950s and 1960s that may contribute to thyroid cancer.

est. Those most at risk were children then under the age of five who drank milk contaminated by I-131, since cows and goats concentrate the radionuclide in their milk.

The fallout may be responsible for 10 000 to 75 000 thyroid cancers in the US population, because I-131 accumulates in the human thyroid gland. The reason for the wide band of uncertainty is because 70% of those cancers have not yet been diagnosed, NCI scientists believe. Of greatest concern are those youngsters who were most exposed for about two months following each of a total of 90 atmospheric tests conducted until the Test Ban Treaty was signed in 1963.

"There were few, if any, Americans in the contiguous 48 states at the time who were not exposed to some level of fallout," said Richard D. Klausner, director of the NCI, in a conference call with reporters. But Klausner and Bruce Wachholz, of the institute's radiation effects branch, emphasized that both the extent of exposure for any individual and the relationship between exposure and cancer rates were uncertain. While everyone in the country during the period of the atmospheric tests was exposed to I-131 at some level, the average cumulative dose was small—about 2 rads. By comparison, a routine diagnostic scan of the thyroid in a child during the 1950s would give 200 to 300 rads to the gland. Today, a thyroid scan would give about 0.4 to 4 rads in the thyroid, depending on the radionuclide used.

Doses of I-131 varied widely according to the geographical area (see map). In general, people living in Western states and to the north and east of the

test site experienced higher doses than those living in West Coast, Southern and Eastern states. In the 24 counties with the highest exposures, NCI estimates that the average cumulative doses ranged from 9 to 16 rads.

Those children most at risk would now be in their 30s and 40s. If the doses were going to cause thyroid cancer, it's still chancy whether the cancer would have appeared by now. By current cancer rates, about 420 000 thyroid cancers would be expected in a population at the time of about 160 million. "We do not know what risk, if any, those individuals have had and whether the risk they may have had would have already manifested itself," said Klausner.

The link between radiation and thyroid cancer is widely debated, but some experts believe that the cumulative releases of I-131 from the 90 above-ground tests could amount to about ten times the amount spewed by the Chernobyl nuclear power plant accident in

1986, when tens of thousands of children were exposed to radiation doses to the thyroid. Klausner announced that NCI investigators are collaborating with scientists in Belarus and Ukraine to study the incidence of thyroid cancer among individuals in those countries who were exposed to fallout from Chernobyl.

Klausner urged caution in rushing to judgment on the skimpy data released so far for the US population, particularly because the study does not directly address the question of cancer risk from the fallout. He said NCI had enlisted leading radiation experts in the US to "fully evaluate the risk and develop an appropriate public health response." Meanwhile, the Institute of Medicine, a branch of the National Academy of Sciences, has been asked to review the data in assessing whether risks can be determined and to recommend to physicians how to identify, evaluate and treat individuals who might be considered at risk.

The NCI study was ordered by Congress in 1982, and Klausner spent much of the one-hour teleconference explaining why it had taken so long to produce. Even so, the NCI released a scant summary of the 100 000-page report only after watchdog groups charged that the findings were being covered up. The groups urged those who lived in high-exposure areas to be checked by a physician. Thyroid cancer is highly treatable if detected early.

The institute had preferred not to release anything before the end of September, said Klausner, when it intended to submit the entire report to Congress, but it was goaded when portions of the findings were leaked to the press in July.

The report will be posted on the NCI's World Wide Web site in September. For now, a color-coded map detailing the county-by-county exposure estimates is available on-line (<http://rex.nci.nih.gov>).

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Garwin Uses Fermi Prize Event to Recommend Decisive Actions

When his time came to accept the Enrico Fermi Award from the Department of Energy (DOE) at a ceremony in the State Department's rococo dining room on 24 July, Richard Garwin had a startling statement. "I'm going to take advantage of this illustrious audience to seize some opportunities we have in this post-cold war era," said Garwin, fellow emeritus of IBM's Thomas J. Watson Research

Center and now adjunct professor at Columbia University and consultant to Sandia National Laboratories.

