SCIENCE NEWS

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MEASUREMENT OF THE SPECTRUM PHOTOGRAPHS OF STARS

THE radiometer has now been used to study the spectrum photographs of stars, which show their composition. This application has been made by Dr. Sinclair Smith and Olin C. Wilson, Jr., of the Mount Wilson Observatory.

The common form of radiometer, which was the invention of the great English physicist, Sir William Crookes, consists of four small vanes balanced on a pivot in a partially evacuated bulb. One side of each vane is polished, the other blackened, and the black side of one faces the polished side of the next. When heat radiation, either from the sun or an artificial source, falls on the vanes, they start moving in the direction of the polished sides. The reason for this is that the black side absorbs more of the radiation than the other, and is heated more. The molecules of the small amount of gas remaining in the bulb are constantly in motion. When they hit the warmer side, they bounce off with a greater kick than those hitting the polished side, and so they push the vanes around.

In the arrangement developed by the Mount Wilson scientists, two tiny vanes are used, suspended from a fiber of quartz. Thus they can not turn completely around, as they twist the fiber. To the upper part of the fiber is attached a small mirror. A beam of light falls on this mirror and is reflected to a moving photographic film. As a greater or less amount of radiation falls on the vanes, the fiber twists more or less, and the reflected spot of light moves back and forth, leaving a trace on the film.

The spectrum photographs to be studied are negatives, and show a series of parallel clear lines, of which the relative brightness and widths are significant, as well as their positions. To study them, a strong light is focused to a narrow line on the plate, which is then steadily moved by an electric motor. The light that passes through, and the heat that accompanies it, varies with the intensity of that part of the spectrum plate. This heat falls on the radiometer, and thus the moving spot of light reflected from the mirror traces on the film a record of the intensities of the spectral lines.

Such a device is called a registering spectrophotometer, and previous ones have used either thermocouples or photoelectric cells to detect the light changes. The former converts the heat into electric energy, while the latter makes a similar conversion of light. Dr. Smith states that the new device avoids the electrical difficulties accompanying each of these, and that it is more sensitive than the thermocouple. He also says that it is much simpler, and that many institutions might build one, though unable to afford the other and more expensive instruments.

COLLOID GOLD

GOLD dispersions in water, known to the ancients as "aurum potabile," have been purified here by a special method of "electrical decantation" and concentrated so as to contain up to six grams of gold per liter (a fifth of an ounce per quart).

Professor Wolfgang Pauli, of the Colloid Institute of the University of Vienna, who devised the method, has been able, by analyzing the concentrated pure sols, to identify the gold compounds which are present in small quantities in the usual gold sols and are needed to maintain the gold particles suspended in pseudo-solution in water.

These gold particles are extremely small—visible only with the aid of the ultra-microscope—and are maintained in constant "Brownian" motion by the bombardment of the surrounding water molecules. This alone would not be sufficient to prevent the particles of gold from coalescing. They are kept separate by the electric charge which causes them to repel one another.

The origin of this electric charge has been much discussed by colloid chemists during the last decades. Zsigmondy, one of the pioneers in this field of knowledge, maintained that the particles consist of pure gold, charged by adsorbed ions, that is, electrically charged atoms or groups of atoms attached to the surface of the gold particle. Pauli, on the other hand, brought forward the view that the surface of the gold is covered with a chemical compound of gold which breaks up or dissociates, giving positive ions to the surrounding water, while the complex iron ion with a negative charge remains attached to the gold particle. The compound in question, in the special case when the gold sol is prepared by passing electric sparks through electrodes immersed in water acidified with hydrochloric acid, has been shown to be the insoluble gold ("auro") hydrochloride which gives up its hydrogen ion to the water.

When the gold particles are coagulated by freezing, this auro-chloride passes into solution in the form of auri-chloride, with liberation of hydrochloric acid.

The new facts discovered by Professor Pauli are of value both theoretically and practically because they will enable chemists to foretell the behavior of many metallic colloids, which have already been used in therapy.

Colloid gold itself has been employed against alcoholism, a fact rendered common knowledge by the shortest "story of three generations" ever told.

"Gold mine, gold spoon, gold cure."

HEAVY WATER

PROFESSOR GILBERT N. LEWIS, of the University of California, has obtained by experiment pure water that is heavier than ordinary water and even denser than sea water. This extraordinary water has a specific gravity of 1.035, whereas normal water is the liquid upon which specific gravity measurements are based and therefore has a value of one.

More than one third of the hydrogen in the heavy water consists of the hydrogen isotope, of atomic weight approximately two, that was discovered in 1931. This variety of hydrogen is the same chemically, but is twice

as heavy as the more usual hydrogen atom. The heavy water, like ordinary water, consists of two hydrogen atoms combined with one oxygen atom, as expressed by the familiar formula, H_2O.

