

munity mental health centers and shutting thousands of people through with a sure-fire analysis of the mental health of the patient, his family and his society. Possibly, the psychiatrist says, a kind of television eye could be set up in the home to pick up interactions between family members. Information could then be fed directly into a computer for diagnosis.

• Defense analysts have been schooled in thinking about the unthinkable and have calculated the relative advantages and disadvantages of

higher and lower levels of annihilation.

From this kind of speculation it is no great leap of imagination to the peace games of the "Iron Mountain" report. A peace game is a computerized technique that will "revolutionize the study of social problems." With it the Iron Mountain analysts can calculate the effects of a moon landing on elections in Sweden or the impact of a draft law change on real estate in Manhattan.

We have the means, says the anonymous author. "It's in a primitive phase, but it works." ♦

BACK IN THE FURROW

Atomic Explosions for Peace Rescheduled

With the rescheduled Gasbuggy test due to take place this week, the Atomic Energy Commission's peaceful explosions program, Plowshare, seems back in the furrow.

A flurry of recent activity in the Plowshare program has included proposals for two tests that, like Gasbuggy, would use nuclear explosions to free recalcitrant natural gas from underground deposits; another to form an underground reservoir to store gas, and tests to free shale oil and break up copper ore.

All the proposals followed joint AEC-industry feasibility studies.

"From the outside," says Plowshare assistant director William L. Oakley, "it may look like the program has been languishing and is just now coming to life. But actually we've been working pretty hard. There's a lot of preparatory work to these programs, and they just are coming to fruition all at once."

Gasbuggy, originally scheduled for Nov. 14, was postponed because water leaked into the emplacement near Farmington, N.M., and test directors wondered if the cement shell had developed a crack.

After finding the shell intact, they decided the explosive could be put in the wet hole, and the water could be forced out by the cement added to the emplacement to tamp it down.

As in the oil shale and copper experiments, the natural gas test is designed to break up hard rock formations that make the resource hard to recover.

The natural gas could be drawn off directly. Shale oil, in the form of solid hydrocarbons, would be decomposed by igniting the broken shale and driving the oil to a pool at the bottom of the rubble, from which it could be pumped up.

Copper would be dissolved, or leached, from the rubble by percolating dilute sulfuric acid through it and then re-

covered from the solution without the expense of mining and crushing the ore.

"Copper leaching isn't new," says Oakley. "The technology is known, and so is the technology of nuclear explosives. It's a matter of getting the two technologies together to see if they fit."

Apparently they do, since the feasibility studies resulted in formal industry proposals to go ahead with the project. The AEC is now studying the proposals.

Meanwhile, the most spectacular application of nuclear explosives, for excavation of canals and harbors, is languishing in the doldrums of international politics.

Project Cabriole, scheduled for last February, was one of six cratering experiments planned to develop the technology of blasting nuclear holes where they would do the most good, particularly in digging another Panama Canal. But the test was postponed indefinitely to avoid complicating negotiations of both the Latin American Nuclear Free Zone pact and the atomic non-proliferation treaty (SN: 5/13).

The AEC requested, and got, money to perform the test during fiscal 1968. Along with authorization of the money, the Joint Atomic Energy Committee tartly complained of the "inconsistency of offering to other nations something which is not now available (cratering technology) while at the same time and in the same context postponing the effort to develop the promised technology."

Despite this encouragement, the Cabriole experiment remains under continuous interdepartmental review.

And the deadline this year, as last, is April, when spring grazing lands near the Commission's Nevada Test Site northwest of Las Vegas will become vulnerable to short-lived but deadly iodine 131 fallout which could affect dairy cattle.

FOOT-AND-MOUTH IN BRITAIN

Grounds for Slaughter

Foot-and-mouth disease, a malady that affects only cloven-hoofed animals such as cattle, sheep and pigs, is not primarily a killer. It causes sore gums that make eating difficult and painful, and blistered feet. Farmers and other livestock owners, however, hold the disease in such terror that it might seem to be death itself.

It spreads like wildfire. It can be carried by almost anything—other animals, human beings, birds, the wind, automobile tires. Most importantly, it leaves the livestock virtually worthless (SN: 9/22).

In 1923, a foot-and-mouth epidemic swept Britain and resulted in the deaths of more than 128,000 animals. Yet it is likely that only a small percentage of that number had actually contracted the disease, and few if any of those actually died from the virus that causes it. The animals were slaughtered, killed in countrywide programs to keep the disease from spreading. If even one animal on a farm was found to have the disease, every cloven-hoofed animal on the farm was killed and either buried or burned.

The technique is effective. It wiped out the disease from the U.S. in 1929, Canada in 1952-53 and Mexico in 1947. Australia (with 50 percent more cattle than Britain and five times as many sheep), New Zealand, Japan and Central America all use it.

But since mid-November, Britain has been in the grip of its worst outbreak of foot-and-mouth disease in this century, and so much livestock has been slaughtered that farmers are clamoring for the alternative—vaccination. Almost 200,000 animals have been killed since the first sign of the disease on a Shropshire pig. The owners are compensated for the animals by the government at market value, except for animals that are already diseased, in which case the compensation is zero.

Livestock shows, horse races and even a cross-country automobile rally have been canceled to prevent the spread of disease. On Nov. 19 a ban was imposed on the movement of livestock throughout England and Wales; five days later all of Scotland was quarantined. Neighboring farmers have been avoiding each other like the plague. Farms suspected of harboring the disease and their neighbors within 10 miles have been issued "standstill orders," prohibiting any movement of livestock. Within a diameter of 20 miles beyond that, any movements of cloven-hoofed animals require a special, and hard-to-get, permit.

By the beginning of last week the

government had already paid farmers \$15 million in compensation, and the figure was expected to reach at least \$20 million.