The first of these, he said, is to "move without delay" to dispose of surplus plutonium. Last December, Hazel O'Leary, the outgoing energy secretary, announced that DOE intends to pursue two technologies for disposing of plutonium taken from dismantled nuclear weapons (PHYSICS TODAY, February,

► **Profit in Traffic Jams** In 1993, the phrase that seemed to describe the impending digital revolution in communications was Vice President Al Gore's "information superhighway." Licensed to drive on electronic roadways are now being granted in record numbers. All anyone needs to enter the traffic jams on the Internet is a personal computer, network software, phone line, modem and a "domain name," which is akin to a postal address or a phone number. The National Science Foundation (NSF) developed the Internet from DarpaNet, devised from packet-switching developments in the early 1970s by the Defense Advanced Research Projects Agency to link military computers. A decade later, NSF upgraded DarpaNet to connect scientists at universities with each other and with supercomputers.

At first, NSF registered the domain name addresses. But by 1993, with the number of domain names at 4000 and new registrations coming in at about 200 each month, NSF sought help. After a peer-reviewed competition among large and small firms, NSF selected a new company, Network Solutions, in nearby Herndon, Virginia, for a five-year run. The agreement between NSF and Network Solutions stipulated that 30% of the \$50 registration fee would be deposited in a special fund for the foundation to use for "the preservation and enhancement of the 'intellectual infrastructure' of the Internet."

Now that some 1.2 million names bearing suffixes "com", "net", "org", "edu" and "gov" have been registered by Network Solutions since 1993, nearly \$30 million has accumulated in the fund, Philip Sunshine, NSF's deputy inspector general told the Senate Committee on Commerce, Science and Transportation on 24 July. According to Sunshine, the fund is increasing at \$2.7 million per month, and is likely to contain more than \$60 million when the agreement expires in September 1998. "Not surprisingly," he said, "a pool of money in this amount has engaged our attention—especially because there appears to be no clear consensus in the foundation or within the scientific community about how best to expend these substantial funds."

Sunshine said the agency's office of inspector general has recommended that NSF call for proposals for scientific projects to advance R&D on the Internet. But NSF hasn't decided what to do with the return on its investment. In response to a question from Senator John McCain, the Arizona Republican who heads the Commerce Committee, Sunshine said the agency has spent more than \$300 million since 1990 to support development of the Internet, access to it and basic research in computer networking.

► **Two Awards and a Tribute** At its annual meeting on 7 October, the National Academy of Engineering (NAE) will present its Founders Award posthumously to Mario G. Salvadori and its Arthur M. Bueche Prize to Erich Bloch. Salvadori, who died on 25 June, shortly after the awards were announced, was honorary chairman of Weidlinger Associates, an engineering consulting firm, and founder of the Salvadori Educational Center on the Built Environment in New York City. His citation reads "for leadership in the design of complex structures, the education of several generations of structural engineers and the introduction of our younger generation to science and mathematics." In an article published in the NAE's quarterly *The Bridge*, Salvadori tells how he broke with the family tradition of studying engineering to pursue mathematics at the University of Rome, where he found he could attend courses in physics conducted by a young Enrico Fermi.

Thus, wrote Salvadori, he was "painlessly introduced to the mysteries of quantum mechanics, relativity theory and

the other revolutionary ideas about the physical world that changed the way we look at it." In those classes, he noted, "I discovered . . . how to coax unwilling students (of the kind I myself had been) into a fascination with a new subject and, thus, [in teaching at the university] to excite their will to learn." Salvadori foresook the German pedagogical methods favored by most professors. "I would have my students look first at problems from the physical, intuitive point of view, after which I would show them how simple the mathematical solution was when dictated by a clear understanding of the physical problem. (Who could have predicted then that 60 years later I would adopt the same approach in dealing with students in the elementary and junior high schools of New York City?)"

