

ASTRONOMY

Plane Eclipse Pictures Show Million-Mile-Thick Corona

Photographs Taken By Amateur Astronomer But Veteran Stratospherist Result in Discovery

THE SUN'S corona consists not merely of the spectacular array of pearly-hued streamers seen during a total eclipse, but of a uniform, globular, million-mile-thick blanket.

Such is the revelation of photographs snapped from a sub-stratosphere airplane during the June 8 eclipse by Major Albert W. Stevens, noted for his stratosphere balloon explorations, who was a member of the Hayden Planetarium—Grace Eclipse Expedition. The implications of this discovery were discussed at a conference held at the Harvard College Observatory.

Leading astronomers attending the conference say that all of Major Stevens'

plates "clearly show the corona as a globular shell surrounding the sun with a depth considerably greater than a solar diameter."

Streamers Less Important

Heretofore astronomers studying the corona have devoted most of their attention to the radiant streamers which completely dominate the usual eclipse photographs taken from the ground. On Major Stevens' plates, however, the bright tracery has been proved to be of secondary importance in the immense globular envelope.

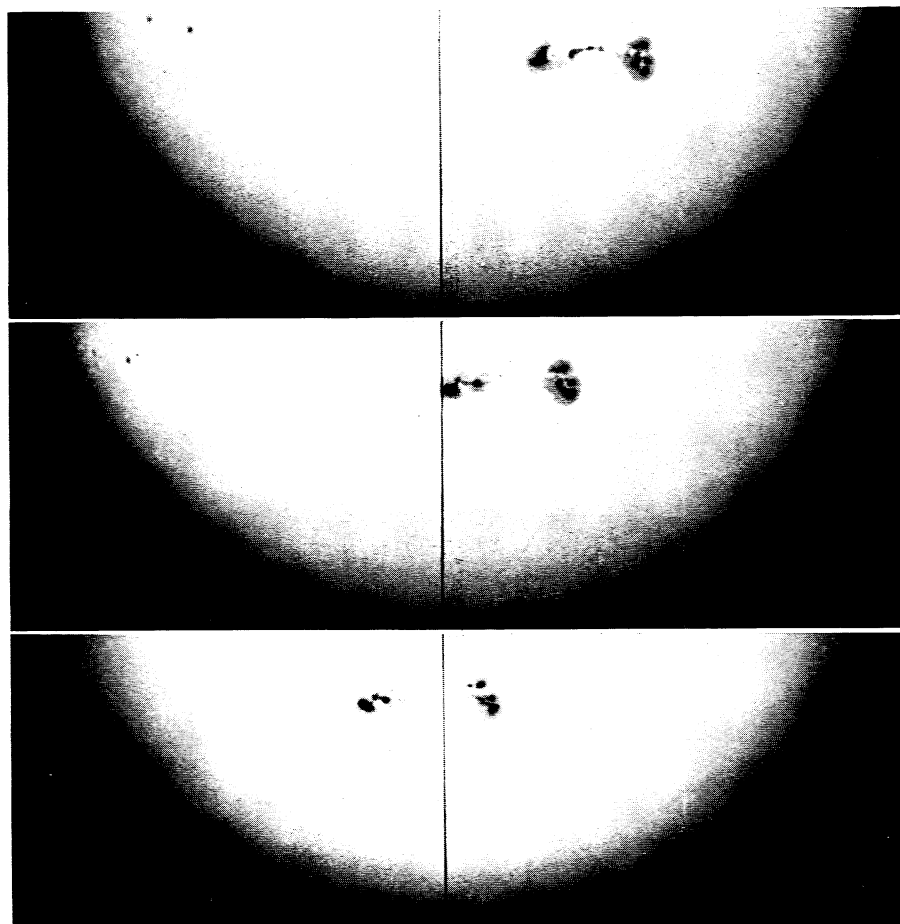
According to Dr. Harlow Shapley, director of the Harvard observatory, the

great difficulties encountered by Major Stevens in making his observations at a 25,000-foot altitude were well worth while, for it was this great height that made his remarkable pictures possible. In the sub-stratosphere Major Stevens was above approximately two-thirds of the earth's atmosphere, and thus avoided most of the dust particles and air molecules which tend to obscure ground pictures of such difficult subjects as the corona.