Heavy water was first produced at the U. S. Bureau of Standards in Washington last year, but Professor Lewis by using similar methods of manufacture has obtained a larger concentration of the heavy hydrogen isotope in the water and his heavy water is therefore heavier. The heavy water obtained at the University of California is 35,000 parts per million heavier than ordinary water, whereas the U. S. Bureau of Standards water is 1,400 parts per million heavier than normal.

Experiments showed that the University of California heavy water has a refractive index one tenth per cent. below that of ordinary water.

Professor Lewis used the method devised by Dr. E. W. Washburn, of the U. S. Bureau of Standards, and Professor Harold C. Urey, of Columbia University, of obtaining a concentration of the heavy hydrogen isotope. This depends upon the fact that the light weight hydrogen is given off in electrolysis of water before the double weight hydrogen, resulting in a concentration of heavier water.

CLIMATE CHANGES AND THE LAST GLACIAL PERIOD

EVEN those portions of the earth not covered by ice during glacial periods are indirectly influenced by the ice sheet. One of the rare instances where these influences could be detected was described by Professor William Morris Davis, visiting professor of geology from Harvard University, in a recent address at the California Institute of Technology.

The unusual locality was the Santa Monica mountains which rise out of the ocean immediately west of Los Angeles. There the effects of three successive glacial periods are visible. During these the sea receded and the steep cliffs which it wore from the mountains were left to be softened and filled in by land deposits. Meanwhile the land was rising, so that after the glacier withdrew the sea could not reach its old shore-line and consequently made new sharp cliffs at the lower level. This process was repeated twice.

It is estimated that during a glacial period the sea-level may sink thirty feet or more. Since the water removed from the sea forms ice on the continents and since these cover only about one fifth of the earth's surface, the ice layer must attain an average thickness of several hundred feet, even if it is spread over half the earth. The present sheet over Greenland is several thousand feet thick.

It is well known about how fast the land is rising in California; so from the difference in level between successive cliffs estimates can be made of the elapsed time between glaciers and since the last one. It turns out that the last one was quite recent in comparison with the interval between glacial periods. Professor Davis suggested that this may indicate that the earth will get warmer before it starts to cool again prior to the next glacier. The ice caps in the polar regions may disappear entirely and the poles may become useful and inhabited places.

Even though the average temperature of the earth need drop only about five degrees below the present average to bring on a glacial period, the consequent change in climate may be enormous. If the earth warms up enough to melt all glaciers now existing a remarkable change in climate all over the world would probably result. The advantage to science would be incalculable if we could take observations and make explorations in comfort in the polar regions.

CATCHING COLD AND BODY TEMPERATURE

WHETHER your body has a good heating system or not decides how easily you will take cold this spring, Dr. P. Schmidt, of Berlin, told a correspondent of the American Medical Association.

Dr. Schmidt had noticed for many years, that under the same circumstances, some people take cold much more easily than others. Now, using human beings as guinea-pigs, he has found out why.

Under his guidance a large number of persons exposed themselves to cold until they were thoroughly chilled. Then he measured their skin-temperature at several intervals until they had all returned to normal. He discovered that most of them regained normal skin temperature in a very short time. Some, however, were much slower to warm up to normal, and these, he discovered, were the ones who took cold from exposure.

The reason for this, says Dr. Schmidt, is the contraction of the blood-vessels and tissues at a low temperature. When contracted they are much less able to fight off germs and bacteria, just as an army of men when cramped into close quarters are unable to fight efficiently. So the persons whose temperature remained low over a long period of time gave the germs a chance to get the upper hand.

Only one tenth of all those tested had slow temperature reactions, which should mean that only one tenth of all people are naturally subject to colds. When you catch a cold, if you belong to the other nine tenths, it means that your heating system is temporarily out of order because of nervous or psychological conditions or because a prolonged unperceived draft has cooled off your bodily radiators. That last is why people have learned to think they catch cold from drafts. They do indeed, though indirectly.

Persons whose heating systems are ordinarily slow, says Dr. Schmidt, can speed them up by spending a great deal of time out of doors.

CHILDREN'S INVENTIONS

EVEN in this day of machine-made toys, children contrive tools and playthings strikingly like those made by primitive man in the Stone Age, Dr. Rosa Katz, of the psychological laboratory of the University of Rostock, Germany, found in a study of inventive genius as it appeared in her son Julius. She has reported her study to the *Journal of Genetic Psychology*.

Julius had read "Robinson Crusoe," and probably

got from that book the inspiration to be primitive and devise tools from available materials. He did not, however, get suggestions for the particular tools constructed; those developed from his needs of the moment.