He left Italy, he wrote, "rather than fight in World War II on the side of the Nazi-Fascists," and came to the US in January 1941 to teach at Columbia University "by the unexpected and never admitted help of my mentor and by then good friend, Enrico Fermi," who was teaching there at the time.

The Bueche Award, created in 1982 in honor of a former senior vice president of corporate technology at General Electric, will go to Bloch, a former vice president of IBM and one-time director of the National Science Foundation, "for his path-finding leadership in the computer industry, for distinguished and bold leadership on national science and technology policy, and for stimulating industry-government-academic cooperation." Bloch is now distinguished fellow of the Council on Competitiveness in Washington, DC.

► **Virtually OTA** When Republicans took over the House of Representatives in 1995 for the first time in 40 years, one of their first acts was to abolish the Office of Technology Assessment (OTA), Congress's own uniquely nonpartisan think tank (PHYSICS TODAY, October 1995, page 53). In the 23 years of OTA's existence, its staff had provided lawmakers with 735 timely and readable reports on scientific and technical issues ranging from fusion energy to the global securities market. Its demise was attributed at the time to the need by newly elected members to demonstrate to voters that Congress was willing and able to downsize its own operations.

Since then, OTA's staff (including eight PhD physicists) have scattered about Washington and elsewhere, and its director, John Gibbons (another PhD physicist) has taken charge of the White House Office of Science and Technology Policy. But some lawmakers miss the advice they got from OTA. So, on 16 July, two senators, Robert F. Bennett, the Utah Republican who chairs the appropriations subcommittee on the legislative branch, and Jeff Bingaman, a Democrat of New Mexico, submitted an amendment to Congress's spending bill for fiscal 1998. The amendment would set aside \$500 000 for a pilot program of scientific and technical studies related to legislative issues. As Bingaman explained it on the Senate floor, the amendment uses the same legislative authorities, on which OTA was established, to conduct the studies.

Still on the books, said Bingaman, is the authority for a bipartisan Technology Assessment Board consisting of six members from the House and six from the Senate, who would decide on the topics for studies. The studies would not be done by reinventing OTA but by existing scientific, technological or academic institutions that the board would choose to do the work. "Think of it as a 'virtual OTA' or, if you prefer, an 'outsourced' OTA," said Bingaman. The amendment passed by voice vote, as did the Senate bill for funding Congress next year. The bill now awaits a House-Senate conference in September and will then come before each chamber for final action.

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page 53). Garwin deplores DOE's lack of action. "We need to do something about this," he said, "and it's time" to take the "two-track" approach O'Leary spoke about: vitrifying plutonium, uranium and other radioactive waste into glass or ceramic blocks for eventual burial, and processing plutonium oxide to create a mixture known as MOX, which would then be used as fuel in commercial power reactors. Russian officials have said they are not disposed to take either route until the US sets out. If the US doesn't take any action, Garwin observed, the danger exists that "Russian plutonium will end up in nuclear weapons in the hands of terrorists or of nations thirsting for such weapons."

Garwin's second recommendation dealt with tritium, which is necessary to ensure that thermonuclear weapons are in a state of readiness. DOE has been mulling over whether to build a proton accelerator to produce tritium or generate tritium in a commercial light-water reactor. While there is no rush to reach a decision—DOE has enough tritium for weapons until about 2010—Garwin suggests the reactor approach would be cheaper and quicker than constructing an accelerator. "But there's another way, an even cheaper way, and that is to buy it from the Russians, who, I'm told, would be willing suppliers," he declared. "National security will not be impaired. And we can buy it five years before it's needed, and if the supply is cut off, there is time to begin domestic production" from a reactor.

At a reception after the ceremony, Garwin said Russian officials had informed him that tritium produced at

their Mayak complex would be priced at about \$20 000 per gram "or much less." He estimated that tritium from a US reactor, by contrast, would run in a range of \$300 000 to \$900 000 per gram.

Garwin is one of five US members of an independent scientific commission created by Presidents Clinton and Yeltsin to advise them on issues arising from the Comprehensive Test Ban Treaty, START-I and other arms-control treaties their governments have signed. In that capacity, Garwin meets with Russian scientists and officials to discuss problems and progress in meeting the goals of each treaty.

