SCIENCE NEWS

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ASTRONOMICAL PROGRESS DURING 1941

WAR on the earth has not prevented astronomers from moving forward in their conquest of the heavens. A round-up on astronomical progress during 1941 by Dr. Bart J. Bok, of the Harvard College Observatory, shows a formidable battery of five new great telescopes getting into action: two already in use, one finished and being tested, two more due for completion early in 1942.

The two instruments already in action are a 20-inch Ross refractor at Lick Observatory in California and a 24-inch Schmidt telescope at the Warner and Swasey Observatory of the Case School of Applied Science in Cleveland, Ohio.

Twin 24-inch Schmidt telescopes are being constructed, one for Harvard College Observatory, the other for the new Mexican National Observatory at Tonanzintla, Puebla, which will be formally dedicated by President Camacho, late in February. The latter instrument will contribute importantly to astronomical research because of its favorable location at high altitude in low latitude.

The fifth wide-angle telescope under construction is also of the Schmidt type, but with a diameter of 48 inches. It will be mounted at the Hale Observatory on Mount Palomar in California. The mightiest of all pieces of astronomical artillery, the 200-inch reflector for Mount Palomar, will probably not be completed in 1942, but satisfactory progress is reported on both the great saucer-shaped mirror and its massive mounting.

"The effects of war are beginning to be more and more felt in the field of astronomy," Dr. Bok reports. "Many astronomers in the United States are now working on defense projects and the total output of scientific research is accordingly reduced." The slowing down of astronomical work has been reflected in the reduced volume of publication of astronomical research reports. In Britain, only about half the normal number of papers on astronomical subjects have appeared, and the German output has been even less, though the quality of work reported holds up. Surprisingly enough, in the conquered and occupied Netherlands, astronomers are apparently fully at work on their research programs again, and even in France interrupted observation and photographing schedules are being resumed.

Despite communication difficulties, astronomers in the warring countries manage to keep in touch with each other, and still maintain a considerable degree of the exchange of information that is indispensable for progress in what is probably the most completely international of the sciences.

FREQUENCY MODULATION APPLIED TO TELEGRAPH LINES

TELEGRAPH lines now use the new FM radio, putting more messages over one circuit with less interference.

Western Union has announced the first use of frequency modulation or FM on its wire network to combat the troubles caused by sharp weather changes that sometimes throw sensitive carrier currents out of balance.

FM radio (contrasted with the conventional AM or amplitude modulation of most broadcasting stations) invented by Major Edwin H. Armstrong is coming into use extensively in radio broadcasting stations of a new breed. FM gives radio signals that can not be disturbed by static. Static is not a trouble in wire telegraphic circuits, but there are other difficulties that FM does take care of.

Four telegraphic carrier current systems linking New York City with Buffalo, Chicago, Washington and Atlanta will be converted to FM operation. Future carrier systems will in general employ FM.

In order to send several messages simultaneously over the same wire, telegraph companies put several electrical currents of different frequencies on the wire. These are analogous to the carrier waves of different frequencies used in radio broadcasting. In the same way, at the other end of the wire are receivers each tuned to respond to only one of the several pitches. This is called carrier current system. Western Union at present uses twenty-two different frequencies.

The frequency corresponds to the pitch of a musical note. The single monotonous tone, however, would convey no intelligence. To do this, meaningful variations must be superimposed upon it. This is "modulation." Either the pitch or the intensity can be varied. The latter is amplitude modulation (AM). The former is FM.

Actually, neither in radio nor in wire applications of these principles is the carrier wave note heard. Its frequency or pitch is far above what the human ear can hear. Only the slower variations or modulations are converted by the receivers into audible sounds, or into motions that actuate a recorder.

Most external disturbances such as static are intensity or amplitude variations, whose pitch is within audible range, that are imposed on the carrier wave. If this is amplitude modulated, these disturbances add to and even drown out the signal modulations. But the FM receiver responds only or almost only to frequency variations and is very insensitive to amplitude changes. Hence the disturbances are not heard or are very much reduced.

BAUXITE

BAUXITE, ore of aluminum, is one of the most impartially distributed of all strategic minerals. None of the warring powers has a monopoly of it. There are large deposits in both North and South America, to meet this country's requirements. Britain has Empire sources in India, Africa and Australia, and her Dutch ally in the Netherlands Indies. There are vast beds of bauxite in the U.S.S.R. The Axis powers, on their side, have mines in their own and in conquered territories: Hungary, Italy, Yugoslavia and France, with undeveloped deposits also in Greece and Rumania.

The largest deposits in the United States are in Arkansas, but there are also workable beds in Alabama, Georgia, Mississippi, Tennessee and Virginia. The Aluminum Company of America, until now the only producer of aluminum directly from the ore in this country, has not worked the domestic beds to the limit, preferring to supplement the home supply with high-grade bauxite from Surinam (Dutch Guiana) and thereby conserve the ore resources within the boundaries of the United States. In addition to the Surinam bauxite, there are known to be immense deposits in Brazil, but these have not been opened up as yet.

