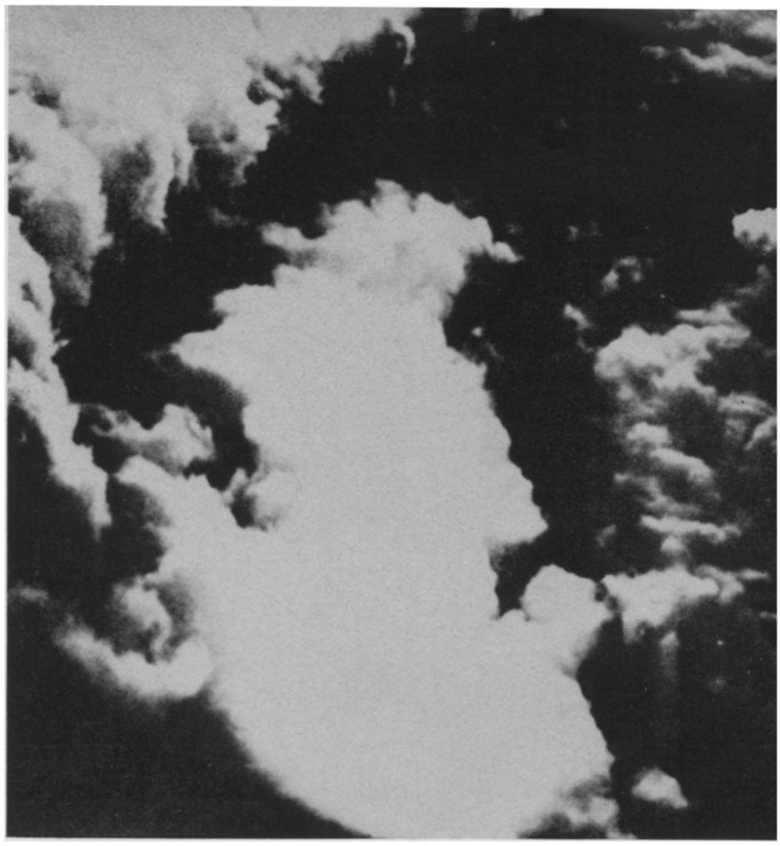
Stormfury: calming the eyewall

Hurricane tamers get a wider area to test techniques



ESSA/Air Weather Service

An instrument-laden converted B-57 will observe as Project Stormfury tries to reduce the mighty winds of hurricanes.

The first sign that the researchers were onto something was the fading of part of a bright smudge on a radar screen. The smudge was the image of of 1961's Hurricane Esther. The faded spot marked an area where, only minutes before, an airplane had flown through the wall of the storm's eye, leaving in its wake a cloud of tiny particles, the beginning of man's efforts, seemingly presumptuous, to tame hurricanes.

The particles were silver iodide, the same as those used to seed clouds in rainmaking attempts. In rainmaking, the particles are intended to provide nuclei around which water vapor will condense into droplets. The hurricane investigators had a different goal: to transform existing drops of supercooled water into ice crystals, thereby releasing their heat into the eyewall next to the warm eye of the storm. The added heat should lower the atmospheric pressure in the wall, thereby reducing the sharp pressure difference across it which produces the hurricane-force winds.

In 1962, those first seeding efforts became Project Stormfury, established by the Commerce Department and the Navy to investigate what one official calls a kind of atmospheric judo.

Since man cannot muster anything approaching the energy of a hurricane, and so has no hope of overcoming the storm by force, Stormfury attempts to use the giant's own energy against it.

Since its inception, however, Project Stormfury has proceeded at a pace more like that of a vague breeze. In six years, it has seeded one hurricane.

Through 1966, the problem was caution. Meteorologists, unsure of the consequences of their tampering, agreed to limit seeding to the safer storms—those passing through a part of the Atlantic from which no hurricane on record had ever struck a highly populated coastal area within a day and a half. Hurricane Beulah, in 1963, was the only one to qualify.

Last year, bolstered by improved prediction techniques, the researchers relaxed their standards to include any storm in the southwestern North Atlantic, as long as there were at least nine to one odds that the storm's center would stay 50 miles from populated areas for one day. But the scientists were frustrated again. For the first time in 14 years, no hurricane passed through the area.

Last week, Project Stormfury began its 1968 season. This year, researchers have given themselves better odds. The 50-mile, 24-hour restriction still applies, but the test area has been expanded to include the entire Caribbean and the Gulf of Mexico. Had the 1968 standards been in effect since Stormfury's birth, 11 hurricanes would have been eligible for seeding.

The two hurricane seeding attempts so far have been promising enough to keep the investigators excited. When the seeded part of Esther's eyewall faded from the radar screen, it meant that the droplets either had changed to ice or had been replaced by smaller drops of liquid. In 1963, the pressure at the center of Beulah's eye rose following seeding, indicating a smoothing-out of the pressure gradient, and the highest-speed winds moved outward as intended, like a spinning skater extending his arms to slow down. These shifts, however, might have been a result of natural changes within the hurricane.