In remarks from the podium, with Energy Secretary Federico Peña standing beside him, Garwin said DOE seemed to have two choices for each of the two opportunities he had cited. "Sometimes it seems to me the Department of Energy can't make up its mind," he said. Garwin grinned. Peña grimaced.

Garwin's third recommendation was that the US pay Russia up front to dilute 500 tons of highly enriched uranium, "enough to make about 20 000 nuclear weapons," so that the material is rendered useless for weapons as rapidly as possible. Russia has agreed to sell at least 500 tons to the US in the next 20 years. "As long as the uranium stays [in Russia] in its highly enriched form, it is a tempting target" for diversion or theft.

If all three of his proposals were adopted soon, Garwin told the audience, "I think Enrico Fermi, my mentor and friend of 50 years ago, would say we are doing well and he would smile upon us."

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provides him with a strong background for delivering balanced views to Peña, who has little experience in science and technology issues.

As under secretary of DOE, which one of his predecessors used to call "the department of physics," Moniz will be responsible for the department's research programs in science and technology, environmental matters and defense work, including nuclear weapons stockpile stewardship.

On 6 August Clinton nominated **Michael L. Telson**, currently the special assistant to DOE's deputy secretary, to serve as the department's chief financial officer, a position reporting directly to Peña. The chief financial officer oversees all financial management activities connected with programs and operations, including preparation of DOE's annual budget, and maintains an integrated accounting and financial management system for the department.

Telson, who earned all his academic degrees at MIT, including a PhD in electrical engineering and an MS in industrial management from the Sloan School of Management, was staff economist to the House ad hoc Committee on Energy in the 1970s and staff coordinator for former House Speaker Tip O'Neill's House Task Force on Energy. Telson then served nearly 20 years as senior analyst for energy, science and space programs in the House Budget Committee, most recently as a key aide to its chairman, Leon Panetta, who later became Clinton's chief of staff.

Like Moniz, Telson requires Senate confirmation for the post. Also like Moniz, Telson is respected in Washington science policy circles.

Robert A. Eisenstein, director of the physics division at the National Science Foundation (NSF) since 1992, was appointed assistant director of the agency's mathematical and physical sciences directorate effective 8 September. As chief of NSF's physics division, Eisenstein managed such large-scale projects as the Laser Interferometer Gravity Wave Observatory and established novel programs in biophysics and complex phenomena. His selection came after an extensive search that took almost a year since the resignation of **William C. Harris**, who left to become executive director and president of the Biosphere 2 Center near Tucson, Arizona.

Eisenstein, who has a PhD from Yale University, was a physics professor at Carnegie Mellon University before joining the University of Illinois, where he was a professor of physics and director of the Nuclear Physics Laboratory.

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Washington Ins & Outs

Key Posts Filled at DOE and NSF

On 31 July, just hours before Congress began its traditional August recess, President Clinton announced his intention to nominate **Ernest J. Moniz** as Under Secretary of the Department of Energy (DOE), the number three job at the agency. Moniz currently heads the physics department at MIT. He returned to his post at MIT in January after serving for two years with the White House Office of Science and Technology Policy (OSTP), where he was associate director for science. Prior to joining OSTP, he had been head of MIT's physics department from 1991 to 1994 and director of the university's Bates Linear Accelerator Center from 1983 to 1991.

In his search for a chief scientific

adviser, Energy Secretary Federico Peña had learned about Moniz from scientists at the department as well as from Vice President Al Gore and OSTP Director John Gibbons. While Moniz was awaiting Senate confirmation for the OSTP job in 1994, he was the principal author of "Science in the National Interest," the Clinton Administration's first major foray into science policy. He also was the mastermind behind a scientific facilities initiative that Congress approved last year to fund academic users of DOE laboratory machines, such as synchrotrons and neutron sources. His service on panels assembled by DOE, the National Science Foundation and the National Academy of Sciences to examine science facilities