SCIENCE NEWS

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THE NOBEL PRIZE IN PHYSICS

THE discovery that light of a single color, or wave-length, shining on certain transparent substances, is partly changed to other colors is regarded as the greatest accomplishment so far of Sir Chandrasekhar Venkataram Raman, of the University of Calcutta, who has 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. Research laboratories in all parts of the world are now engaged in studying it, because it has opened up an entirely new field in the study of molecular structure.

One of the first investigators, outside of Sir Chandrasekhar's own laboratory, to verify the discovery, was Dr. R. W. Wood, of the Johns Hopkins University. Working at the private laboratory of Alfred L. Loomis, Tuxedo Park, New York, Professor Wood considerably improved the original apparatus and detected the effect in the summer of 1928.

The Raman effect occurs when monochromatic light (which is light of a single color, or wave-length) 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 wave-lengths 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 Chandrasekhar, 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 improved apparatus Professor 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, is precisely the same as the frequencies of the infra-red absorption bands of the same substance. These absorption bands, that is, the bands of color absorbed by the substance with infra-red light, or light vibrating too slowly to be seen, are very difficult to determine directly, so the Raman effect was a convenient means of studying them, thus giving a new means of studying the properties of the molecules of these substances, and of the structure of light.

Incidentally, the Raman effect was a rather convincing proof of the validity of the quantum theory of light, which supposes that light and other radiation consist of separate pulses, or quanta, rather than waves. Five years before the effect was discovered, it had been predicted, on the basis of this theory, so when it was detected it immediately provided good evidence in favor of the existence of light quanta.

Sir Chandrasekhar 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 the University of Calcutta 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.

THE NOBEL PRIZE IN CHEMISTRY

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

Professor 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 or enzyme rules the organic world because in everything that happens in living matter, respiration furnishes the driving force. It is found in all living cells.

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

When Professor 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 Professor 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 syn-

theses 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. In addition, the influencing of the metabolism of the blood pigment in this way is not likely since this probably depends upon sterins or substances closely related to them.''

Professor 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. He has devoted himself to studying the pigments of blood and bile, and pyrrol chemistry.

EARLY MAN IN NEVADA

WITH high hopes of uncovering further data bearing on the last phases of the Pleistocene or ice age period in America, and especially on the association of man with animals now extinct, the joint expedition of the Southwest Museum of Los Angeles and the California Institute of Technology has resumed its exploration of Gypsum Cave near Las Vegas, Nevada. The work is in charge of Curator M. R. Harrington, of the Southwest Museum.

This is the cave which yielded, last spring, numerous bones of the ground-sloth, Nothrotherium, together with enormous claws with horny covering still intact and even masses of the coarse tawny hair of the same animal; also bones of two species of American camels and at least one type of native horse. All these are well-known Pleistocene or ice age species except the smaller of the two camels, which seems to be new. This was a tiny variety related to the South American llama, with slender limbs like those of a gazelle.

Even more important was the finding, in every room of the cave, of evidence indicating the association of man with these extinct animals, in the form of charcoal, burnt sticks, flint dart-points and crude wooden dart-shafts decorated with painted designs. These objects were found in the same deposits as the bones of the extinct animals, in some cases at lower levels, and in one instance a patch of charcoal, probably the remains of a campfire, was found beneath two layers of ground-sloth dung about eight feet below the present surface. Near the surface and far above the campfire were implements left by the Paiutes, the Pueblos and the Basketmakers, these last the earliest people hitherto known to have inhabited the southwest.

The finds were considered so important that the Carnegie Institution of Washington made a grant of money to the Southwest Museum to supplement the limited funds of the latter institution in carrying out the work. It is hoped that during the present season evidence will be found bearing on the question now puzzling the archeologists and paleontologists—whether man really existed in America twenty or thirty thousand years ago, the time usually assumed for the Pleistocene, or whether some of the Pleistocene animals lived on until more recent times, say, up to within ten or fifteen thousand years. It is also hoped to find human bones in the older deposits, from which it may be determined whether these early Americans were of the primitive type associated in Europe with the low-browed Neanderthal cave man who flourished in the Pleistocene period.

