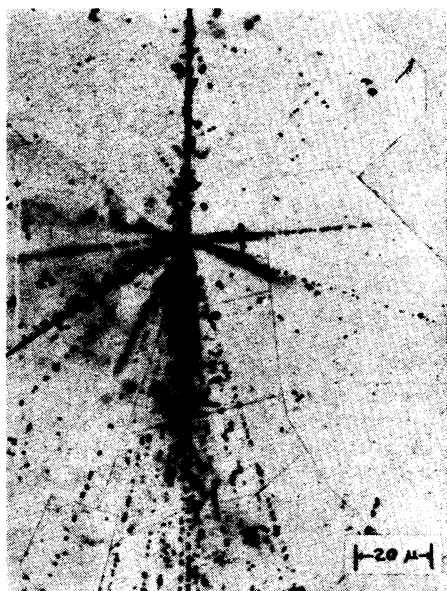


nuclei heavier than helium make up only two percent, but these heavy elements carry astrophysical information of decisive importance.

More and more sensitive techniques have gradually found heavier and heavier elements. In the last few years examination of meteorite samples gave the first evidence of very heavy nuclei, those more massive than iron's 56 atomic units.

Finally five square meters of photographic emulsion flown on a balloon by Peter Fowler of Bristol University in England have yielded a few dozen particles with atomic weights up to 232 and possibly beyond. This has raised the possibility that transuranic elements—radioactive elements beyond atomic weight 240, no longer found naturally on earth—exist in primary cosmic rays.

Professor Fowler flew two balloons last year from the U.S. National Center



NRL

Heavy cosmic ray track in emulsion.

for Atmospheric Research in Palestine, Tex. He plans to go back later this year and fly two more. At least one American group, composed of physicists from Washington University, St. Louis, also plans to fly large area emulsions from Palestine this year.

The presence of transuranic elements at the source of the cosmic rays is expected. As Prof. M. W. Friedlander, one of the St. Louis group, puts it, once a process of element building has started, there's no reason to cut it off at any arbitrary level.

All the transuranics are naturally radioactive, however. Survival of any of them long enough to reach earth would have important implications for estimates of cosmic ray ages, which in turn

says something about the length of the journeys and the source.

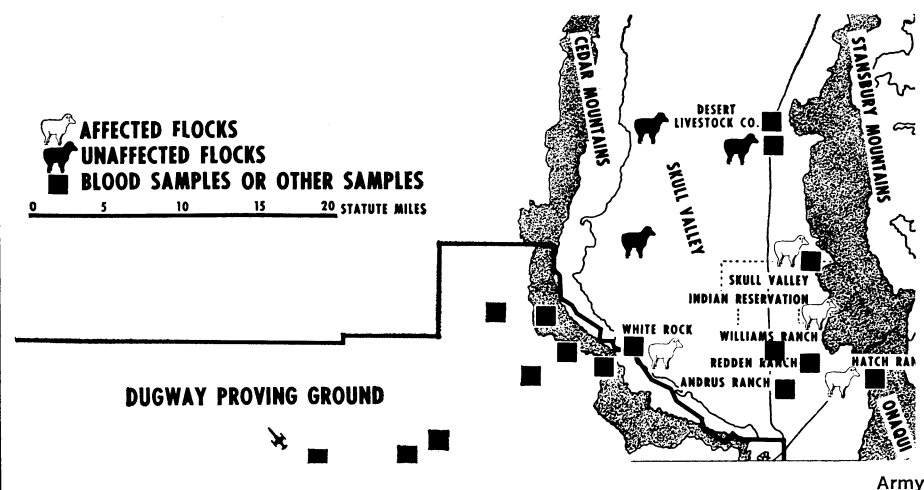
But the measurements will not be straightforward; the journeys are not straight nor at uniform speed. Interstellar magnetic fields are believed to both accelerate cosmic rays and bend their paths. These effects smooth out the products of random explosions—probably supernovas—until the primaries arrive at the earth equally from all directions and have a more or less steady flux—two or more particles per square centimeter per second, varying with the solar cycle.

A majority of experts believes that nearly all this flux comes from within our own galaxy. In our galaxy we see only one supernova in 300 years, but, says Dr. Maurice M. Shapiro of the Naval Research Laboratory, there is evidence that actual rate of occurrence may be higher, up to one every 30 or 40 years. Such a rate could supply the cosmic ray flux.

