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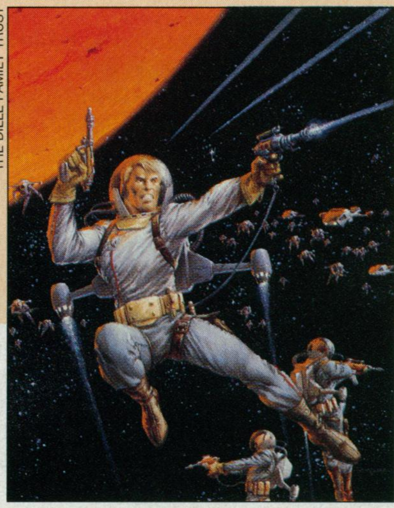
LETTERS



THE DILLE FAMILY TRUST

Retro Ray Guns?

Buck Rogers (left) move over! Letter writer William E. Parkins sees a contemporary counterpart in Department of Energy Secretary Hazel O'Leary's decisions to fund a laser at Lawrence Livermore National Laboratory and a proton accelerator at Los Alamos National Laboratory. Discussions of genetic discrimination and e-mail privacy continue in other letters.

Megabucks for Megajoules?

It is almost dazzling to see U.S. Secretary of Energy Hazel O'Leary in the role of a female Buck Rogers appealing to cheering crowds with her offers of hundreds of millions of dollars to build gargantuan ray guns. She was hailed at the Lawrence Livermore National Laboratory in California when she ensured its future with a promise to fund the National Ignition Facility (NIF), a proposed 1.8-megajoule laser (Andrew Lawler, "O'Leary ignites debate on laser lab," News & Comment, 28 Oct. 1994, p. 538). And now she has tossed an equivalent political bone to hungry mouths at the Los Alamos National Laboratory in New Mexico with promises to fund a 130-megawatt proton accelerator (James Glanz, "Los Alamos wins one in tritium race," News & Comment, 13 Oct., p. 227).

What is the primary purpose of these facilities? What is the history of these technologies?

Consider first the NIF. It is intended to be a next step in the quest for a power-producing fusion reactor based on the inertial confinement principle. Land-based controlled fusion has been pursued for more than 50 years. There have been many heroic experiments using both magnetic and inertial confinement. After many billions of dollars, neither approach has even achieved the physics "break-even" condition. And should that goal ever be reached, it would not lead to a power-producing fusion reactor plant because of engineering realities (*1*). Consider, in contrast, that less than 5 years after the discovery of fission, fission reactor production plants of hundreds of megawatts were operating that could have been converted to power generation. While allowing fission reactor design to be surprisingly straightforward, nature has stacked insurmountable technical difficulties in the path of any future fusion-type power plant.

Next, consider the high-power proton linear accelerator proposed for Los Alamos. Its primary purpose would be to generate spallation neutrons in a heavy metal target, these neutrons to be suitably slowed and absorbed to produce tritium for thermonuclear weapons. Here again the concept is about 50 years old. When the hydrogen bomb development was undertaken shortly after World War II, there were two proposed approaches to generate neutrons for tritium production. One was the nuclear fission reactor and the other a high-power accelerator releasing neutrons in a heavy metal target. This latter approach was promoted by the greatest "high energy" salesman of the day, Ernest O. Lawrence. Never one to think small, Lawrence envisaged a proton linear accelerator with energy of 300 million electron volts and a beam current of 1 ampere. This was the MTA Mark II. MTA stood for Materials Testing Accelerator, a "cover-up" name for the secret project. While the Mark II was never built, a lower energy, high-current first section of the proton linear accelerator, the Mark I, was built and operated at Livermore; the project was the seed that spawned what became the Lawrence Livermore National Laboratory.

A sensible decision was made by the newly formed U.S. Atomic Energy Commission to terminate the MTA project and to proceed with construction of the heavy-water-type production reactors at Savannah River, South Carolina. There were two principal reasons for this decision. Lawrence's far-fetched scheme confronted too many technical difficulties compared with the nuclear reactor approach. And the cost per neutron produced would have been much higher using an accelerator. Consider the irony of building a nuclear reactor plant to power an accelerator, when a reactor could do the whole job without the accelerator facility ever being built!

In summary, not only is history repeating itself—nothing seems to have been learned. The fusion power plant is a dead-end today, just as it has been every decade for the last five. Accelerator production of neutrons for tritium breeding is a much inferior approach compared with the use of fission reactors. That is true today just as it was 50 years ago.

These projects are ill-advised. The country would be better served by redirecting the large required budgets to other scientific enterprises.

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References

1. W. E. Parkins, *Science* **199**, 1403 (1978).

Genetic Discrimination

One can be doubtful about the long-term efficiency of the recommendations from the U.S. National Institutes of Health–Department of Energy's Working Group on Ethical, Legal, and Social Implications of the Human Genome Project and the National Action Plan on Breast Cancer to protect against genetic discrimination in health insurance (K. L. Hudson *et al.*, Policy Forum, 20 Oct., p. 391). These recommendations aim at negative discrimination, but overlook positive discrimination, that is, the possibility to discriminate in favor of "good" risks that "deserve" lower rates. Such a possibility is remote today, as genetic research priorities are to identify diseases; but in a not-too-distant future, as knowledge of the human genome advances, science should be able to distinguish genetic features that decrease, as well as increase, individuals' health risks. When this happens, today's trend will be reversed, as it will be the consumers who have a "good" genome who will insist on showing it to their insurer to get a better rate.

The law could explicitly forbid positive as well as negative discrimination, or prevent any disclosure of genetic information to insurers, even by the concerned individual. But that would not work either: To respond to new market demand, insurers would design new products with limited coverage and lower rates that would be the preferred choice of customers who know they have a genetically low risk, whereas people who know they have a higher risk would be inclined toward more extensive coverage with higher rates.

Genetic research has revealed a new inequality that was heretofore hidden by a veil of ignorance. Addressing it will not be easy. Politicians in all countries will need to be imaginative to devise a new solidarity among their fellow citizens, a solidarity that will no longer be based on ignorance, but on the new genetic knowledge science has discovered.

Maybe genetic research, after causing such serious ethical problems to health insurance, will help resolve its economic problems by advancing predictive and preventive medicine.

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Barbara R. Jasny is right in her editorial of 20 October (p. 359) to suggest that "as-