RADIO AS AN AID TO AVIATION

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 considerably. However, the nearer the transmitter, the louder is the signal. Therefore, if the pilot hits the beam head on near the center, then starts to drop, and, as he does so, approaches closer to the field, the signal will remain of the same strength, because the approach to the transmitter compensates for the greater distance from the center of the beam. The curve along which the signal maintains a constant strength is just about the same as the best landing curve. A meter on the instrument board indicates the signal strength, and is adjusted so that the pointer is at the center when the pilot follows the proper landing curve. It indicates either "too high" or "too low" if he departs from the right direction.

MODERN DAIRY METHODS

THE dairy farm has joined the industrial revolution and now cows are bathed, relieved of their milk and sent back to their barns by automatic machinery that resembles the constantly moving assembly line of a large automobile factory.

A rotary combine milker or "rotolactor" just put in commercial use for certified milk production at the Walker-Gordon Laboratories farm or "milk factory" near Plainsboro, New Jersey, milks fifty cows simultaneously with less cost, greater speed and less danger of contamination of milk than the old method of individual milking practiced for centuries.

Upon a sixty-foot circular platform there are fifty milking stalls. Each cow in turn steps upon the moving platform into a stall, where she is held in place by an automatically closed stanchion. As the platform slowly rotates, the cow receives an automatic warm water shower bath while above her the milking machine and milk jar of her stall is being cleaned and sterilized by machinery. Next the cow receives the attention of the attendant whose sole duty consists of drying the udders with individual sterilized towels. Next the cow is inspected by an expert hand milker who merely starts the milking process, which is accomplished by milking machines. Just 12½ minutes after the cow steps on the milking merry-go-round the milking is complete, the cow is automatically released to walk back to her barn for a dinner of special dehydrated alfalfa and other feeds to give a balanced ration. The jar containing her milk automatically empties into a weighing and recording device and flows through pipe lines leading to the bottling plant.

Under this new system the cow goes to the milking machines instead of the milker visiting the cow. Even this walk that the cow must take single file through the runways leading to and from the special rotolactor building contributes to her health. For these walks for her milkings three times daily gives her just the amount of exercise she needs.

Under this new system the cow barns become living and dining quarters exclusively and milking is done under the most hygienic conditions in the tiled rotolactor room which is fed with conditioned air.

In an eight-hour day of continuous operation the rotolactor when put into full-time operation will milk some 1,800 cows three times daily. At present there is only one rotolactor in existence, designed and perfected by the staff of the Walker-Gordon Laboratories farm under the direction of Henry W. Jeffers, president. Studies of feed production, both scientific and economic, and nutritional studies of the milk are among the extensive research projects under the direction of Dr. H. E. Van Norman, of the Borden Research Foundation, of which the Walker-Gordon Laboratories are a part. These other studies supplement the development of automatic dairying machinery like the rotolactor.

ITEMS

EVEN the plodding of plough horses will be speeded up to keep pace with our fast moving era, if British horse breeders succeed in the task to which they are now setting themselves. A team that can plough a 300-yards-long furrow nine inches wide can plough nearly two acres more during a month's work than can a team that ploughs only a 280-yards furrow in the same time. On a large arable farm this might amount to a saving of about $725 a year and might mean the margin between profit and loss under the new economic conditions. By mating active, free-moving mares and stallions that can sire progeny not merely able to move heavy loads but also able to move at a more rapid pace than is usual at present, the breeders hope to develop a plough horse capable of surviving competition of the machine age.

THE national health is a dollars and cents asset to the country, Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Co., recently told members of the American Public Health Association at their annual meeting. Absence of disease in a city not only makes it a more desirable place to live in but also brings added citizens and increased industry to it. The expenditure of $2.50 per capita or a total of about $300,000,000 every year would be enough to bring the best public health practices to the people of the United States. At present, however, we are spending each year less than $1 per capita for public health. "We as a nation are notorious for our large outlays of every character," Dr. Dublin said. "Our annual candy bill has been estimated as high as $690,000,000; perfumes and cosmetics consume another half a billion and our tobacco bill is rapidly approaching the two-billion mark, if it has not already passed that point. In a country as rich as ours, there should be no great difficulty in making available in a relatively short period of years the small sum which, if put into the hands of our health authorities, will give them the power to reduce sickness and prevent death consistent with our present knowledge."