But much more study is needed to give definite answers to cosmic ray questions. As Prof. Friedlander puts it, scientists are now getting a whiff, rather than a taste, of what they seek.

## SKULL VALLEY

### Sheep die near nerve gas tests



Army

Death apparently blew from the tiny plane (bottom left) to Skull Valley herds.

On March 13 a plane flew by. On March 14 the deaths began. Within the first week some 5,000 corpses lay on the rugged slopes of Utah's Skull Valley.

The victims were sheep, who simply began dying one day with no advance warning except a sudden loss of muscular coordination, followed by collapse. Autopsies at first revealed practically nothing, and Federal, state and university investigators were at a loss.

There was one fact: Bordering the grazing area is Dugway Proving Ground, the U.S. Army's main testing facility for chemical and biological weapons.

The day before the sheep began to die, the Army had fired several 155-millimeter artillery shells containing Sarin, a U.S. variation of a nerve gas developed by Germany prior to World War II. That same afternoon, 160 gallons of an unnamed persistent nerve chemical were disposed of by burning in an open pit, and 320 gallons of a similar persistent agent were sprayed

from a "high-performance" aircraft flashing along 150 feet above the ground. The spraying took place some 27 miles from the nearest sheep kill.

At first the Army said it "definitely was not responsible" for the deaths, which by the beginning of last week had topped 6,400. Then it changed to the view that "no definite cause of death" had been established. As investigators chipped away at other possible causes, the official statements backed off even further. "We are still saying that as far as has been determined, we had nothing to do with it," an Army spokesman said a week after the first report.

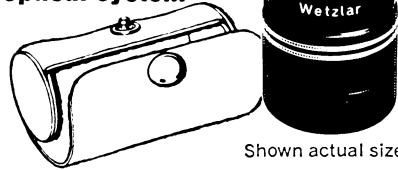
Meanwhile, the dead and dying sheep were confounding doctors and scientists from the Federal and state Departments of Agriculture, the U.S. Public Health Service, the University of Utah and the Army itself; the bodies revealed hardly any symptoms of anything, let alone nerve gas.

"We've pretty well ruled out contagious disease," reports Dr. Jordan

more than just a telescope more than just a microscope

# emoskop

a complete  
vestpocket  
optical system



Shown actual size

We went to Wetzlar, Germany (world capital of fine optics) to find such perfection at such a price. Remove the EMOSKOP from its fitted leather case and it is a 30x microscope. A twist of the wrist converts it to a 3x telescope (ideal for theater, field or sky) or a unique 3x telescope-loupe. Another change and you have your choice of 5x, 10x or 15x magnifying glasses. The perfect vest-pocket companion for exacting professionals and scientists and all those who wish to observe anything closely and clearly. A most discreet opera glass. If you make a fetish of quality, the EMOSKOP will do you proud. Coated lenses, fully achromatic, absolutely flat field. Modern Photography Magazine calls the EMOSKOP "... the only magnifier worthy of the name."

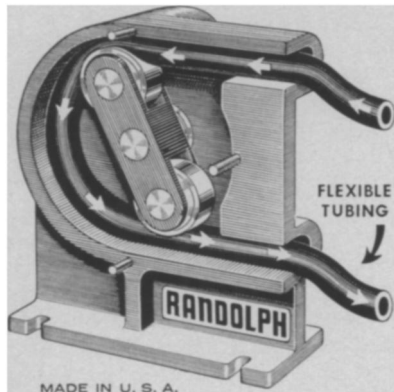
Send me the EMOSKOP. I enclose \$15.95 (\$14.95 plus \$1 postage and insurance). Calif. residents add 5% tax. Refund within 10 days if not delighted. **SN-0406**

Name \_\_\_\_\_  
Address \_\_\_\_\_  
\_\_\_\_\_ Zip \_\_\_\_\_

584 Washington,  
San Francisco 94111  
Phone (415) 981-5688

**haverhill's**

## The Pump That Never Gets Wet



### RANDOLPH PUMP

FLUIDS FLOW THROUGH A FLEXIBLE TUBE WITHOUT CONTACTING THE PUMP CAPACITIES UP TO 200 GALLONS PER HOUR

Send For **FREE** Catalog

**THE RANDOLPH COMPANY**  
1088 ROSINE ST. HOUSTON, TEX. 77019  
Phone (Area Code 713) JACKSON 6-2091

Rasmussen, chief USDA veterinarian in Utah. Painstaking examination of a vast variety of tissues from the sheep showed no abnormalities.

