was a white light solar flare, one containing all the colors of the visible spectrum.

Outpourings of protons, electrons and other forms of radiation accompanying the flare were picked up by earth-orbiting satellites such as the Navy's SolRad series, while scientists watching the moon feared—unnecessarily, as it turned out—that the film in Lunar Orbiter 4, which was taking pictures at the time, might become fogged.

Nor was the solar spectacular over. Two days later, the unusual flare was followed by the most intense magnetic storm in more than a decade, which lasted for more than 24 hours.

The flare itself was the real rarity, however. Although it was second in a succession of three close-together flares, the others showed no traces of the white light phenomenon.

A white light flare is actually part of a larger flare, and exists only at the bigger one's peak size, and at the point where it is hottest. The eruption encompassing the May 23 white light flare was rated at "Importance 3," almost the maximum size and duration in a scale that only extends up to 3+. Scientists at the center believe the flare may have produced synchrotron radiation—streams of electrons accelerated to prodigious energies by passing through an intense magnetic field—which is the same kind of radiation produced in the Crab Nebula, a major celestial source of radiation. If this is

Mt. Wilson and Palomar Observatories

The Crab Nebula—like a rare flare.

true, McIntosh says, it is probably safe to conclude that all such white light flares produce this kind of emission. It is also likely that the presence of synchrotron radiation would be closely connected with strong magnetic disturbances.

Unfortunately, it may be difficult to find out if such radiation did indeed come from the recent flare. The usual method would be to measure the polarization of the flare's light as it was in progress, but since the white light was unexpected, no such measurements were set up beforehand. Fortunately, however, there may be other techniques available, since the flare was photographed; it is believed to be the first of its kind ever captured on film. The U.S. Air Force's Sacramento Peak Observatory, located in Sunspot, N. Mex., has its own White Light Patrol, which automatically photographs the solar disk every 30 seconds. Scientists there are attempting to analyze the flare's radiation through the use of photometry.

Astronomy itself is almost as old as the human neck-joint, but flare-watching, says McIntosh, dates only from early September of 1859. The English astronomer Richard Carrington, who was sufficiently accomplished to have had his own observatory for six years previously, was trying to measure the sun's rotation by studying sunspots as they moved across its face. On September 1 or 2, while looking at the dark sunspots, he suddenly came upon a blazing patch of light that was brighter even than the rest of the sun's surface. His curiosity was aroused and a science was born.

RADIO ASTRONOMY

Carbon Broadcasts

Space is occupied by atoms of many elements—from hydrogen on up to the heavier elements. To radio astronomers, however, only the few—helium and hydrogen up to now—which emit energy in the radio frequency range—are of any value. Now there may be a third.

The newly-discovered radiation probably comes from carbon, according to studies by six Harvard College Observatory astronomers and one from the National Radio Astronomy Observatory in Green Bank, W. Va. They reported to last week's American Astronomical Society's sessions in Williams Bay, Wis.

Radio waves from hydrogen sources in the sky have already enabled maps to be made of the Milky Way's spiral structure in greater detail than was possible optically.

The hydroxyl ion, a charged combination of the elements of hydrogen and oxygen, has also been found to emit microwave radiation.

Deuterium, a heavy form of hydrogen, has been sought and reportedly detected by the Russians, but this has not been confirmed.

The emission from carbon was discovered when the astronomers were looking for radio emission at a frequency (5009 megacycles) where they expected to find further evidence of helium, or possibly of hydrogen.

They found five helium sources, but they also detected two other objects sending out radio waves believed unlikely to be from either helium or hydrogen. These objects broadcast at a slightly different frequency (5011.33 megacycles), which was far enough from the expected frequency so that the scientists are fairly sure it was not simply an error in observing helium or hydrogen.

The radio wave observations were made using the National Radio Astronomy Observatory's 140-foot antenna, equipped with a 21-channel spectral-line radiometer which broke the incoming signals down into their different frequencies.

Drs. Patrick Palmer, Benjamin Zuckerman, Hays Penfield and A. Edward Lilley of Harvard, with Dr. Peter G. Mezger of the NRAO, made the observations, reported to the meeting by Dr. Palmer. The theoretical basis for assigning the measured radio wave line to carbon was worked out by Dr. Leo Goldberg, director of Harvard College Observatory, and graduate student Andrea K. Dupree.

AIR POLLUTION

Apathy Clouds the Air

Air pollution has been a fact of life ever since man learned not to sit downwind from a campfire.

It has been a national political issue in the United States, however, only in the last few years, when conservationists and clean-air-minded Senators decided it was time industrial and urban polluters were called to heel.

Momentum began to build in December, when President Johnson called a national clean air conference in Washington, to launch his own clean air package of proposals, and take the play away from the Congress.

Since then, the Senate Public Works Committee has been holding hearings and drafting legislation which, when it is unveiled next month, should incorporate both Presidential and Congressional views and raise the key question sharply: how much power should the Federal Government have to force urban and industrial polluters to spend their share of the estimated $3 billion a year it will cost to clean the air?

The contest may have to be fought, however, in the shadow of less public concern than either the conservationist proponents of legislation or their cost-conscious opponents may realize.

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