PHYSICS

Indian Scientist Awarded Nobel Physics Prize

His Discovery That Light Changes Color When Shining On Transparent Substances Brings Him Honor

THE DISCOVERY that light of a single color, or wavelength, shining on certain transparent substances, is partly changed to other colors is regarded as the greatest accomplishment so far of Sir Chandrasekhara Venkata Raman, Indian scientist of the University of Calcutta, who has just been awarded the Nobel Prize in physics. Named after its discoverer, this phenomenon is now known as the Raman effect, and it was first announced in the spring of 1928.

One of the first scientists, outside of Sir Chandrasekhara's own laboratory, to verify it was Dr. R. W. Wood, of the Johns Hopkins University. Working at the private laboratory of Alfred L. Loomis, Tuexdo Park, N. Y., Prof. Wood considerably improved the original apparatus of the Indian scientist and detected the effect in the summer of 1928.

The Raman effect occurs when monochromatic light (which is light of a single color, or wavelength) shines on transparent substances, such as quartz, chloroform, or water. Generally a mercury arc is used as the light source. The light that is scattered by the transparent material is mostly of the same color as that of the light illuminating it. The spectroscope, the instrument that analyzes light, however, shows that part of this light is changed to wavelengths a little longer or shorter than that of the source. That is, part of the light is either more reddish or more bluish.

On the spectrum photographs, the result is a heavy line, representing the main color, attended on either side by narrower and fainter lines. The fainter lines on one side are arranged the same way as those on the other, except that they are reversed, as if reflected in a mirror, the center heavy line being the mirror. Sir Chandrasekhara, in his first experiments, found only a single and very faint line on the high frequency, or blue, side of the main one; but with the improved apparatus Prof. Wood found groups of nearly equal strength on each side.

The great importance of the discovery came from the fact that the differences between the frequency of the exciting color, used to illuminate the substance, and the frequency of the additional, or Raman, lines are precisely the same as the frequencies of the infrared absorption bands of the same substance. These absorption bands, that is, the bands of color absorbed by the substance with infrared light, or light vibrating too slowly to be seen, are very difficult to determine directly, so the Raman effect is a very convenient means of studying them. Thus it gave a new means of studying the properties of the molecules of these substances, and of the structure of light.

Sir Chandrasekhara was born in India on November 7, 1888, and graduated from the Presidency College in Madras in 1904. In 1907 he joined the Indian Finance Department, and after that held various scientific positions, finally becoming Sir Taraknath Palit professor of physics at Calcutta University and honorary professor at Benares Hindu University. In 1924 he visited the United States, following the meeting of the British Association for the Advancement of Science at Toronto, to attend the centenary celebration of the Franklin Institute in Philadelphia. After that he served for a time as research associate at the California Institute of Technology at Pasadena. In the same year he was made a fellow of the Royal Society, the highest British scientific body. He was knighted in 1929.

SIR CHANDRASEKHARA VENKATA RAMAN

Professor of physics at the University of Calcutta and discoverer of the Raman effect. He has just been awarded the Nobel prize in physics in recognition of his work.

Science News Letter, November 22, 1930

CHEMISTRY

Honored for Research on Chemistry of Blood

Value of Pure Science Recognized in Award of Nobel Prize To Professor Hans Fischer of Munich, Germany

THE AWARD of the 1930 Nobel Prize in chemistry to Prof. Hans Fischer of Munich, Germany, for his research on human blood is a recognition of the value of what is sometimes called pure science, that is, discoveries or developments which are of great theoretical importance but which may or may not have practical value.

Prof. Fischer's recent noteworthy contribution was the synthesis, or laboratory production, of hemin, which is one of the components of hemoglobin, the red coloring matter of the blood.

Hemin has also been called the respiration ferment, said to rule the organic world. In the higher animals, hemoglobin is a transport agency for oxygen, carrying it from one place to another in the body, but the respiration ferment, hemin, takes up the atmospheric oxygen, which was transported by the hemoglobin, and transfers it to certain organic substances which in turn become oxidized. The respiration ferment is found in all living cells.

Prof. Fischer's synthesis of hemin made possible the artificial production of hemoglobin itself, which is indispensable for the life of animals, especially mammals.

When Prof. Fischer announced this synthesis last year, scientists hailed it as an important contribution to the chemistry of living matter. Some claims were made for it on practical grounds, but Prof. Fischer himself did not agree with these views.

"Contrary to many fantastical statements of the daily press no changes will take place in the field of therapeutics [treatment]" he said, "since hemin has been easily obtainable from blood for a long time. It is improbable that the intermediate products of the syntheses and the numerous isomeric hemins, on which work is being done, will gain a practical importance but their investigation is of interest from a theoretical viewpoint."

