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In Memoriam

LARRY LIDSKY

Larry Lidsky died of cancer on March 1, 2002; he was 66 years old. From 1962 when he received his Ph.D. from MIT until shortly before his death, Larry was on the faculty of the MIT Department of Nuclear Engineering. Both his doctorate thesis and his research and teaching over the next 20 years focused on nuclear fusion, a field in which he made several important contributions. However, during this time he became increasingly skeptical about the practicality of fusion as a commercial energy source, and, to the consternation of many of his fusion colleagues, he went public with his misgivings in an article, "The Trouble with Fusion," published in 1983. Larry later became a strong advocate of the Modular High Temperature Gas Reactor (MHTGR), arguing that, in a world with many energy options, nuclear power would only be acceptable to the public if reactors could be designed and demonstrated to be invulnerable to a core meltdown following a loss of coolant accident—the case with the MHTGR. At the time, this reactor concept engendered little enthusiasm in the nuclear community, but more recently it has been taken up by many others who view demonstrable reactor safety as a necessary if not sufficient condition for a large global expansion of nuclear power.

Characteristically, Larry had by then moved on to other things, for example, the development of photonuclear processes for the production of medically important radioisotopes and a broader interest in the energy problem, including the connection between nuclear power and nuclear weapons. Although Larry and I had interacted on several projects since 1976 when I joined the nuclear engineering department, it was his increased concern about the nuclear power/nuclear proliferation and terrorism linkage that led to our last and most substantive collaboration and the article that follows, prepared as a paper for a meeting in Japan in the summer of 1998. Since then I have had many requests for copies, and it is for this reason as well as a tribute to Larry that I have asked the editor of *Science & Global Security* to publish the paper as originally written.

If I were to rewrite the paper today, the only substantive change I would make is on the prospects for the recovery of uranium from seawater. In recent years, Japanese researchers had done much good work in this area, particularly in the development of an inexpensive, highly selective ion-exchange resin for absorbing uranium from the ocean. However, too little is known today about the recovery of uranium from seawater on a commercial scale to merit much confidence in cost estimates for the process, which over the last decade have ranged from $250–$1,200 per kilogram of recovered uranium. (The current market price is about $25 per kilogram.) On the other hand, predictions of the future terrestrial availability of any mineral, including uranium, based on current costs and prices and current geological data are likely to be extremely conservative. In particular, there is strong evidence for the existence of both very high-grade (e.g., >20% U_3O_8) uranium ores in so-called "unconformity" deposits as well as large amounts of uranium of lower grade. Moreover, experience with the mining of other metals over the past century indicates that innovations in the extraction process can compensate for the need to mine leaner ores so that the real cost of recovered metals is actually lower today than it was a century ago. Thus, I believe that the optimism expressed in the paper about the availability of enough uranium to permit a large expansion of nuclear power using once-through fuel cycles is still justified. (I hope to expand on the subject of uranium resources in a future article for *S&GS*.)

The only other change I would make would be to spell out the grounds for the skepticism expressed about the Integral Fast Reactor (IFR). Proponents of the IFR claim that it is more "proliferation-resistant" than the classical breeder because the recycled fuel is contaminated with rare earth fission products and that the long-term hazard of the waste in geological storage is much smaller than that of spent LWR fuel because of the removal of the actinides. However, the gamma radiation "shield" around the plutonium in IFR fuel is smaller by several orders of magnitude than that of the plutonium in spent LWR fuel, and the long-term hazard of the buried waste is dominated by the groundwater leaching of long-lived soluble fission products such as Tc-99 rather than the highly insoluble actinides. Hence, separation of the actinides is of minimal benefit.

Being intelligent, irreverent, enthusiastic, and thoughtful, Larry was great to work with, and I hope that at least some of these qualities come through in the writing. He was also a charming and caring person who contributed a great deal to the lives of all those who were fortunate to know him. He will be sorely missed.

Marvin M. Miller