An interesting feature of the discovery is that Major Stevens' highly important findings were unexpected and largely accidental. One of numerous field observers in the Hayden Planetarium—Grace expedition, Major Stevens aimed principally at reaching a sufficient altitude to photograph the spectacular course of the moon's shadow racing across the earth.

May Revise Methods

His discovery, it was predicted, will probably affect traditional methods of observing eclipses, leading to increased use of sub-stratosphere observations. Further analysis of the corona must await the South American-South African eclipse three years hence, when scientists plan to study the (*Turn to next page*)



PHOTOGRAPHY

Over Twenty Earths Could Be Put In Giant Sunspots

YOU could drop over twenty earths into the giant sunspots which recently obscured the surface of the sun.

When observed on July 26 the spots were joined into a single greater unit that occupied some 20 square degrees of the sun's surface. This area amounts to well over a billion square miles and more than equals the area of twenty great circles formed by cutting an imaginary section through the earth at the equator.

Astronomers are interested in the spots not alone because of their size but also because the "parent" spot reversed the usual procedure of a sunspot and broke up as it approached the sun's meridian line.

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SPLITTING

Almost as groups of cells divide, this huge group of sunspots is splitting in the middle as it nears the meridian of the sun. The photographs were taken at the U. S. Naval Observatory on July 27, 28, and 29.

phenomenon from the sub-stratosphere with ultraviolet lens systems, spectroscopes and polarizing screens.

Another comment on the discovery came from Dr. Donald H. Menzel, Harvard's authority on solar phenomena and leader of the Harvard-Massachusetts Institute of Technology expedition to Siberia last year. Major Stevens' discovery, he said, is "of great importance and will have an immediate bearing on the interpretation of the structure of the sun's upper atmosphere."

Guided by Major Stevens' discovery, Dr. Menzel has re-examined plates taken by Harvard last year, and has found the globular coronal blanket recorded on some of them, although, because of the brighter sky background, they showed not nearly as clearly as on the photographs taken in the sub-stratosphere. Two European astronomers, Bergstrand and von Klueber, had obtained previous indications of the globular form of the corona, but a complete appreciation of its nature was not reached until Major Stevens' pictures were studied.

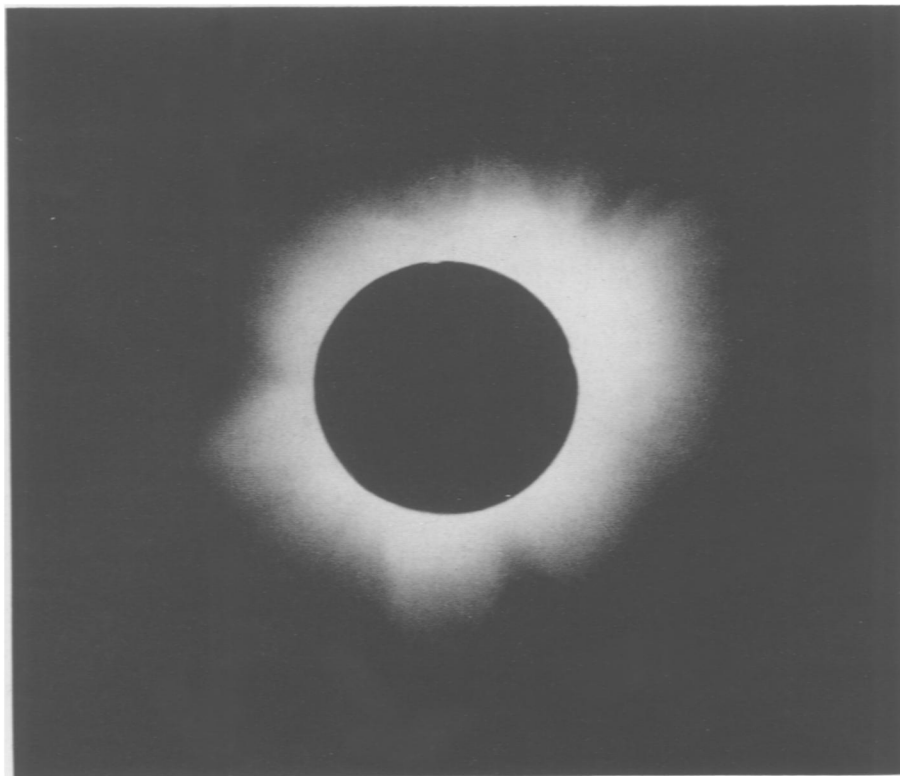
No Optical Defect

Rigid tests by Drs. Kenneth Mees and Walter Clark of the Eastman Kodak Laboratory, and by Dr. Brian O'Brien of the Institute of Optics of the University of Rochester, were made to investigate the possibility that the unusual appearance of the corona on Major Stevens' plates was caused by optical or photographic defects, or by minute ice particles in the stratosphere. Fifty scientists from a dozen American observatories accepted the results of these tests as conclusive evidence that a natural phenomenon had been photographed.

