SCIENCE NEWS

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THE ANALYSIS OF LIGHT

EXPECTED to be of tremendous assistance in the analysis of light, two new instruments are being developed at the Massachusetts Institute of Technology by Professor George R. Harrison, director of the spectroscopy laboratory. Light analysis, or spectral analysis, is one of the most powerful of modern scientific weapons.

One of these instruments automatically measures and computes the wave-lengths of spectrum lines, which are the separate bands that appear when a beam of white light is spread out by a prism or grating into an artificial rainbow. The other instrument, called an interval sorter, determines the energy of atoms and molecules from the spacing of these spectrum lines.

In measuring a spectrum by previous methods, the observer estimates by eye the distances of the spectrum lines from some standard line, using a delicate machine known as a comparator. For a spectrum photograph containing many of these lines the task might easily require days or even weeks. To avoid errors caused by temperature changes in the mechanism, each plate had to be measured several times and the results reduced by complex calculations.

Although the new machine for measuring wave-lengths is still in the process of development, it makes measurements twenty times faster than by the conventional methods, and the results are twice as accurate. Further development is expected to make it 200 times faster than the old method. A beam of light supplants the human eye in recording the measurements by means of a photo-electric hook-up.

The interval sorter speeds up the process of determining energy levels of spectra several hundred times, eliminating computations which in some instances total 100,000 in a single analysis. Professor Harrison's machine makes automatic computations at the rate of 50,000 a minute, sorting out the wave-length intervals and recording them photographically at the same time.

THE CONSTITUTION OF THE SURFACE LAYER OF THE MOON

VOLCANIC ash and pumice. That is what the moon's surface is made of, if a committee of the Carnegie Institution of Washington has the correct evidence. Green cheese has never been considered moon material except in nursery rhymes, but investigators have wondered whether the lunar landscape is made of dark, solid rocks like most of the earth's surface.

The reflected sunlight that reaches earth one and a quarter seconds after leaving the moon brings a message to scientists. Because it is relatively little polarized or set to vibrating in one direction, as it would be if it came from dense dark rocks, it is concluded that the moon rocks are like the light, translucent rocks and materials found around volcanoes here on earth. The rapidity with which the moon drops in temperature when the eclipse shadow of the earth sweeps over it also argues for a moon surface largely made of silica and produced by volcanism.

While the moon was once the scene of great catastrophic movements and crustal movements, it is "dead" in comparison with the earth. It is without air and water, and no protective blanketing atmosphere softens the impact of the sun's rays and prevents the escape of heat. Temperature fluctuates violently. Moon craters make earthly volcanoes dwarfs in comparison. Moon mountains are unlike earth mountains and geologists have difficulty understanding them. Moon mountain heights reach 25,000 feet and the deepest crater has a depth of 24,000 feet.

Four miniature moons have been prepared by Dr. F. E. Wright, of the Geophysical Laboratory, chairman of the committee to facilitate the latest study of the moon. These globes are the first spherical photographic negatives, specially coated and fashioned for this research.

THE DEFLECTION OF COSMIC RAYS IN ELECTRIC FIELDS

A METHOD of analyzing cosmic rays—by deflecting them in intense electric fields—has been achieved by Dr. Ernst Lenz at the Physical Institute of the Technical College at Stuttgart. Dr. Lenz is a pupil and colleague of Professor Erich Regener, the cosmic ray authority.

If cosmic rays consist, in part, of electrical particles such particles should be deflected by both strong magnetic and electric fields. The deflection by magnetic fields has long been known but hitherto investigators have had difficulty in detecting the electric field deflection.

Using three Geiger-Muller counters to line up the axis of a corpuscular cosmic ray and a fourth counter to measure the angle of deflection, Dr. Lenz found that fields of 700 volts per centimeter were capable of deflecting the weaker and softer rays about four tenths of an inch.

Very intense electric fields of 70,000 volts per centimeter were necessary to deflect the most penetrating rays. For the soft rays the displacement indicated a preponderance of particles bearing a positive charge of electricity. The strong, penetrating rays, however, showed a preponderance of particles carrying a negative electric sign.

From the deflection observed, it was possible to estimate the energy of the weak and strong components of the cosmic rays. The weak particles possessed an energy equivalent to 10,000,000 electron volts and the strong, penetrating particles energies of 2,000,000,000 volts.

The new method, Dr. Lenz indicates, " is considerably more convenient for the investigation of cosmic radiation than the use of magnetic fields."

Dr. Lenz's results appear in the British science journal *Nature* in the last issue, which has not yet reached America.

With reports from Germany that scientists have at

last been able to deflect penetrating cosmic radiation by the use of strong electric fields it is revealed that research at the Bartol Research Foundation laboratories has been directed along similar lines in the past.