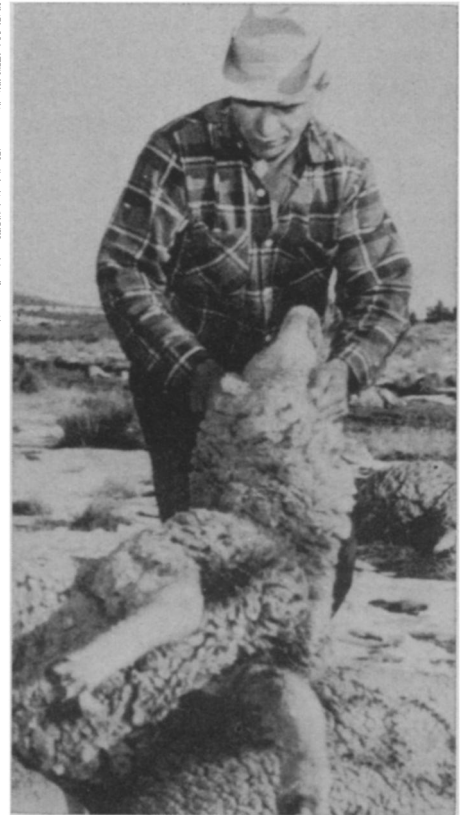
Nor did poisonous plants seem to be to blame. Investigators, looking for culpable flora, combed Skull Valley in vain. One noxious weed called halogeton has taken a heavy toll in the past, according to Utah State Agriculture Commissioner David Waldron, but it could never fit the killer's description. It is usually fatal only if the animal drinks water soon afterward, causing bloat, and the symptoms would be obvious. In addition, thousands of acres of the plant have been plowed under; there is not enough left in Skull Valley to do such terrible damage.

Adding to the mystery was the fact that the affected sheep seemed to be limited to a fairly well-defined area. "There are sheep to the north and sheep to the south," says Waldron, "and they're doing fine." Even more curious is the fact that sheep were the only animals affected. People—Skull Valley has a population of about 55—horses, cattle, rabbits, birds, rodents and other creatures showed no symptoms at all. Almost the only difference between the sheep and everybody else was that sheep are natural snow-eaters.

This seemingly innocuous fact again suggested Dugway as the source of the killer. State officials theorized that wind carried the droplets of nerve gas spray over the low Cedar Mountains then allowed it to settle on the snow that had fallen on previous days.

By this time the Army was just about ready to indict itself. "We fully recognize, with this occurring right on our doorstep . . . that we are highly suspect," admits Brig. Gen. William W. Stone, in charge of research and laboratories for the Army Materiel Command.

Yet the Army couldn't even make its own rap stick. The reason, says Gen. Stone, was that it simply could not isolate its own nerve gas from the bodies of the sheep. By this time, after some 10 days of sleuthing, scientists had managed to determine from urine and tear samples that the deaths were apparently due to an organo-phosphate compound similar to those used in nerve agents, as well as in several insecticides. Such compounds kill by blocking the action of a blood chemical called cholinesterase, whose job is to suppress another chemical that causes muscular action. Without this suppression, the muscle operates continuously, causing convulsions. Unfortunately, this was not enough to pin down the Army compound. Traces from the spraying were easily found and identified by the Army on its own test range,



UPI

*Shepherd and mystery poison victim.*

and should, officials say, have been just as easily identifiable in the sheep.

Another possibility raised last week was that the poison might have come from a chemical preservative used on seed grain that may have been fed to two herds of rams in the valley. A similar incident reportedly occurred in Turkey a few years ago. Even if such feed was used in the valley, however, it would have been virtually inaccessible to the sheep, which were at least six miles from one of the buckherds and 20 miles from the other. Waldron writes the idea off entirely. "I've heard quite a few ideas that I thought were silly," he says, "but I'd have to put that at the top of the list."

So Dugway still looks like the culprit. If it is, the Skull Valley incident is one of the biggest chemical-warfare-agent disasters in U.S. history.

#### RIOT REPORT

### Deafening silence; deadly words

"Let your search be free. . . . Find the truth and express it."

Those were President Johnson's instructions, last July 29, to his National Advisory Commission on Civil Disorders.

The commission reported in early March, citing broad racism in white America as an underlying cause of civil disorder, calling for strategies for ac-