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COLORS AND THE HUMAN EYE

IF the sky is viewed through a narrow, blackened tube its usual "blue" appears white, clouds are seen to be yellow, purple turns to pink, and a beautiful sunset becomes a mixture of tawdry colors. This fact was mentioned by Professor J. B. S. Haldane, the physiologist, chemist and philosopher, as an illustration of his theory of vision. He explained the theory in delivering the inaugural address to the 197th annual session of the Edinburgh Royal Medical Society.

The apparent hues of a glorious sunset are not "really there." They are an illusion created by the human eye in an attempt to make the sunset conform to the "normal" color-balance in the field of vision. The familiar blue of a clear sky is in part imposed by the eye to balance the brilliant yellow rays of the sun. What we see depends, Professor Haldane believes, as much on the peculiar reactions of the eye to external stimuli as on the stimuli themselves.

Professor Haldane formulated his theory as follows: 1. In the perception of either color or brightness our vision as a whole is always active; there is no merely objective cause of color or brightness. 2. In this active perception we can distinguish the coordinated maintenance of color and complementary color, as well as brightness and darkness, in the field of vision.

If his theory be true, the assumption on which Galileo and Newton founded physics, that "our sense-organs are simply receptive of various kinds of impressions from a surrounding physical world," does not cover the facts. Newton, in his "Opticks," had assumed that the color of any light depended solely on its refrangibility, or wave-length. Professor Haldane showed with experiments that he could make light which, by the laws of physics, ought to be yellow, turn blue, white, green or any other color, merely by changing the whole of its background.

A small area of a white screen lit by a daylight lamp appeared blue when viewed through a hole in another screen lit by a yellow lamp, and green when the front screen was lit by a red lamp. After a few moments the front screen appeared to be white, although actually it was still lit up by the red lamp. It is necessary for an object to be given the eye's whole attention if its "true" color is to be determined.

COSMIC RAYS

WHEN high-speed cosmic rays from outer space hit atoms or other material particles on arrival in the earth's atmosphere and thus start a shower of slower, secondary rays, the energy put in by the primary rays appears to be equalled by the energy in the resulting secondaries. Thus the physical rule known as the law of the conservation of energy would seem to hold good in this new border zone of the realm of physics.

Evidence suggesting that this is the case has been found by a 23-year-old student at the famous Cavendish Laboratory at Cambridge University, C. W. Gilbert. This evidence is the result of experiments seeking the thickness of lead armor that would produce the best results when used over batteries of instruments that register the arrival of showers of electrically charged particles started by cosmic rays. At sea-level the best thickness of this lead armor was found to be 16 millimeters (approximately five eighths of an inch), which indicates an average energy of 70,000,000 electron volts in the arriving shower particles. On the heights of the Jungfrau in Switzerland, 11,500 feet above sea-level, the maximum thickness was found to be 22 millimeters (approximately seven eighths of an inch), corresponding to an average of 95,000,000 electron volts. This Mr. Gilbert interprets as indicating that the law of the conservation of energy is followed in the generation of secondary cosmic rays.

Mr. Gilbert's data and interpretations have not yet received technical publication. Early next year he will present a paper on them before the Royal Society. Mr. Gilbert is a former pupil of Professor P. M. S. Blackett, co-discoverer of the electron.

THE WEIGHT OF A NEUTRON

AMERICAN ultra-modern alchemists working at the destruction and creation of new atoms from old have found that one of science's newly discovered building blocks of matter called the neutron is much lighter than English physicists have measured.

Dr. Ernest O. Lawrence, addressing the meetings at the Solvay International Institute at Brussels, told how he and his colleagues, Drs. M. Stanley Livingston and Malcolm C. Henderson, of the University of California, have again used their whirligig atom-smashing machine to pry into the hearts of atoms. Accelerating the hearts of heavy hydrogen atoms, which are called deutons, up to the enormous energy of 3,000,000 volts, they have bombarded the rare light metal beryllium.

These are the most energetic atomic particles ever produced by man and the most efficient atom-destroying bullets ever devised. From the results of the bombardment it is concluded that the beryllium disintegrates. Among the fragments flying out as a result of the explosion are neutrons. These neutrons are electrically uncharged particles similar to the hearts of ordinary hydrogen atoms called protons.

The California investigators say that the neutron weighs 1.0006 mass units. Professor J. Chadwick, of Cambridge University, England, last year said that the neutron weighs 1.0067 mass units. This little difference in mass means an enormous difference in energy for it is from the transformation of mass into energy that modern alchemists hope to realize the Utopia of the future where all the energy necessary to run the world will come from the actual transformation of weight into driving power.

The crashing of the deuton bullets into the target of

ordinary beryllium of isotope number 9 results in a transmutation of elements. Beryllium is changed into boron of isotope number 10 and a neutron. Assuming this to be the explosion that happens, a new low value for the weight of the neutron, 1.0006 mass units, has been calculated.