Professor W. F. G. Swann, director of the Bartol laboratories, when informed of the achievement of Ernst Lenz at Stuttgart in bending cosmic rays nearly half an inch with electric fields, pointed out that in April, 1933, he and Dr. W. E. Danforth, Jr., reported to the National Academy of Sciences preliminary results of similar work. No detailed report of the work has yet been published by Professor Swann.

THE SOUTH DAKOTA PLESIOSAUR SKELETON

SOUTH DAKOTA'S fossil-rich mountains, the Black Hills, have yielded a new and notable prize, a well-preserved fossil skeleton of a plesiosaur, or seafaring dinosaur. The find was made by two geologists of Whitewood, S. D., Charles C. Haas and his son, Arthur J. Haas.

The skeleton was embedded in a stratum of Cretaceous age—perhaps fifty million years old—in which no remains of this group of giant reptiles had ever before been discovered. It has been identified as the saurian species known to scientists as *Trinacomerum bentonianum.*

The discoverers were told by Curator S. C. Simms, of the Field Museum, Chicago, that "only five or six plesiosaur skeletons of any genus are on exhibition in any museum in America, and none of this genus, nor any from this formation."

The plesiosaurs were structurally well adapted for a life of submarine piracy in the high seas. The body was streamlined, propelled by four wide paddles, which were their modified legs. Astern the body tapered off to a short, thick tail. The neck was long and snake-like, bearing a narrow head like that of an enormous bird, with a long beak lined with sharp, alligator-like teeth.

The specimen found by the Messrs. Haas will have a total length of about 34 feet when fully restored, they estimate. It lay on its back, its parts all "in line," with very little scattering of the bones. Adjoining rocks bear material that may prove to be parts of its skin.

An interesting part of the find consists of a number of rounded pebbles of hematite, an iron mineral, which appear to have been the creature's "gizzard stones" for dinosaurs of old, like chickens of to-day, chewed their food after swallowing, by means of an internal pebble mill.

The skull of the Haas plesiosaur measures 28 inches in length, 12 inches in width and 7 inches high. There are 15 teeth to each side of the jaw, cone-shaped, smooth-surfaced and very sharp. The ten-foot neck has 13 vertebrae, the largest being five inches in diameter and six inches long.

One flipper, which seems to be one of the rear pair, has been measured. It is a foot wide and four and one half feet long. The largest rib is three feet long and one and one half inches wide.

Other fossil remains found in the same formation include some twenty different kinds of shark teeth, the remains of a number of squid, and two six-inch footprints of web-footed saurians. There were also a few leaf-fossils and pieces of wood.

VITAMIN C AND THE RHEUMATIC HEART

IT is much too soon to advocate oranges, tomatoes and cabbage for those who fear rheumatic heart trouble; but the U. S. Public Health Service reports experiments at the National Institute of Health in which "encouraging results have been obtained" linking the production of rheumatic-like heart lesions with vitamin C deficiency in guinea-pigs.

Seizing upon the suggestion of University of California scientists, Drs. James C. Rinehart and Stacy R. Mettier, that a state of undernourishment approaching scurvy may contribute to the development of rheumatic heart disease, Dr. A. M. Stimson, of the federal health bureau, conducted research which seems to link the two conditions.

With characteristic caution, he says that "it can not be stated that scurvy is a factor predisposing to rheumatic infection," but adds that the results of his research justify going further in studies of the apparent relation between the two conditions.

Of course, it may be months or years before the discovery can be applied to human beings. Many additional laboratory and field investigations need to be conducted, Dr. Stimson says. Nevertheless he has obtained the following positive and "encouraging" results:

Guinea-pigs were given scurvy by withholding vitamin C from their diet. They were then inoculated with hemolytic streptococci, "germs" thought to play a rôle in causing rheumatic heart disease. The animals developed heart lesions "somewhat comparable" to the most typical lesion of rheumatic disease found in man. Guinea-pigs fed on diets lacking vitamins but not lacking vitamin C did not develop these typical lesions after inoculation with the streptococci.

THE CAUSE OF "WORDBLINDNESS"

DIFFICULTIES in reading, or partial "wordblindness," may be caused by a condition in which the individual prefers neither the right nor left hand and eye, or in which the preferred hand is on the opposite side from the preferred eye, according to a theory being developed by Dr. Walter F. Dearborn and his associates at the psycho-educational clinic at the Harvard Graduate School of Education. "Wordblindness" is a term which has been used to describe and to account for the absence of reading ability or "alexia." The term "dyslexia" is used to describe somewhat lesser degrees of difficulty in learning to read.

Dr. Dearborn's theory represents a distinct departure from the belief that the disability is due to defects in the cerebral areas or controlling centers of the brain. He suggests that a more likely explanation may be found in such objective symptoms as reversals in letters and word forms such as in reading "saw" for "was," "tog" for "got" and "broad" for "board."

