ASTRONOMY

1951 Astronomy Highlights

Ten top achievements include computing positions of five outer planets over 407-year period and finding neutral hydrogen radiation in space.

➤ ASTRONOMICAL HIGHLIGHTS for the past year picked by Dr. Harlow Shapley, director of Harvard College Observatory, Cambridge, Mass., are:

1. Calculation with large digital computing machines of the positions of the five outer planets for the years 1653 to 2060. This was done by Dr. W. J. Eckert of the International Business Machine's Watson Scientific Computing Laboratory, with the assistance of G. M. Clemence of the U. S. Naval Observatory and Dr. Dirk Brouwer of Yale University Observatory.

2. Measurement of velocities up to 3,300 kilometers (about 2,050 miles) per second for hydrogen nuclei (protons) in the aurora borealis. This work by A. B. Meinel of the Yerkes Observatory indicates that protons are the source of much if not all the energy for auroral displays.

3. Raising to over a hundred the number of known "radio stars," detection in the microwave region of radiation from three or four of the brighter spiral galaxies, and progress in the measurement of microwaves from the solar surface. These rapid advances in radio astronomy were made chiefly by radio engineers at Manchester and Cambridge, England; Sydney, Australia, and Leiden, Holland.

4. Putting into operation two special types of Schmidt telescopes: one, the instrument in South Africa owned jointly by Armagh Observatory of North Ireland, Dunsink Observatory of Eire and Harvard Observatory; the other, the first ever designed exclusively for tracking meteors. Both instruments were designed by Dr. James G. Baker and their operation is associated with Harvard Observatory.

5. Theoretical prediction and actual measurement of radiation from neutral hydrogen in the space between the Milky Way stars. Discovery of this invisible hydrogen gas had been predicted by Dr. I. I. Rabi and associates at Columbia University, E. M. Purcell of Harvard University and Dr. H. C. van de Hulst of Leiden Observatory, the Netherlands; Dr. Harold I. Ewen of Harvard University first detected and measured its radiation with a radio telescope.

6. Measurement by Dr. John Hall of the U. S. Naval Observatory of the polarization of light from one and only one of the stars in the Pleiades, an A-type star whose light is highly reddened as it travels from star to observer.

7. Discovery of 216 new variable stars in the so-called Sculptor cluster, wide-open spheroidal galaxy, and prediction that the total number would run over 700. This finding of Dr. A. D. Thackeray of Radcliffe Observatory, Pretoria, South Africa, is important in verifying the belief that stars making up spheroidal galaxies and globular clusters are much alike.

8. New theory of the ice ages, developed by Dr. Ernst Opik of the Armagh Observatory, North Ireland, attributes both the Paleozoic and Pleistocene glaciations to changes in the radiation of the sun resulting from temporary disturbance in production of atomic energy radiation deep in the sun.

9. Measurement of radial velocities of external galaxies more distant than any heretofore recorded. Dr. Milton Humason, working with spectra only two millimeters long (less than 0.02 of an inch) obtained with the 200-inch Palomar telescope, deduced that some galaxies are rushing away from the solar system at speeds up to 38,000 miles a second, about one-fifth the speed of light.

10. Demonstration that primary cosmic radiation, unlike that with which we are familiar at the earth's surface, is composed of the nuclei of the elements from hydrogen to iron and beyond, with hydrogen nuclei (protons) dominating. Physicists at the University of Minnesota and Rochester University made the measurements with photographic film carried by balloons to an altitude of 100,000 feet.

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MARINE BIOLOGY

Largest Rock Fished From 3-Mile Pacific Deep

➤ A NEW deep-sea fishing record has been set by scientists just returned to La Jolla, Calif. Their prize came from the ocean floor, three miles down.

The find—probably the largest rock ever dragged up from a three-mile depth—is now being examined at the University of California's Scripps Institution of Oceanography.

Like many other objects—rocks, whale bones and sharks' teeth—dredged up from the ocean's floor, this 100-pound mass is covered with manganese dioxide. Manganese, a metal used in hardening steel, is known to exist on the bottom of all oceans, and in the dioxide form it coats ocean objects.

By finding out what lies underneath the chemical coating, scientists may get new information on the age of the Pacific, for manganese dioxide does not accumulate on rocks on land.

The prize find was brought up only by chance. Oceanographers on the research vessel *Horizon* had been using a new, more

FISHING FIND—Accidentally dredged up from three-mile deep ocean floor, this manganese concretion is being examined by Jose Barandiaran, Harris B. Stewart, Jr., and John D. Cochrane of the Scripps Institution of Oceanography.