

creased 10-fold over a decade, and the credibility of the governmental regulatory agencies has declined. He says the latest study of nuclear energy conducted by the American Physical Society (SN: 5/3/75, p. 286) shows that a serious accident involving thousands of deaths is expected to occur every couple of decades.

Not so, counters Lapp; Ford is mistaking probabilities for major and minor accidents, and the APS study actually predicts less than one death a year from nuclear accidents. As for the economic arguments, Lapp cites an Arthur D. Little study showing nuclear costs—including building the expensive plants—to be about half those of conventionally powered electric generation. In just the next five years, he concludes, the United States will save \$13.7 billion because of the reactors already on line.

Several times Laird turns, after one of these acrimonious confrontations, to Moss, whom he met years ago as a White

House Fellow. Yes, nuclear energy does have unresolved safety problems, Moss says, but so does coal. The current economic problems of reactors have mainly to do with the recession and a reassessment by the utilities of future growth, he continues. Since adequate energy conservation will not likely follow from altruism, new policies must "make sure that the user of energy pays the full cost of the energy he uses." Specifically, Moss recommends repealing the Price-Anderson Act that limits private liability in event of nuclear accidents, and also favors levying emission charges for users of coal and holding coal mining companies responsible for the \$1 billion a year paid to victims of black lung disease.

The purpose of the program is to open the nuclear debate to a wide audience, freeing it from the specialists who have been the most vocal so far. "What is the comparison of risks?" asks Hosmer—but no consensus is reached. □

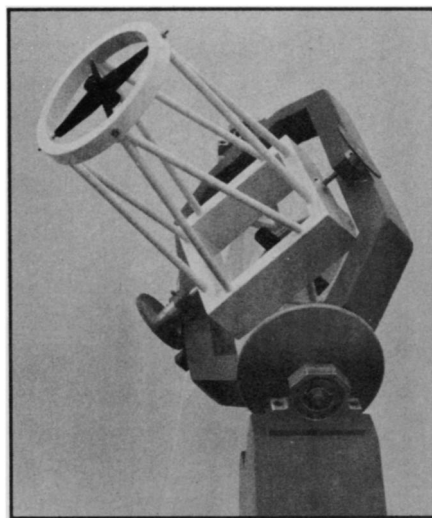
Wyoming site for 84-inch IR telescope

Infrared is a range of the electromagnetic spectrum little used by astronomers until very recently. Water vapor in the atmosphere absorbs infrared very heavily so most of the early work was done from balloons and rockets. But if you get to high enough elevation, the atmosphere gets thinner, and now with highly sensitive equipment it is becoming practical to do ground-based work. (An example is reported on p. 332.) That's where Wyoming comes in.

Wyoming: the bucking horse on the automobile tags, the Union Pacific chugging up Sherman Hill, the wide open spaces where the deer and the antelope—and very few people—play. And some very tall mountains.

"Laramie is a nice place to live," says Robert Gehrz of the University of Wyoming. "Right in the middle of the mountains." In those mountains an infrared telescope will be built that with a reflecting surface 84 inches in diameter will be the largest in the continental United States. The only larger one in the country is a 120-inch installation being built on Mauna Kea in Hawaii. The Hawaiian telescope is especially designed for planetary studies so the Wyoming instrument will be the largest in the country for stellar and galactic infrared observations.

The new telescope will be a national facility administered by the University of Wyoming. Funding, in the amount of \$1.6 million, will be by the National Science Foundation and the State of Wyoming. It is rather unusual for a state to contribute to such a fund except through the budgets of universities, and in this case the state's contribution will be the larger share: \$975,000 or almost three dollars per inhabitant. The state and other users will bear the operating costs.



Planned infrared telescope in $\frac{1}{24}$ scale.

Final choice of a site is expected soon. Two are in the running: Little Brooklyn Lake in the Snowy Range about 35 miles west of Laramie, elevation about 10,400 feet, and Jelm Mountain, 35 miles southwest of Laramie, elevation about 9,656 feet. In either case, as E. Gerald Meyer, vice president for research at the University points out, the high altitude, low temperatures and pollution-free sky produce the extremely dry atmospheric conditions that will enable observations in several infrared windows inaccessible from most existing observatory sites.

Construction is expected to begin this summer. Completion of the telescope, which has been designed by Astro-Mechanics Inc. of Austin, Texas, is planned for 1977. Gehrz, J. A. Hackwell and W. T. Grandy Jr., all of the University's Department of Physics and Astronomy, will supervise construction. □

A hole in ionosphere for astronomy

When the last of the Saturn 5 rockets carried the Skylab workshop into orbit in 1973, its passing left a huge, temporary "hole" in the ionosphere—a region about 2,000 kilometers across, swept nearly clean of its usual population of free electrons (SN: 2/1/75, p. 71). Now two Boston University researchers are proposing that such holes be made on purpose, with the promise of offering radio astronomers a new window to the sky.

It is those free electrons, replenished by photodissociation, that make the ionosphere "a nearly impenetrable barrier" for ground-based radio astronomy at low frequencies, point out Michael D. Papagiannis and Michael Mendillo. Yet the portion of the radio spectrum below about 30 megahertz carries important information about the heavens, from Jupiter's remarkable decametric bursts to the 3-MHz peak in the radio intensity of the whole galaxy.

At night, the number of free electrons drops sharply in much of the ionosphere—the so-called D, E and F1 layers—due to natural processes that cause the electrons to recombine with readily available ions. Higher up, however, in the F2 layer, such processes are far less active. And here is where what Papagiannis and Mendillo call the "Skylab effect" could be a valuable discovery.

The 1973 hole occurred when the hydrogen and water vapor in the exhaust of the Saturn rocket's second-stage engines combined with oxygen atoms in the F2 layer to form positively charged ions, which then combined with the negatively charged electrons. The effect could be easily duplicated, the astronomers point out in the May 1 NATURE, by deliberately injecting molecular hydrogen into the region from an inexpensive sounding rocket. It becomes merely a matter of injecting the hydrogen over the site of a radio telescope. "This artificial ionospheric window," they report, "should allow radio astronomical observations to be carried out from the ground between 1 and 6 MHz, and possibly at even lower frequencies."

At present, low-frequency radio astronomy is almost entirely limited to what can be done from satellites. This means, among other drawbacks, that angular resolution is almost inevitably poor because the wavelengths at such frequencies are usually longer than the satellite antennas. A single 1-MHz wave, for example, is 300 meters long. Ground-based observations allow not only larger single antennas, but also the possibility of interferometry through multiple antenna arrays.

In the mid-1950's, pioneer radio astronomers G. R. Ellis and G. Reber at-