"It appears," says Dr. Dearborn, "that in order to avoid difficulties in reading and writing, one should be

either left-eyed and left-handed or right-eyed and right-handed, preferably the latter. Difficulties appear especially in children who have been changed over in handedness or whose one-sidedness or later dominance has never been well established."

Until recently, research on this subject has centered about the supposition that difficulty originated in inherited defects in the visual and auditory "centers" of the brain.

After investigations of more than 100 cases, Dr. Dearborn came to the conclusion that knowledge of the defects of the brain centers is very vague and limited. The evidence he gathered points directly to sensory and motor difficulties which induce habits interfering with reading power. He states that the structural basis for some of these difficulties may be inheritable.

In a comparison between 100 cases of dyslexia and 376 cases of normal readers selected from the public schools, Dr. Dearborn found that 81 per cent. of the word-blind subjects were of either left dominance in hands and eyes; crossed dominance, such as right eye with left hand; or of mixed dominance—that is, both hands and eyes of equal controlling strength. Only 51½ per cent. of the normal students had left, crossed or mixed dominance.

Dr. Dearborn emphasizes the fact that a condition of left, crossed or mixed dominance does not necessarily bring on dyslexia and is only one of several possible causes. The large majority of persons so equipped are either not unduly troubled or manage to overcome the attendant difficulties.

The key to the difficulties, according to Dr. Dearborn, is the fact that in the English language the movements of the hand and eye are from the left to the right. This, it has been well established, is the easiest and most natural movement for the right-handed person, away from the center of the body. Left-handed and left-eyed children have a preference for the opposite direction, that is, from right to left. Consequently when such subjects are confronted by flash reading tests, the tendency is for them to see words and letters backwards as "form" for "from," and "on" for "no."

ITEMS

APPARATUS for making oxygen squeeze itself out of the air at temperatures of 297 degrees below zero Fahrenheit was demonstrated before the recent St. Louis meeting of the American Physical Society by Professor Charles T. Knipp, of the University of Illinois. By cooling one spot of a glass container of colorless oxygen gas with liquid air at a temperature of minus 310 degrees Fahrenheit he was able to turn the gas into its liquid form and obtained a pale blue oxygen fluid. Liquid air is cold enough to liquefy oxygen, Professor Knipp pointed out, because four fifths of all air consists of nitrogen which only liquefies at 319 degrees Fahrenheit below zero.

THE working of small unmanned stratosphere balloons sending back continuous reports by radio from altitudes of over 17 miles was described by Professor J. M. Benade, distinguished Indian physicist from Forman Christian College at Lahore, India, before the meeting of the American Physical Society. Cosmic ray intensity is transmitted by a special electrometer measuring the electrification of air molecules in the apparatus. Gradually the air ions formed by cosmic rays charge up the electrometer which is arranged so that for a given constant charge it will energize a photoelectric cell. The photocell current then cuts off the radio transmitted. The frequency with which the incoming signal is interrupted is, therefore, a measure of the cosmic ray intensity at the point in question.

CERTAIN perennial weeds can be made to "drink" poison through their tops. This recent finding is being taken advantage of by the California State Department of Agriculture in the eradication of the noxious weed known as camel thorn. Brought into the state from southwestern Asia, apparently in alfalfa seed, the weed has caused alarm because it does not respond successfully to ordinary methods of control. Under the direction of W. S. Ball, chief botanist, the tops of old plants are bent over and placed in quart or pint jars filled with a weak solution of arsenic, care being taken not to break the stems. The poison is carried into the root system by capillary action. Death follows not only for the plant treated but also for others growing from the same root system. Every few days the jars are filled with fresh poison and moved to other plants. The solution used is a one per cent. strength of sodium arsenite or some other arsenical that is readily soluble in water. Farmers who have used the treatment experimentally against field bindweed, or wild morning-glory, report good results in the late summer when vines are mature. Care must be taken to keep grazing stock away from treated plants.

LEATHER from dolphin stomachs is the latest achievement of Soviet chemists. In their search for new sources of leather and leather substitutes, the chemists have found that dolphins—sea-going mammals and small relatives of the whale—have stomachs that provide suitable material for women's and children's shoes, and various haberdashery articles. Dolphin leather will be manufactured at the leather works in Tagan Rog, Northern Caucasus. The method was worked out at the Azov-Black Sea office of the leather trust. Soviet chemists have been actively working on leather materials, since the second five-year plan calls for increased shoe production. One hundred million pairs per year is the goal to be attained, compared with present output of thirty million. Twenty-one new factories are to be constructed for the purpose.

WESTERN farmers who had a fight on their hands with the chinch bug last summer will find that it was only a skirmish, compared to the battle they will be up against in the summer of 1935. The hordes of tiny pests are going into winter quarters in scarcely diminished numbers. Even if the coming winter is severe there will undoubtedly be enough survivors to breed a crop plague of calamity proportions, necessitating heavy expenditures in money and man-power to save the grain.