Anguished livestock owners were becoming virtual hermits, sometimes refusing to admit even exhausted and overworked veterinarians. "Do not call in the helpful neighbor to see a slobbering cow," warns I. A. Graham, regional veterinary officer in Wales. "It is not easy for farmers and their families to be antisocial," he says, "but a stay-at-home attitude could pay dividends and make reunions all the sweeter when the tension is over."

Despite the cost of compensation, as well as the lost revenue to farmers who will need years to rebuild their herds, British officials have remained firmly in favor of slaughter over vaccine as the way to combat the disease. Only about 0.4 percent of the 50 million susceptible animals in Britain have had to be slaughtered, they argue, whereas a vaccination program would have to reach every cow, sheep and hog in Britain every year.

The government estimates that such a program would cost \$70 million annually and might still not work, since no single vaccine is yet known to exist that is effective against all seven types, 42 subtypes and possibly several sub-subtypes of the foot-and-mouth disease virus.

Animals that have survived infection by one of the major types are still susceptible to the others, and, after as little as two years, even to the one with which they were originally infected.

Yet the matter is widely controversial. In countries such as Panama, for example, where the number of susceptible animals is relatively small, the cost of vaccination may be worthwhile, compared to that of losing large numbers of livestock.

Even in the U.S., where the disease has not existed for almost four decades, some researchers are reluctant to take sides.

As the cure is uncertain, so is the cause. The current British outbreak has been variously blamed on viruses brought by starlings, or beef imports from Argentina (denied by Argentine officials) or other countries which together provide about one-third of Great Britain's beef.

The disease had not spread to any new areas for several days by the beginning of last week. Livestockmen and officials in Britain were still too battered for joyful anticipation, but one British official in Washington ventured a cautious hope.

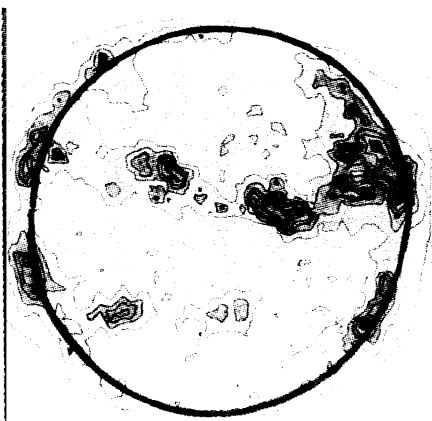
"If this holds," he said carefully, "it could mean that the tide may at last have turned."

SOLAR ASTRONOMY

OSO Reveals the Sun in Ultraviolet

Regular observations of the sun's ultraviolet light, virtually all of which is blocked off by the earth's atmosphere, are giving scientists, for the first time, a three dimensional map of the solar corona. The survey, from which photographs come in at the rate of 150 a day, could lead to a method for predicting solar flares.

The photographs also show for the first time the solar corona in depth over its entire face, rather than only at the edge as it is seen during an eclipse or through a coronagraph. The three-



NASA

Satellite view of sun in ultraviolet.

dimensional chart of the corona reveals new information about how different chemicals are distributed and how temperature varies at different heights.

The new pictures of the sun are being taken, and have been made since Oct. 24, by a sophisticated ultraviolet spectrometer constructed at Harvard College Observatory by a group headed by Dr. Leo Goldberg, in collaboration with Drs. Edmond Reeves and William Parkinson. Dr. Goldberg foresees that preliminary results of analyzing the thousands of photographs already available will be reported to the American Astronomical Society meeting in Tucson next February.

Although the spectrometer experiment is designed to have a lifetime of six months, Dr. Goldberg hopes it will last much longer, perhaps even on through the period of maximum solar activity, now predicted for early 1969. There is some basis for this hope since many instruments on other satellites have sent back data for months beyond their expected lifetimes. Some, such as the Tiros satellites, have transmitted for as long as four years after they were scheduled to stop.

Even if OSO-IV does not take ultraviolet photographs beyond May, however, it will still be in a unique position

to study solar flares, giant outbursts of charged particles hurled into space that could endanger astronauts.

A solar flare is accompanied by a surge of ultraviolet radiation. The Harvard scientists plan to record the occurrence and development of flares and the changes in temperature as the flares shoot through the corona. Their aim is to determine the precise mechanism responsible for the sudden bursts of solar energy, usually connected with sunspots. When that is known, they should be able to predict their occurrence.

Some believe a flare is triggered by an explosion of electrons that begins high in the corona and streams downward toward the center.

The OSO photographs show, as do those made from earth, that the sun has two belts of spots from east to west. In successive pictures, these spots move, since the sun itself rotates once every 27 days.

The way the ultraviolet instrument operates and the wavelengths in which the photographs are taken are controlled by Harvard astronomers, who meet each day to decide the plan for the following 24 hours. From 50 different wavelengths of ultraviolet they have their choice of seven in which to scan the solar corona during any 24 hour period. The pictures begin to arrive two hours after the satellite's program is changed.

The spectrometer can record ultraviolet radiation in two ways. It can concentrate on a small spot in the center of the solar disk and record, in about half an hour, the intensity of the radiation over the whole ultraviolet spectrum; it does this during one orbit a day. During the other 14 or so orbits, the entire disk is scanned to build up a picture of the sun at one wavelength at a time.

GENERIC VS. BRAND

Handwriting on the Drugstore Wall

For close to \$300 million a year, the Federal Government buys drugs for soldiers, hospitalized Medicare patients, welfare recipients and others. If it bought compounds by their generic titles instead of brand names, according to Senator Russell B. Long (D-La.), it could crop its bill by one-third, saving \$100 million.

This year Sen. Long introduced an amendment to the Social Security Act that would establish a Formulary of the United States—a list of drugs,