In reporting the discovery, Dr. Shapley pointed out that two of the most significant observations of this year's eclipse were made by amateur astronomers. Major Stevens, although an expert in stratospheric flight and aerial photography, is not a professional astronomer, while the best coronal photographs ever made in polarized light were snapped by an amateur astronomer, Fernando de Romana, of Arequipa, Peru.

Major Stevens' pictures were taken near Lima, in a Pan-American Grace Airways plane, piloted by Capt. Charles Disher and co-pilot W. E. Gray. W. O. Runcie, Lima photographer, assisted in the difficult task of making the pictures. They include 11 photographs with a 24-inch camera, four with an 8¼-inch camera and 150 feet of motion picture film made with a 6-inch lens.

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USUAL PRINTING

In this print made by the customary method of shining light through the negative, the delicate detail of the globular corona is largely lost. This is Major Stevens' photograph taken during June 8th eclipse at an altitude of 25,000 feet. See illustration on next page.

ANIMAL PSYCHOLOGY

Bass Taught to Distinguish Between Colors in Research

WHEN you select a fly with a dash of red, or trail a plug or spinner gaudy with yellow, you have good scientific warrant for the use of bright colors in luring your fish. Experiments supporting this conclusion are described in a new publication of the Illinois Natural History Survey.

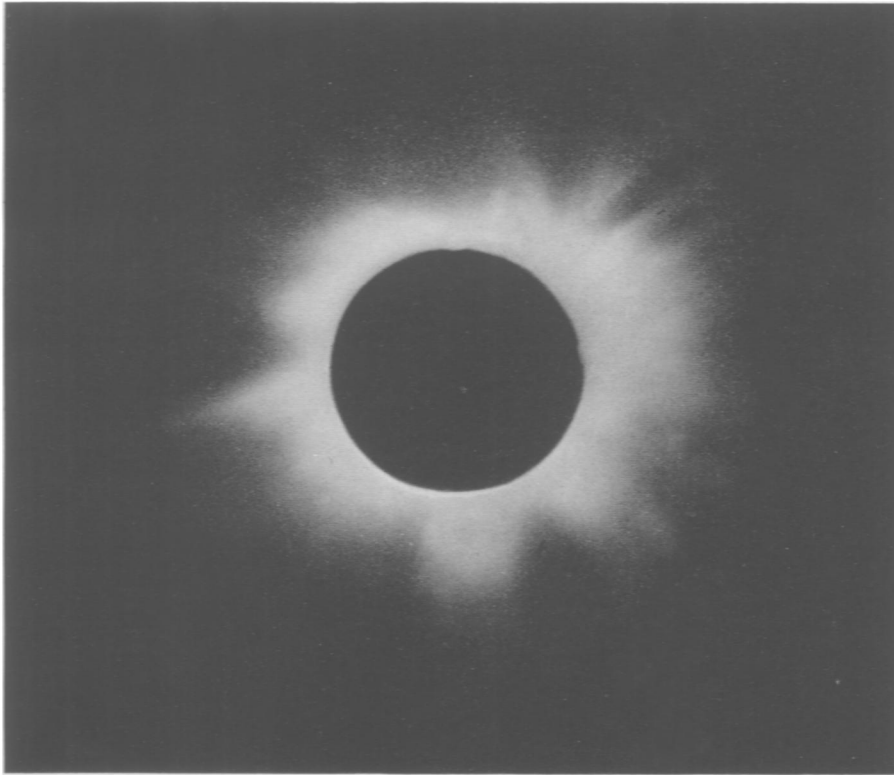
The experiments, performed by Dr. Frank A. Brown, Jr., indicate that large-mouth black bass "are able to distinguish among colors in about the same manner as would a human being with perfectly normal color vision, looking through a yellowish filter."

