ASTRONOMY

Sun Is Hissing at Us

Solar static may cause streaking in television and interfere with high frequency radio reception. Giant "mirrors" will be used to explore the sun's outbursts.

By MARTHA G. MORROW

➤ THE SUN is hissing at us in a high-pitched voice. And we on earth are just beginning to listen to find out why—and how.

The sun is constantly radiating vast amounts of energy of one sort or another. Light and heat are those with which we are most familiar.

As we use higher and higher frequencies in our scramble for radio space, energy reaching the earth in the radio frequency bands becomes of increasing importance.

Solar noise, which interferes with radio reception at ultra-high frequencies, is a steady hiss. Upon this are often superimposed "puffs" and "swishes" lasting but a second or less. When the swishes overlap, a grinding noise results.

Solar static comes to us on the same frequencies as those used for FM, television and radar.

In a television set, solar static may cause streaking on the screen and picture jumpiness. Intense bursts of solar energy that last for several hours cause a radar set to go blind when pointed in the direction of the sun.

But someday this very static may be harnessed to serve us. If we learn how to predict intense bursts of solar static, in wartime air raids may be scheduled for those days when the enemy's radar will be least effective. For peacetime, radio sextants may be developed so that solar static indicates the position of a plane or ship. Such a device would be effective, rain or shine, and be completely independent of ground stations.

Waves of Energy

Solar static does not reach the earth as noise that you can hear, but as electromagnetic energy. The waves can be turned into sound or used to draw lines on a chart.

Giant "mirrors" 10 to 25 feet across are being installed to explore outbursts from the sun. Some are solid metal, others are of wire screening.

Two of these enormous mushrooms have been set up at the National Bureau of Standards' radio propagation laboratory at Sterling, Va. Originally Giant Wurzburgs, a type of radar used by the Germans, these instruments have been converted to record solar noise. Brought back to this country by the Army Signal Corps, their steel mesh mirrors are 25 feet across.

A small antenna in the center of the basket-shaped mirror receives solar static, which is carried by cable to the electronic equipment in an adjoining building. One saucer is already at work on the 480 to 500 megacycle band; the other has just begun to collect static.

With these instruments Grote Reber, in charge of the Bureau of Standards' project, hopes to discover:

1. Frequencies on which the solar noise is strongest.
2. If the static varies with the seasons.
3. Whether or not there is a long-term fluctuation.

At Cornell University, W. E. Gordon prefers to call his instrument a "radio telescope." Director of the Microwave Astronomy Project sponsored jointly by the university and the Office of Naval Research, he pictures the saucer-shaped radio antenna as the mirror of the telescope. Its wire surface collects radio waves an inch or so in length. A radio receiver replaces the usual eyepiece.

Follows the Sun

Designed to study static at several wave lengths, the instrument can follow the sun automatically in its daily rising and setting. An audible rather than a visible picture results. It will be used to study the relationship of solar static to sunspots.

Not screens, but solid metal disks are used at the Naval Research Laboratory at Anacostia, D. C., to collect the sun's radio waves. The two instruments, designed to record energy at wave lengths of ten centimeters or less, are each ten feet across and painted black to cut down the heat, which otherwise would be focused at the antenna.

Although solar static can be heard whenever earphones are plugged in, electronic devices are normally used to make the electromagnetic energy record its presence in the form of an inked line on a strip of paper.

Absorption of radio waves by oxygen and water vapor in our own atmosphere is one of the chief projects to be investigated by the Navy team headed by J. P. Hagan, with F. T. Haddock as his right-hand man.

Only within the past two decades have we on earth been aware of static coming out of the depths of the universe. Noises originating outside our planet were discovered in 1931 by K. G. Jansky of Bell Telephone Laboratories. The hiss he detected came not from the sun, but from the Milky Way.

While studying the direction of arrival of thunderstorm static at Holmdel, N. J., he observed that a small residual static remained even when there were no local or distant showers. This static Mr. Jansky traced to the heavens. The strongest signals came from the direction of the center of the Milky Way, in the constellation of Sagittarius, the archer.

Noise originating in the Milky Way can be detected by the same equipment as that designed to study static from the sun.

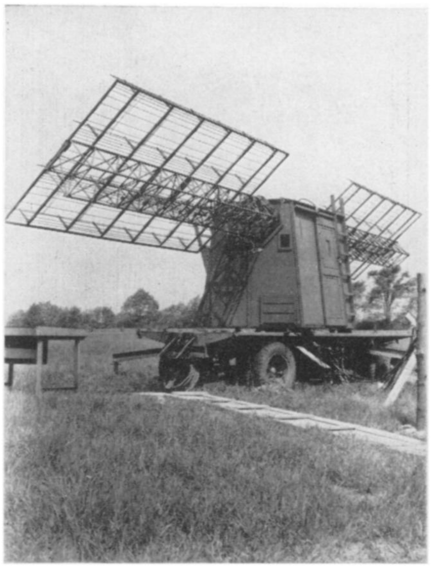
Two radio enthusiasts helped attract attention to the cosmic hisses a decade or so ago. Radio waves in the microwave region were studied by Dr. G. C. Southworth of the Bell Telephone Laboratories; those of meter wave lengths were investigated by Mr. Reber, whose hobby kept him up many nights.

