

ASTRONOMY

Puzzle of Sun's Coronal Halo Solved by New Swedish Theory

Green Line in Spectrum, Thought Due to Coronium, Ascribed to Atoms Broken by Powerful Excitation

ASTRONOMERS are excited by news from Sweden that one of their colleagues, Dr. Bengt Edlen, has found a satisfactory solution for the problem of "coronium"—which they once thought was an unknown element causing a strange green line in the spectrum of the sun's outer shell, its corona.

Dr. Edlen ascribes this and other mysterious lines to broken atoms, with many more electrons removed from their shells than anyone has supposed up to now. His researches indicate that there is some yet unidentified but powerful excitation from the sun that breaks these atoms. They also indicate that the sun is sending to the earth very short ultraviolet rays, which possibly play a part in producing the ionized layers of our atmosphere and make long distance radio possible.

Dr. Polydore Swings, Belgian astronomer now on the staff of the Yerkes Observatory, Williams Bay, Wis., has just made known the research. He describes it as "most certainly the most brilliant attack ever made upon the problem of the line spectrum of the solar corona."

Dr. Swings was associated with Dr. Edlen in previous researches and spent some time discussing this with him in the summer of 1939.

The line spectrum of the corona has been observed for about seventy years at the times of total solar eclipses, and, in recent years, with an instrument called the coronagraph. This spectrum, produced by passing the coronal light through a prism, or reflecting it from a grating ruled with thousands of lines to the inch, shows more than twenty lines, some quite conspicuous.

Most prominent is a green line. There are also two red ones, two in the infra-red and one in the ultraviolet. The last three are not visible, but can be photographed. Many previous suggestions have been made to explain them, but these have been unsuccessful.

Dr. Edlen proposes that they are so-called "forbidden" lines, that is, due to atomic changes which cannot take place under ordinary circumstances. However, such changes do occur in the great gase-

ous nebulae in the sky. As a result of laboratory tests, he concludes that the atoms in the corona are much more highly ionized than has previously been considered. That is, more of the electrons which revolve around in them, like the planets in the solar system, have been removed. The green line, he suggests, is caused by iron atoms thirteen times ionized. By some as yet unexplained excitation, thirteen of the electrons are removed from the iron atom.

The next three strongest lines, the two in the infra-red and the one in the ultraviolet, he ascribes to iron atoms from which twelve electrons have been removed. Weaker lines are caused by nine and ten times ionized iron, while eleven and twelve times ionized calcium and eleven, twelve, fourteen and fifteen times ionized nickel account for others.

"The general result," said Dr. Swings,

"points to a maximum abundance for ions with ionization energy of about 400 volts and the source of such a tremendous excitation is very puzzling. Edlen concludes that 97 per cent of the coronal line emission is now explained and that the coronal matter has a chemical composition similar to the average composition of the meteorites; this suggests a possible origin for the coronal matter."

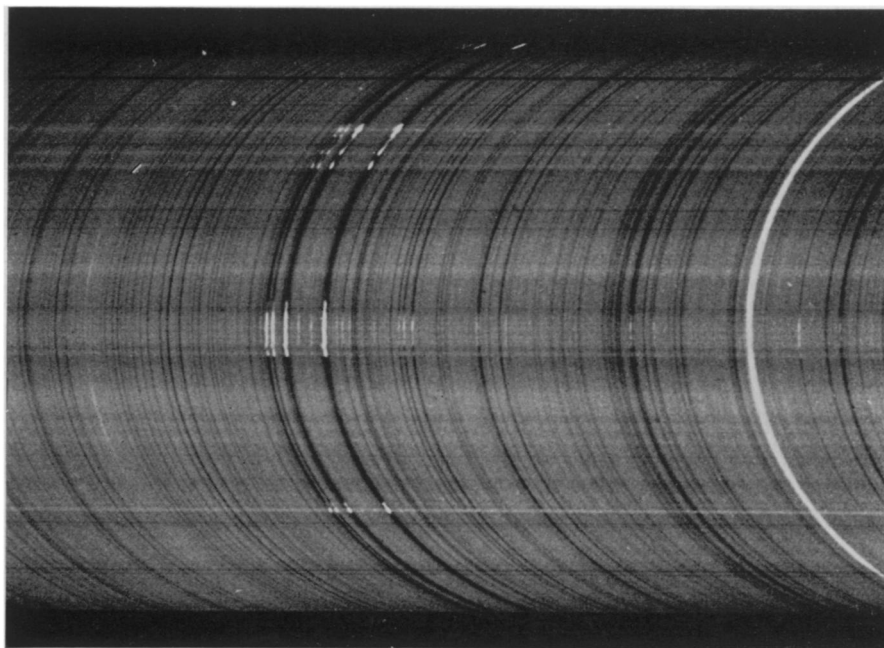
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"Quite Convincing"

DR. Edlen's theory of the probable cause of the lines in the spectrum of the sun's corona is "quite convincing," declared a scientist who has worked in the same field. He is Dr. Joseph C. Boyce, assistant professor of physics at Massachusetts Institute of Technology.

In a statement prepared for Science Service he said:

"Edlen's proposed identification of the lines of the solar corona is extremely interesting. Starting from a suggestion made by Grotrian two years ago for two coronal lines, Edlen has now identified thirteen more lines including all of the important lines in this hitherto mysterious spectrum. The many previous proposed solutions of this problem have all turned out to be wrong, but none of



GREEN MYSTERY

The green line in the corona spectrum is the prominent white arc to the right, shown in this photograph made, without an eclipse, by Dr. Bernard Lyot, from the Pic du Midi in France.

them involved as large a fraction of the observed lines. The more lines of a spectrum that are identified, the less likely it is to be due to chance coincidence.