Bauxite is a mineral that looks very much like hardened, fine-grained clay. Essentially it is an oxide of aluminum, with some water intimately bound in. But combinations of other elements are almost always found with it: iron, silicon and titanium principally, with much smaller quantities of calcium, magnesium, sulfur, manganese and chromium. In its purest form, bauxite is grayish white, slightly tinged with yellow; but presence of the other elements, notably iron, gives it a wide range of shades, from pink or yellow to dark red or brown.

The mineral gets its name from the village of Les Baux, in southern France, near the city of Arles. Here is was first identified and described by P. Berthier, just 120 years ago.

CYCLOTRON TREATMENT OF CANCER

DR. JOHN C. LARKIN, research associate in the radiation laboratory, and Dr. R. S. Stone, professor of roentgenology in the Medical School of the University of California, reported at the San Francisco meeting of the Radiological Society of North America that sixty-one of one hunhundred and twenty-nine patients who faced death from advanced cancer have been saved and some of these perhaps cured by treatments with the great atom-smashing machine—results so encouraging that less advanced cases will now be treated by the physicians at the University of California.

One hundred and fifty-three patients have been treated during the three years. The 129 with which the report was concerned were treated with the 225-ton cyclotron; the remaining 24 with the 85-ton cyclotron.

Beams of neutrons—sub-atomic particles—are given off by the cyclotron during the atom-smashing process. These neutron beams are shot into the cancerous tissue, producing a marked shrinking of the tumor. The patient feels no sensation, however.

Drs. Larkin and Stone reported that cancer of the skin with extension into the underlying bony structures, cancers of the mouth and throat and primary cancers of the prostate gland have shown the best response to treatment. They said results are "encouraging," and enough is now known about cyclotron treatment to start using it on patients with less advanced cancer.

ITEMS

THE fifth annual Wright Brothers Lecture will be heard by members of the Institute of the Aeronautical Sciences on December 17, the anniversary of the first flights at Kitty Hawk in 1903. The lecture will be presented at Columbia University by Professor Richard V. Southwell, British aerodynamics expert. He will speak on "New Pathways in Aeronautical Theory." Dr. Charles G. Darwin, director of the National Physical Laboratory of England, who has been in this country for some months, will act as honorary chairman.

A RAINBOW at high noon, something very rarely seen in the sky, was visible for a short time at Washington on Friday, December 5, at exactly 12 o'clock. Because the sun was high, the bow (which always forms opposite the sun) was quite low in the northern sky, but distinctly outlined and with bright coloring. Screened by high buildings, it escaped the view of many persons in the downtown district, but even there it could be glimpsed up the vistas of north-and-south streets.

X-RAYS at million-volt intensity were used on fruit trees, berry bushes and vegetable seeds in the laboratories of the General Electric Company at Schenectady to change the physical set-up of the heredity-bearing cells and produce, if possible, new varieties of plants. The trees and bushes were exposed to the million-volt bombardment for an hour, the seeds for intervals stepped up from 12 to 60 minutes. They have been planted by genetical researchers at the New York State Experiment Station at Geneva. The exposures were conducted by Dr. Bernhard Nebel, of Cornell University, assisted by Dr. E. E. Charlton and C. D. Moriarty, General Electric research men.

A NEW 3,000-watt mercury vapor lamp, the largest of its type in the world, has been announced both by the General Electric and Westinghouse Companies. General Electric believes that the new lamp will be a boon for the lighting of steel mills, foundries and other shops where large areas require a lofty mounting of the lights. Westinghouse plans to use the lamp if possible for a new lighting of the torch of the Statue of Liberty. The 3,000-watt mercury lamp is a tubular light source 55 inches in length and a trifle over an inch in diameter. It is rated at 120,000 lumens, which is eight times more powerful than its nearest rival, a 400-watt mercury lamp. The new lamp gives twice as much light per watt as an incandescent lamp.

A NEW super-liquid state, in which the substance is much more fluid than it was originally, was found to occur in certain liquid films one molecule in thickness just before solidifying. The discovery was made by Drs. William D. Harkins, Lyle E. Copeland and George E. Boyd, of the University of Chicago, and was announced by them in a paper presented at the Chicago meeting of the American Physical Society. This is of course the opposite of the usual behavior of liquids in solidifying, which generally become more viscous (less liquid) as the freezing point is approached. The substances which showed this peculiar behavior were three forms of the higher alcohols which have high freezing points. They were particularly chosen because they have long, chain-like molecules like those of lubricating oils. The investigation is of importance in studying the behavior of lubricants, paints and cleaners.