While a goose was being dressed in the kitchen, Julius found that the "wind pipe" of the bird could be used as a water hose, and caused water to flow through it into a water basin. Later he blew through it and produced a hissing sound. He then stripped off the outer tissue, bored a hole through the side of the tube, and there was a primitive flute. It was possible to produce a flute from the wind-pipe only because it had first been used for water and thus made moist. Julius noticed this relationship.

From the same goose, Julius also made a primitive type of ornament. He noticed that the breast bone resembled somewhat a face, and immediately made of it a mask.

A suggestion of how primitive man may have bound up wounds in the absence of surgical gauze or muslin bandages is found in another invention of the boy. Julius was gathering up some wood shavings left in the house by a carpenter. In so doing he injured a finger. He sought out the thinnest of the shavings, moistened them, and with them bound up the wound.

Among the boy's other inventions were a milling stone in which he ground the kernels of hazelnuts, a flint scraper for removing bark, a tomahawk which during peaceful times served also as a hammer, a spear and a snail shell pendant for a feather garland. Snail-shells were used as pendants during the Stone Age.

But Julius's best achievement was probably his ax. He split the end of a stick previously made free from bark. He clamped a stone in the cleft and wound the shaft with a cord.

"There is no doubt that this was the essential appearance of the first ax swung by the human hand," according to Dr. Katz.

ITEMS

As the scattered members of Dr. Sven Hedin's Asiatic expedition gather in Peiping, to report their discoveries, alarm is beginning to be felt because Dr. Nils Ambolt, astronomer, has not arrived. Dr. Ambolt was expected in November, according to advices received in Berlin. He has been in northern Tibet, mapping unknown territory. It is feared that robbers may have attacked the party as it journeyed toward Peiping.

Blinded completely in one eye, with his other eye weakened, and with his hearing affected, Professor Gustave Aartovaara, of the Helsingfors Technical University, is a martyr to his search for a missing chemical element. In 1931, while engaged in the chemical concentration of the missing chemical element, 87, he was the victim of a laboratory explosion, the effects of which have prevented his continuance of research. To Professor Fred Allison, of the Alabama Polytechnic Institute, Professor Aartovaara sent specimens that he believed contained element 87 and Professor Allison detected this element by his magneto-optical method of analysis.

The most significant progress in the search for the cause of cancer is being made in laboratories where these glands are being studied, Dr. James Ewing, himself an eminent cancer authority and director of cancer research at Memorial Hospital, New York City, told members of the American Society for the Control of Cancer. Cancers of certain glands secrete the powerful hormones of these glands. A specific test for one group of cancers, those of the sex glands, has been devised as a result of discovering a hormone substance in all these cancers.

Two new isotopes of the element mercury have been discovered by Professor F. W. Aston, of the Cavendish Laboratory of the University of Cambridge. They have atomic weights 197 and 203. The detection was made through the obtaining of mass-spectra of mercury on new, very sensitive photographic plates. Isotopes 197 and 203 are estimated to be present only to the extent of one hundredth of one per cent. and six thousandths of one per cent., respectively. The mean atomic weight used by chemists is therefore affected only negligibly.

X-rays as intense as all the radium in the world could produce, and of a penetration and frequency equal to that of radium's gamma rays, have been produced from a new porcelain insulated, grounded anode x-ray tube of new design described to the American Physical Society by Cyrus A. Poole, of the Kelley-Koett-Manufacturing Co., Covington, Kentucky. Its design is an outgrowth of the work done by Professor C. C. Lauritsen at Pasadena, but embodies a transmission anode and is to be operated on direct current. The new tube operates on 800,000 volts furnished by a system of cascade electrical transformers and it is the first x-ray tube to operate on constant potential direct current at this high voltage.

Authorities in London are apprehensive of an outbreak of yellow fever in the Orient. At a meeting of the Ross Institute Advisory Board, Sir Malcolm Watson and others pointed out the grave danger now existing of this disease being spread from its focus in West Africa to East and South Africa by airplanes. Air travel has brought various parts of the vast African continent so close together that a person might become infected in West Africa with yellow fever and reach the eastern or southern part of the continent before the three- or four-day period necessary for the disease to appear in him. Airplanes may also convey mosquitoes, which may spread this disease. From East Africa it is a short jump to the Orient with its teeming millions who have never been exposed to yellow fever and consequently have probably no resistance to the disease. Quarantine regulations of air travel between South America, where the disease also has a focus, and the United States have been instituted by the U. S. Public Health Service. Similar regulations may be considered for air travel in Africa and between various African, Oriental and Australian points.