"All of Edlen's previous work in spectroscopy has been of the highest quality and the present proposal shows all the signs of his usual careful work. From the point of view of a physicist working in spectroscopy rather than an astronomer, the present proposals appear quite convincing. They do raise a number of problems for astronomers and for radio engineers. The energies involved in the excitation of these coronal lines now turn out to be far higher than had previously been considered. Also it must now be supposed that ultraviolet light of still shorter wave length must fall on the upper part of the earth's atmosphere.

"This may well play a part in the formation of some of the ionized layers which are involved in the transmission of radio waves around the curved surface of the earth. It is hoped that investigators will soon find additional evidence on either of these points, so as to confirm Edlen's identifications. The outstanding problem of astronomical spectroscopy can then be considered as solved."

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BIOLOGY

Centrifuge Distinguishes Cancer Cells from Normal

A NEW and sensitive test to show the difference between normal and cancer cells was described before the meeting of the American Association of Anatomists by Prof. M. F. Guyer and Dr. P. E. Claus of the University of Wisconsin.

The cancer cells examined were from tumors artificially induced in rats by the feeding of a cancer-causing chemical known as butter yellow. (Butter yellow, incidentally, is not found in butter; the name was applied to the chemical because of its color only, and before its cancer-causing proclivities became known.) They were compared with healthy cells from the same animals.

Tests were made by whirling numbers of cells, both healthy and cancerous in all stages of development, in a high-speed centrifuge. The contents of healthy cells proved sufficiently fluid to permit their separation and arrangement into strata, or layers, under the powerful centrifugal force. Cancerous cells whirled at the same speeds failed to stratify, indicating that their contents are more viscous, or "thicker," than those of normal cells.

Science News Letter, May 10, 1941

MEDICINE

Germ-Killing Chemical From Soil Bacteria Cures Humans

Brings Swift Recoveries From Virulent Infections In First Trials; Most Effective Germicide Yet Known

A CHEMICAL from the earth itself, most powerful germ killer yet discovered, better even than the sulfa drugs themselves, has cured in remarkably short time an array of difficult and dangerous human ills, doctors from the Mayo Clinic and the Massachusetts Memorial Hospitals announced to the American Society for Clinical Investigation in Atlantic City.

The new wonder chemical is gramicidin. It is produced by bacteria that live in the soil. The discovery of this chemical was announced to the scientific world in 1939 by Dr. René J. Dubos of the Rockefeller Institute for Medical Research, but these reports are the first on the use of gramicidin in humans.

Empyema from pneumonia, sinusitis, bladder infections and dangerous and hard-to-cure staphylococcus infections in wounds are the conditions this new chemical remedy cured in very short time.

Infected wounds were freed of all bacteria within 24 hours after gramicidin treatment, following which the wounds rapidly healed, Dr. Charles H. Rammelkamp and Dr. Chester S. Keefer, of Boston, reported.

"This is a distinct advance inasmuch as former antiseptics would not rid the wound of bacteria without seriously damaging the tissues," Dr. Rammelkamp pointed out.

Sinus infections were cleared up within 48 hours, Dr. Wallace E. Herrell and Dr. Dorothy Heilman, of the Mayo Clinic, reported. Severe bladder infections which the sulfa drugs do not affect were cured within one week.

Gramicidin is the most highly effective agent yet discovered for stopping the growth of bacteria, Dr. Herrell declared.

Trials on 12 patients at the Mayo Clinic were reported in detail, although three more have also benefited.

It has one disadvantage. It breaks down red blood cells by the process called hemolysis. This toxic property of the new chemical remedy was discovered by the Mayo Clinic scientists in experiments with the chemical on pieces of tissue growing outside the human body. These scientists also found a way

to prevent this red blood cell-destroying action. This can be accomplished by heating the gramicidin. The heating, however, reduces its effect on the germs.

Gramicidin, therefore, cannot be used, unless heat-treated, where it will come in contact with the blood. This means it is not suitable for injection into the veins. It can, however, be safely injected into such cavities as the sinuses, the bladder, and infected but not bleeding wounds and any local infections such as ulcers.

White blood cells, which are part of the body's defense against germs, are not harmed by gramicidin.

The tremendous potency of gramicidin is shown by the fact that one gamma, or one-thousandth of a milligram, of the substance will stop the growth of virulent streptococcus and pneumonia germs in tissues. One milligram is the equivalent of slightly more than one-hundredth of a grain. Strongest concentration used in treating patients at the Mayo Clinic was 400 gamma per cubic centimeter.

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ACADEMY MEETS

Distinguished scientists gathered in Washington last week for the annual spring meeting of the National Academy of Sciences. Photographed in informal discussion between sessions by Fremont Davis, Science Service staff photographer, are: Top row, left to right, Dr. Edward C. Tolman, University of California and his brother, Dr. Richard C. Tolman, National Defense Research Committee; Prof. Ernest O. Lawrence, University of California; President Karl T. Compton, Massachusetts Institute of Technology, and his brother, Prof. Arthur H. Compton, University of Chicago. Center row, Prof. Edwin G. Conklin, President of Science Service; Dr. Harlow Shapley, Harvard College Observatory; Dr. Irving Langmuir, Nobelist, of General Electric Research Laboratory; Dr. Henry N. Russell, Princeton; Prof. George D. Birkhoff, Harvard University; Dr. R. W. Wood, Johns Hopkins University. Bottom: Dr. Frank B. Jewett, president of the National Academy of Sciences; Dr. J. McKeen Cattell, editor of Science; Dr. Henryk Arctowski, Smithsonian Institution; Lt. Paul A. Smith, Coast and Geodetic Survey, Prof. H. D. Curtis, University of Michigan. Shown at top and bottom of page are sections of the Act founding the National Academy of Sciences.