Prof. Fischer was born at Hoechst-am-Main in 1881. He studied at the University of Lausanne, at Marburg, where he received the degree of doctor of philosophy, and at Munich, where he was made a doctor of medicine. He has been on the faculties of various German universities and is now head of the Organic Chemical Institute of the Munich Technical High School.

Science News Letter, November 22, 1930

AVIATION

Pilot Can Now Land His Plane Without Seeing the Field

Curved Course to the Ground is Indicated on Instrument Board by Ingenious Use of Short Wave Radio

AVIATORS can not only fly from city to city without ever seeing the ground, but now it is possible for them to make a perfect landing on a field completely enveloped in the densest fog, that not even the most powerful light beacon can penetrate. That is, they can do so if their plane and the field are equipped with the newest radio apparatus developed by the Bureau of Standards. By experiments made at the College Park airport, near Washington, H. Diamond and F. W. Dunmore, two of the Bureau's radio engineers, have developed the new system.

Two radio sets are used. One is the same set used for receiving the powerful radio beacon signal in flying between cities. This is also used for the reception of spoken orders, and other signals received with head phones. For landing at the proper angle, an ultra-short wave receiver is used, as the signals for this are of about 3½ meters wave length, or 93,700 kilocycles.

The system developed several years ago for guiding the plane over the route makes use of two beam antennae. Each sends out a signal mainly in a certain direction. The two are oriented at right angles to each other, one to one side and the second to the other side of the route. As the plane flies half way between the two beams, the two signals are received with equal intensity, but if the pilot wanders to one side or the other, one signal becomes more powerful.

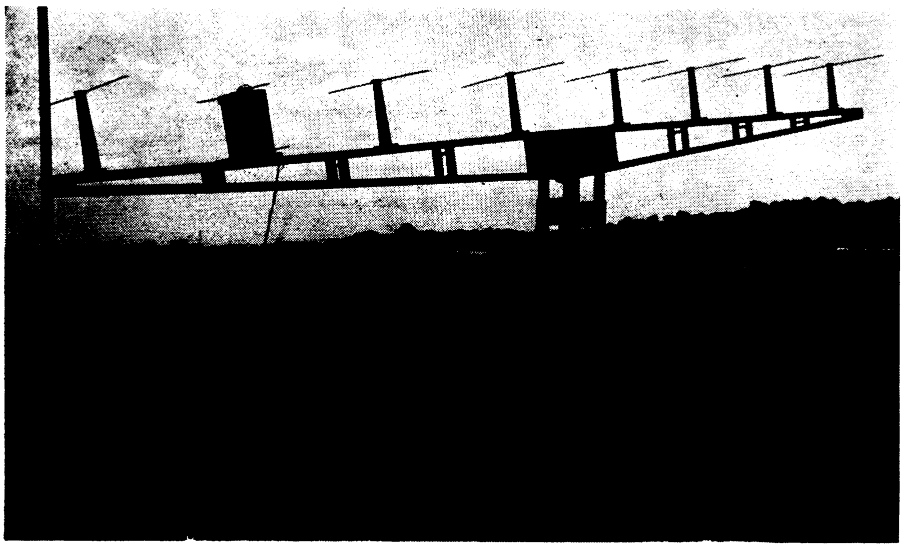
The bureau has developed two types of indicators for this arrangement. In one, a pointer on a dial remains at zero when both signals are equal, and moves to the proper side when one becomes more intense. In the other type, there are two vibrating reeds, the ends of which appear as two white bands on the instrument board. When both are the same length, the pilot knows that he is flying the proper course, but if one becomes longer, it indicates that the ship is off in that direction.

An arrangement exactly the same, but using lower power and smaller loop antennae in the transmitter, is used to give the pilot the direction of the runway on which he is to land. But in addition to the direction, he wants to know just when he is over the edge of the field, and when he is gliding at the proper angle.

To tell the boundary of the field, another type of transmitter is used, in which the signal, heard in the head phones, is loud as the pilot approaches the field, but disappears completely as the pilot is directly over the antenna, which is placed at the edge of the field.

To tell the proper angle at which to glide, the engineers have developed a very ingenious arrangement making use of signals at a very high frequency, or short wave length. These can be directed very accurately in a narrow beam. However, the pilot should not bring his plane down along a straight line, but along a curve, first dropping rapidly, then flattening out as he approaches the ground.

Along the center of the radio beam is the line of the greatest signal strength, but a short distance away it drops con-



SENDS SIGNALS FOR AIRPLANES TO GLIDE DOWN

Airplanes can land in the densest fog if the field is equipped with the apparatus shown above and the plane with the proper receiver. This is the directive antenna which transmits a very high frequency signal in a very narrow beam. The plane coasts down this beam like a sled down a snowy hillside.