A system of rewards and punishments was used to train fingerling bass to distinguish between colors and various shades of gray. Individual fish were kept in pans of water and rewarded with a water flea or a mosquito wiggler when they approached the proper color, or

punished with a light electric shock when they came near any other color or shade of gray. Medicine droppers covered with adhesive tape of the different colors and shades were always shown the fish at the same place in the pan. Fourteen thousand tests of trained bass were made.

Large-mouth black bass are alert, active and lend themselves readily to laboratory experiments. Five to ten training trials are sufficient to teach them to discriminate between red, yellow, green and blue. When the difference in color is small the training must be longer. Memory for certain colors lasts for weeks, perhaps months. Fish trained to come to rose red can distinguish unaccustomed shades and tints and combinations of red from black, white and all intermediate grays. Yellow and green are also recognized as colors but less certainly.

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GLOBULAR CORONA REVEALED

The delicate detail of the newly discovered envelope is brought out by photographing the image on the negatives onto other film by reflected light. This was done from Major Stevens' high altitude photograph by the Eastman Kodak Research Laboratories.

BIOLOGY

Find That Plant Cancer Can Be Caused by a Chemical

AN important discovery of how tumors can be caused in plants, made at the University of Chicago, may influence the trend of research in the study of human cancer.

The husband-wife research team of Profs. George K. K. Link and Adeline DeSale Link, with the help of research assistant Hazel W. Wilcox, found that crown gall, or plant cancer, can be created by applying a special chemical to a plant. Significant point is that this plant disease, long known to be caused by the bacterium organism *Phytoplasma tumefaciens*, can also be caused by the application of a growth hormone, beta-indoleacetic acid, an organic chemical compound.

In the plant experiments it was discovered that the applications of the organic acid not only could produce plant tumors but also, when given in varying concentrations, produced different ef-

fects. Some treatments stimulated healthy growth of the plant and other treatments produced "every type of disease symptom known to the plant pathologist," to quote the announcement of the discovery.

"Research workers in human cancer," continues the report, "have been searching for a specific substance responsible for the production of unhealthy cell growth. The botanical discovery that a growth hormone, under varying conditions and in varying amounts and concentration, causes diverse effects may open an additional line of attack on the cancer problem."

Crown gall is a plant disease of economic importance in the rose family, particularly apple trees. Botanists have known for 30 years that the disease is caused by the bacterium, which enters wounds, especially improperly made grafts. The disease is controlled through

quarantine and destruction of infected trees.

While crown gall is known as a plant cancer it is unlike human cancer in that it does not show the process of metastasis, in which human cancer sends into the blood stream cells which can cause cancer in the other parts of the body. Plants, of course, do not have a circulatory system in the human sense of the word. Rather the spread of crown gall through a plant is accomplished by sending out strands which can cause other galls to occur.

Beta-indoleacetic acid, causing the plant cancers, has been known since the 1880's and in the last five years it has been found to be a growth hormone.

By controlling the concentrations and the amounts of the acid applied to plants the Chicago investigators have been able to produce all the following conditions in plants: tumors, wilting, discoloration, root formation, death and healthy growth.

The report is published in the *Botanical Gazette*.

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ANTHROPOLOGY

Fossil Man of China Now Considered Oldest Human

WHO was the first man? This is one of the major questions of all science.

In layers of earth in various parts of the world are found a few fragmentary bones of human-like creatures that lived and died long before the dawn of history. This record of human evolution constitutes one of the great pieces of scientific sleuthing.

In China, not far from Peiping, near the scene of the Japanese-Chinese military and commercial struggle, over a score of ancient fossil human remains have been found at a site called Choukoutien. *Sinanthropus pekinensis* is the name given to these extremely primitive yet human creatures. *Sinanthropus* is pronounced even nearer to the apes than famous *Pithecanthropus*, ape man of Java.

Dr. Franz Weidenreich, visiting professor of anatomy at the Peiping Union Medical College, looks both ways in time from the era of *Sinanthropus* and foresees that the ancient soil of Asia will bring forth relics of men both earlier and later than the men of Choukoutien. *Sinanthropus* was living before the great Ice Ages, the Pleistocene, began. He knew the use of fire and implements. Obviously human culture began with a