To add the most possible data this year, each hurricane that enters the expanded seeding area will be seeded more heavily than were the previous two. In the past, only a single line of silver iodide generators—cannisters which spew forth the particles as they fall—was dropped at the upwind edge of the tallest eyewall clouds. This year, each hurricane eye will be seeded five times at two-hour intervals, with Navy, Air Force and Environmental Science Services Administration aircraft monitoring the area from four hours before the first seeding until six hours after the last one.

Besides seeding the eyewall, project pilots will also try seeding a hurricane's rainbands, curved bands of precipitation-filled clouds normally found well out from the eye of the storm. The rainbands may represent some kind of middle ground between the hurricane and ordinary cumulus clouds. Airborne observers will try to see if changes in the rainbands produce any changes in the

storm's overall existence and behavior.

A second new experiment will be the seeding of lines of cumulus clouds themselves. Simple cloud lines also have the advantage of being present much more often than hurricanes.

A substantial fleet of aircraft are involved in Stormfury, and as many as a dozen may become involved simultaneously with a single hurricane. In the past, project planes have ranged from DC-4s to Super Constellations, from B-57 bombers to U-2 reconnaissance craft. All are on constant 48-hour alert during August and September, the peak months of the hurricane season, and on through October 15.

The actual seeding will be done by Navy A-6 Intruder jets, which will begin their runs from an altitude of about 35,000 feet, 50 miles from the storm center, then ram through the eye.

Coordination of all the aircraft involved is so complicated that last week, the first order of business was a dry-run rehearsal, using one circling plane to represent a hurricane's eye. Late in the week, if available, a line of cumulus clouds was to be used to simulate a rainband in a seeding test. ◇

BREAST CANCER

Virus in malignancies

Dr. W. F. Feller

Cluster (arrow and inset) of particles in breast cancer tissue may be virus.

Something that looks like a virus has been found in the milk and breast tissue of a suspiciously high proportion of women with breast cancer or a history of the disease.

Cancers caused by viruses have been found in animals—none has yet been proved in humans.

Like other investigators, Dr. William F. Feller of Georgetown University School of Medicine, and his collaborator, Dr. Harish C. Chopra of the Pfizer Co., are cautious in their claims. Writing in the June issue of the JOURNAL OF THE NATIONAL CANCER INSTITUTE, just published, they say the small particle they discovered shows more resemblance to a virus than to any other known structure.

Including some cases discovered after the report was written, they identify the particle in 12 of 28 biopsies and in the milk of six of nine lactating women either with active disease or a history of breast cancer. Identical particles appeared in the milk of normal women, but the incidence of their appearance has been much higher in the milk of breast cancer patients.

"Although the virus-like entity . . . cannot be said definitely to represent a virus," they concede, it looks like one, and "its occurrence in clusters or aggregates ranging up to several hundred particles strongly suggest it is a virus."

Milk and tissue were studied under the electron microscope. Milk collections were made by an electric breast pump on the remaining breast after surgery. Biopsy specimens were obtained from four District of Columbia hospitals.

The researchers emphasize that the presence of a virus in a human cancer does not in itself mean that it was the cause of the malignancy; the virus could be merely a passenger agent.

Assuming that the discovered particle is a passenger virus, however, it could be one that has some predilection for, or is more readily propagated within, malignant mammary cells, or those producing milk. In this case it might, as a secondary invader, have some influence on the course of breast cancer.

It would be important, therefore, the investigators reason, to continue attempts to further characterize it and determine its frequency of association with different biological types of breast cancer.

If the particle is a virus, it could be related to the cause of human cancer and thus make possible a potent weapon against the disease.. Although no cancer-causing virus is now known to be as small, some of them are only slightly larger, and one, the polyoma virus, causes mammary gland cancer in mice.

PULSARS

Gravity wave search

Since pulsars were discovered last spring, theorists have regarded them as possible strong sources of gravitational radiation.

Such radiation (SN: 4/27, p. 408) would be an energy-carrying wave analogous to an electromagnetic wave. Gravity waves should be produced by massive bodies under acceleration just as electromagnetic waves are produced by charged bodies under acceleration. They should be detectable by the stresses and strains they set up in bodies they encounter.

Gravity waves strong enough to be detectable would require dense, massive bodies that produce strong gravitational fields. Most hypothetical pulsar models fit this prescription—dense stars undergoing physical pulsations, or revolving around each other, have been among the most popular suggestions.

There has been much talk about looking for gravity waves from pulsars; now the one man who may have seen gravity waves, Prof. Joseph Weber of the University of Maryland, proposes to try it.

Prof. Weber has been looking for gravity waves for a long time. He uses aluminum cylinders weighing about a ton and a half to look for radiation at a frequency of about 1,660 cycles, and a pair of these have been responding, he says, "to a common external excitation which may be gravitational radiation." Noted among his colleagues for