Microwave Radiometer

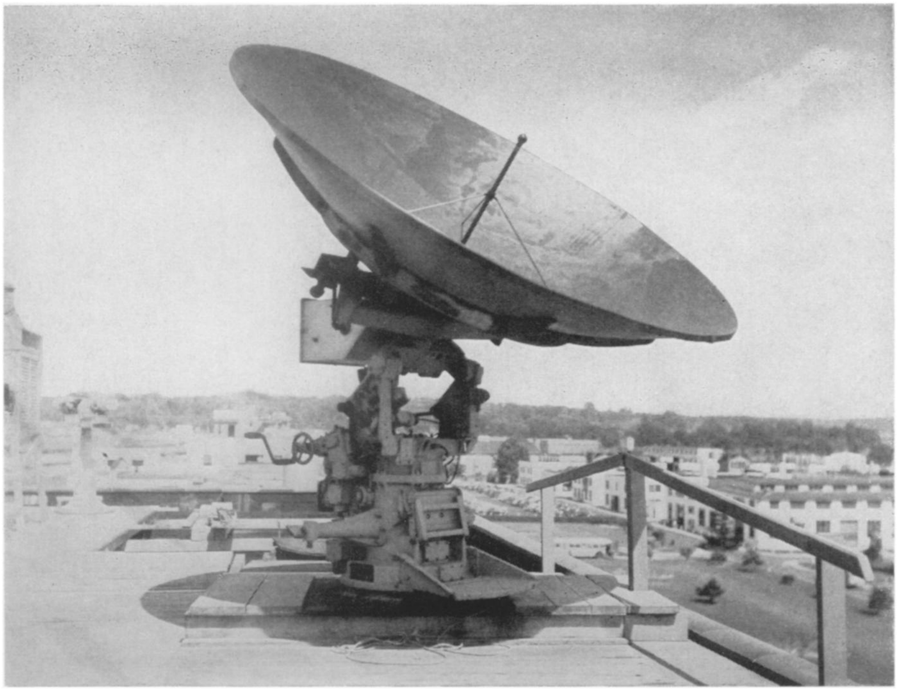
The study of solar noise at ultra-high frequencies was greatly aided about three years ago by a microwave radiometer developed by R. H. Dicke, then at the Radiation Laboratory, Massachusetts Institute of Technology. His device pretty much eliminates static originating in the instrument itself and makes possible more accurate measurements of the effective temperature of the sun and stars.

Much exact data on the sun has been collected during the last few years by A. E. Covington of the National Research Council at Ottawa, Canada. He has been chiefly interested in energy radiated from the sun at 10 centimeters wave length.

J. F. Dennis, of the Laboratoire de l'Ecole Normale Superieure of Paris and



STUDY SUN'S RAYS—The newly completed radio telescope at Cornell University is the only such apparatus on a college campus.



CATCHES SUN'S HISSES—This solid metal disk is used at the Naval Research Laboratory to collect the sun's radio waves.

guest worker at the National Bureau of Standards, found from Mr. Covington's records a marked correlation between radiations received at 10 centimeter wave length and solar activity.

In the visible region, spots appear much darker than the rest of the sun because they are radiating less energy. But at 10 centimeters, Mr. Dennis finds sunspots radiate great amounts of radio energy and thus are many times "brighter" than the rest of the sun.

His analysis shows that the solar radio energy is proportional to the size and number of visible spots, and to the magnetic field of the individual spots.

In Australia, J. L. Pawsey of the Council of Scientific and Industrial Research used an ingenious interference technique to show by direct measurements that radio waves actually come from sunspots. Normally, not just one section of the sun's disk, but all of the energy radiated by the whole disk is studied. In England also, M. Ryle and D. D. Vonberg of the Cavendish Laboratory, Cambridge, have been concentrating on energy radiated by the spots.

The sun explored by radio waves is slightly larger than that seen visually. We see energy originating in the bright photosphere; we hear waves coming from the sun's outer surface or corona. Thus science has a new tool for estimating the temperature of various layers of the sun. And radio waves show a much hotter solar atmosphere than its fiery disk indicates.

At centimeter wave lengths, the sun appears to have a bright limb and dark center. During the recent total eclipse, as much as four percent of the sun's energy continued to reach the earth during totality.

Sunspots sometimes can be found by radio a day or so before they are carried far enough around the sun's edge to be seen visually.

Thus we are beginning to learn much about the sun, source of our heat, light and other energy. Hisses from the sun are attracting the attention of an ever-increasing number of radio engineers, astronomers and others anxious to use this new means of exploring our nearest star.

Today men listen to the static from the sun, and attempt to discover what the noises mean. Instruments and brains are at work—many more will soon be pressed into service in the United States and throughout the world.

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ANTHROPOLOGY

Upper Right Leg Bone Is New Man-Ape Clue

➤ AN UPPER RIGHT leg bone found in South Africa is the latest link in the evidence showing that the man-ape, a creature higher than the modern apes and lower than the most primitive man, walked erect on its hind feet.

The bone was brought back by Dr. Frank Peabody, of the University of California's African Expedition.

The man-ape, which was first discovered by Dr. Robert Broom of the Transvaal Museum in South Africa, had a larger brain capacity than modern apes and an almost human pelvis. There is a possibility, Dr. Peabody said, that the man-ape was contemporary with the early forms of man and that it may have lived as late as the early ice age. The ice age which was tens of thousands of years ago is still comparatively recent in terms of the age of life on the earth.

Although Dr. Broom reported that the man-ape could use its hands for the manipulation of tools and weapons, Dr. Peabody found no evidence that he used implements or fire.

Three tons of fossils were shipped to the University of California by the expedition. An analysis of the animal fossils may