Letters

Man on Mars: A Turnabout

In his article commenting on the lack of direction in the U.S. space program, Colin Norman (News & Comment, 28 Aug., p. 965) makes the point that the Planetary Society is now leading the charge for a manned mission to Mars. To those who know the officers of the society (Carl Sagan, Bruce Murray, and Louis Friedman) and who, like them, have spent years in unmanned planetary science, it comes as no small surprise to learn that they are now calling for manned exploration of Mars. The reason for this sudden turnabout can be found in their May 1987 statement to the Senate Appropriations Committee (*1*). Here, the three authors give it as their view that the manned exploration of Mars is an "optimal goal" that will restore life to NASA. Unfortunately, they are silent about recent history which demonstrates that, for NASA, manned spaceflight and planetary science are opposed goals. A large manned program—and this one would be very large indeed—practically guarantees that science will be un- or underfunded for the indefinite future.

Among scientific objectives for men on Mars, the authors list the search for life; later they warn that samples returned to Earth must be quarantined in earth orbit. Apparently, we are being told that there may be life on Mars and that it may be dangerous. One might never think that there was once a Viking mission to Mars. Again, this proposal ignores history in favor of a dreamworld.

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Chernobyl Public Health Effects

Any reasonable person must take strong exception to a comment in Richard Wilson's article, "A visit to Chernobyl" (26 June, p. 1636). Wilson states: "If . . . the average public health is the sole objective, and a Chernobyl accident happens less than once a year, the RBMK reactors in the Soviet Union can be considered less hazardous than coal-fired power plants of similar size."

While Wilson himself objects to this "too narrow an application of risk-benefit analysis," he does not broaden the risk analysis terms of reference by very much. His discussion of public health risks is limited to cancer morbidity and mortality due to internal and external radiation exposure resulting from "a Chernobyl accident."

A reasonable risk analysis should include a number of public health factors besides the direct effects of radiation. A nonexhaustive list of such public health factors includes

- evacuation-caused illness and death;
- evacuation-caused disruption of public health norms (for example, poor sanitation, poor hygiene, and restricted health care access);
- disaster "trauma" and related mental health effects (*1*);
- resettlement effects on public health; and
- public health effects, direct and indirect, of postdisaster changes (for example, new drinking water sources and restricted zones of travel).

A number of these selected factors are mentioned by Wilson, but not in the context of public health. Rather, he presents some of these factors as problems only in the context of postaccident radiation exposure.

Clearly, if the group of RBMK reactors suffered "a Chernobyl accident" every 2 years (which is "less than once a year") the "average public health" effects of such an accident would soon be seen for what they are: catastrophic and certainly far greater by several orders of magnitude than the average public health hazards posed by "coal-fired plants of similar size."

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Response: Lawless questions whether I correctly compared all the possible effects on public health of coal burning and nuclear power accidents. Coal burning can, and has, killed people. The question is, How many people does it kill now? It is important to consider the whole fuel cycle, from mining to final disposition of the waste. In most cases there are historical data. The best summary is probably in the report of a French conference on the comparison of health risks from different energy sources (*1*), at which Italians, French, and Americans—from their varied perspectives—agreed.

It must be remembered that for a given amount of energy we must burn 3 million times as much coal as uranium-235. Of course, uranium ore contains only 0.1% to 1% uranium and a little less than 1% uranium-235, while 50% of the coal that is mined can be burned. Nonetheless, we must still mine, purify, and transport at least 100 times as much material to get electricity from coal as from uranium. It is this factor of 100 that makes nuclear power more benign, both from an environmental and from a public health point of view, than burning coal.

The death toll starts in the mines. Although coal mines are improving, more than 100 people still die in coal mining accidents in the United States each year. Black lung disease is still a cause of suffering and death that is numerically more important than the uranium-mining cancers. In 1975, 30% of rail transport was moving coal, and 30% (or 570) of the 1900 persons killed in railroad accidents that year can be attributed to moving coal.

Air pollution from coal burning has been a problem since Edward I of England banned the use of coal in the kilns of Southwark in 1307. But air pollution "incidents" have been diligently recorded only in the 20th century. At Donora, Pennsylvania, in 1948, 20 people were killed and half the population got sick; in London, in December 1952, the weekly death rate rose from an average of 1800 individuals to nearly 5000; 4500 deaths were attributable to the dense fog that had settled on the Thames Valley. These numbers are generally accepted, but average air pollution concentrations today are 50 to 100 times less than the peak concentrations of these short incidents. How to extrapolate to low concentrations remains a matter of controversy.

In 1970, Lave and Seskin (*2*) found a correlation between U.S. mortality rates and air pollution variables. Despite the implication that air pollution, at present levels, has been widely questioned, this correlation refuses to go away. Data up until 1981 were reviewed by Wilson *et al.* (*3*), and correlations using 1980 mortality data have recently been found by Ozkanyuk *et al.* (*4*). Taken together, these suggest that 50,000 among the 2 million persons who die each year in the United States may have their lives shortened by air pollution. Some would state a number ten times lower, at present air pollution levels, but it would be a bold optimist who would set it at zero.

Problems with coal waste, a million times as voluminous as high-level radioactive waste and not handled carefully by society, are harder to document. One notes, however, that 137 children died when a coal tip slid into their school at Aberfan, North Wales.

These are all statistics from the Western world. The Russians do not keep good records on accidents, but quote ours (*5*).