References and Notes

1. L. V. Ackerman and J. A. del Regato, *Cancer—Diagnosis, Treatment, and Prognosis* (Mosby, St. Louis, Mo., ed. 1, 1962), p. 821.
2. M. J. Allen, E. Boyland, C. E. Dukes, E. S. Horning, J. G. Watson, *Brit. J. Cancer* **11**, 212 (1957).
3. H. Eisenberg, D. F. Odoardo, T. C. Campbell, *Cancer in Connecticut Mortality Data 1949–1961* (Connecticut State Dept. of Health, Hartford, 1964), p. 68; *1969 Cancer Facts and Figures* (American Cancer Society, New York, 1969).
4. D. R. Stoltz, K. Khera, R. Bendall, S. Gunner, "Cytogenetic studies with cyclamate metabolites," talk given at the Eighth Somatic Cell Genetics Conference, 7 Oct. 1969 at Chatham, Mass.
5. M. V. Barrow, in *Birth Defects Original Article Series 5*, D. Bergsma, Ed. (National Foundation, New York, 1969), pp. 202–206.
6. J. G. Wilson and J. Warkany, *Teratology Principles and Techniques* (Univ. of Chicago Press, Chicago, 1965), p. 35.
7. A. S. Goldman and W. C. Yakovac, *Arch. Environ. Health* **8**, 648 (1964).
8. M. S. Legator, K. A. Palmer, S. Green, K. W. Petersen, *Science* **165**, 1139 (1969).

Reactors and the Public Good

It is dismaying to find that *The Careless Atom,* by Sheldon Novick, was assigned to a book reviewer (1 Aug., p. 483) who admits to "not being an expert in these matters." I find *The Careless Atom* a thinly disguised antireactor tract which seems more intended to alarm than to inform. It contains statements taken out of context, misrepresentations and partial presentations of fact, and depictions of conjectures and events of low probability as seeming imminent disasters.

Novick uses several excerpts from hypothetical studies of reactor accidents to support his allegation that the potential consequences of a reactor malfunction are unacceptably great. . . . One finds in the book no accompanying indication of the assumed succession of human, mechanical, and structural failures on which these postulated incidents are based, and hence of their extremely small probability. He states that the dozen atomic power plants which were to be built by the utilities alone or in cooperation with the Atomic Energy Commission "ran into trouble from the outset. . . ." The Fermi and the Hallam plants, both novel types (which have presented economic problems to their backers but no radiation hazard to the public), are cited. From reading *The Careless Atom* one would not know of Yankee, Indian Point I, or Shippingport, not to mention the total of about 100 other reactors in the United States, that operate routinely and dependably.

Besides offering a one-sided picture of the safety and reliability of nuclear reactors, Novick has made a sensational rather than a factual presentation to suggest that the current radiation protection standards for the routine discharge of low-level radioactivity from nuclear facilities are inadequate to protect man and the environment from present serious risk and future calamity. He describes radiation effects quite graphically, but without relating them to dose or dose-rate. Thus he gives his lay readers no quantitative basis for assessing the degree of the risk involved. Although the releases of radioactivity during past years to White Oak Lake and to the Columbia River, which Novick uses as examples, were considerably in excess of the amounts from modern reactor power and fuel reprocessing facilities, neither has constituted a demonstrated radiation safety hazard to even the immediate populations. With regard to current releases Novick asserts that "reactors will continue to function just within AEC limits." This is contradicted by Bloemke and Harrington (AEC Report ORNL-4070), from which I conclude that most reactors function at less than 1 percent of these release limits.

Novick attacks the basis of public radiation protection standards which are set in comparison to background and at which no measurable damage is anticipated. He says, "It is past time that we realized that in radiation 'no measurable damage' eventually means 'not quite fatal' for everyone." This is a large assertion which indicates either Novick's bias or his ignorance of the painstaking search of the considerable available data on radiation effects made by such bodies as the International Commission on Radiation Protection, of the careful interpretation made by them in recommending radiation protection standards, and of the conservative practices of health physicists in their application.

In my view, to live in the health and well-being made generally possible by a technologically developed society is also to live at risk from a host of potentially deleterious agents. Before getting upset about the possible risk from the operation of nuclear reactors and associated activities, a reasonable person, it seems to me, would want to arrive at the best possible quantitative judgment of how this compares with other accepted risks. I believe that anyone who does not have an a priori conviction otherwise will find it small.

This is not to suggest that there are no disagreements about safety within

the nuclear industry and among health physicists and others responsible for radiation protection. But it is to suggest that those looking for a balanced presentation of the benefits and risks of nuclear energy should look elsewhere than *The Careless Atom* and other more recent publications.

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. . . Novick's probing is trivial compared to the grilling the electric utility and nuclear manufacturers get from the AEC and the Advisory Committee on Reactor Safety. If Novick wants to be a Nader, he ought to take on some real opposition. The nuclear industry is having a rough time trying to displace the stacks of the coal-burners that spew smoke, sulfur dioxide, radon, and about one-fourth of a plant's waste heat into our air. Novick should try fighting the coal lobby or even the bureaucracy of the AEC itself, which is bending over backward to assure nuclear safety for the public, and has reduced the pace of long-term development of nuclear power to a crawl.

The needs of the world for energy are real. The finiteness of our fossil fuel reserve is real. The desire to harness the atom to provide safe, clean, and plentiful power is real, and so are the efforts of dedicated men to achieve these goals. The public good is not well served by scare journalism.

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Moon, Mars, and Money

Carter's rundown on NASA plans (5 Sept., p. 987) prompts me to recall Geographer George Sauer's comment as chairman of the international symposium in the 1950's on Man's Role in Changing the Face of the Earth. "We are now come," he said, at the end of that week, "to a revised version of Aldous Huxley's 'brave new world' of the '20's—to a faceless, mindless, countless multitude managed from the cradle to the grave by a brilliant elite of madmen intent on technological progress."

Paine knows full well that there is a great deal more to be done, of vital urgency, than "to fill 200 million alimentary canals every day." For one thing, there is the problem of emptying those canals! What an assault could be made on our environmental problems —physical, cultural, and economic—if the same quantities of money and brainpower and industrial facilities that go into the space program were to be applied in those fields.

"By the end of the century," says Paine, "if you haven't been to the moon, you're not going to be with it." Give NASA until 1975 (?) to create a vehicle capable of hauling 100 persons and necessary equipment to the moon. Then, a trip a day until the turn of the century would carry only 900,000 of us to the moon—only .045 of 1 percent of our present 200 million could be "with it"—about as many, perhaps, as would make use of the controversial supersonic jets with their prodigious and intolerable sound problems.

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Amchitka: Waves of Opinion

Carter's technique in his article on large-yield explosions on Amchitka (22 Aug., p. 773) is to quote the opinions of "authorities." Though factual in the sense of offering valid quotes, this approach does not truly provide the reader with a basis for drawing his own conclusions. Carter further fails the scientific community by (i) quoting only seismologists who feel some degree of alarm (he could have quoted others of equal scientific renown who would have said there was no danger from large tests on Amchitka), and (ii) quoting the opinions of other scientists who have no basis for forming definitive opinions on the subject, or who are allowing their scientific opinions to be dictated by their political beliefs.

Much scientific information is available on the matter and could have been presented by Carter if he had attended the meetings of the American Geophysical Union or if he had sought the data. The possibility of venting is to be argued only by inspection of the venting history at the Nevada Test Site and Amchitka, that history being available. The possibility that large shots on Amchitka would cause tsunamis should be evaluated in terms of the relation between large shots, observed patterns of seismic radiation from such explosions, observed aftershock activ-