THE TRANSMITTABILITY OF ENCEPHALITIS

FURTHER research into the encephalitis which was epidemic in St. Louis this fall is now being done with monkeys, following the close of experiments on convict-volunteers in Mississippi.

Results of the studies on the monkeys carried on by Drs. Ralph S. Muckenfuss and H. A. McCordock, of Washington University School of Medicine, and Dr. Charles Armstrong, of the U. S. Public Health Service, have been announced by the health service in Washington.

Material from the brains of victims of human encephalitis has been injected into the animals, followed in almost every case by development of typical symptoms of the disease as it occurred in patients in St. Louis this fall. From 8 to 14 days after the injections the monkeys developed fever and sat hunched up with head bent forward and eyes closed as if asleep. When disturbed they seemed alert and often hyperexcitable.

The disease has been passed along from one group of monkeys to another by injecting material from the monkey's brain into healthy animals. Seven such transfers of three different strains of encephalitis have been successfully made.

Although the virus or germ causing the disease has not been gotten out into test-tubes and laboratory cultures, the fact that it can be kept alive in monkeys will enable the search to be continued and will possibly lead to the development of a means of fighting the disease more successfully than at present.

THE LABRADOR GOLD SURVEY

THE dream of prospectors that a goldfield rivaling the Klondike would be opened up in Labrador has been conclusively disproved by the findings during the past summer of Dr. A. K. Snelgrove, of the Princeton department of geology, leader of an expedition of Princeton undergraduates to Newfoundland.

One party of this expedition made discoveries of the greatest importance pertaining to intercontinental correlation in the field of geology.

Dr. Snelgrove, after a complete survey of a concession containing 42 square miles, alleged to contain over two billion dollars in gold, reported to the Newfoundland Government, which had authorized the survey, that the yield was not in excess of 40 cents to a ton. Last year the Newfoundland Government granted 22 concessions of 100 square miles each, in the area of Lake Wabush Katsao, 200 miles north of Seven Islands, Quebec, on the basis of a claim of gold ore found by Captain D. S. Bondurant, of St. Louis, Missouri.

When the government learned that these concessions were being publicly sold to speculators, it requested Dr. Snelgrove and F. W. Foote, a mining engineer from New York, to make the survey in the interest of the investors. The investigation was conducted under the supervision of the Honorable W. J. Walsh, Newfoundland minister of mines, and occupied three weeks. As a result of Dr. Snelgrove's findings, the Newfoundland Government withdrew its postoffice in the district and officially announced that the wealth of gold was a myth.

The Princeton expedition, which passed three months in Newfoundland, was divided into two parties. One party, conducted by George R. Heyl, graduate student at Princeton University, carried on operations along the northeast coast. In the Notre Dame Bay archipelago rocks were found which proved to be the exact counterpart of those occurring in Scotland. This discovery established a definite geological relation between the eastern and western hemispheres. Other finds made by this party furnished the key to the geology of the interior of Newfoundland.

The other party, led by John R. Cooper, also a graduate student at Princeton, has as its purpose the detailed mapping, with the aid of aerial photography, of the various differentiates of the blow-me-down mountain serpentines and their mutual relations on the west coast. This activity was planned by Princeton as part of a two-year program, designed to throw new light on the origin of intrusive rocks which have sprung from common magma.

Last summer's expedition was a continuation of a series of similar trips begun by Princeton in 1911. In addition to Dr. Snelgrove, Mr. Cooper and Mr. Heyl, three Princeton seniors, and one junior from Princeton University, accompanied the expedition. They were: Maitland S. Kemmerer, of New York City; John T. Smithies and James E. Quigley, of Chicago, and C. E. G. Reeves, of Summit, New Jersey.

REDUCTION OF CANADIAN BUFFALO HERD

BUFFALO meat will be available once more for homes, hotels and restaurants of this continent during November and December, following the decision of the Canadian Department of the Interior to reduce the government's buffalo herds at Buffalo National Park near Wainwright, Alberta, by two thousand head. This wholesale slaughter recalls the settlement of the western plains when hunters and settlers wiped out nearly all the buffalo of the plains, killing more than a million of the shaggy animals in less than twenty years.

This year's buffalo slaughter is necessary because of the increase of the herd at Wainwright to 7,500 head. There is only grazing room for about 5,000 animals at this preserve, where 25 years ago the Canadian Government took a herd of 716 animals. It is estimated that this original small herd has grown to 23,000 animals, including those moved to other preserves and those which have died naturally or have been killed off for meat by the government.

Strictly up-to-date methods are used in preparing the 1933 buffalo for the meat market. The whole herd is rounded up and the animals selected for slaughter are separated in special corrals. The buffalo hunt of older days has been replaced by a modern abattoir and the

animals are killed under the direction of government inspectors of the Dominion Department of Agriculture.

In pioneer days, when countless thousands of buffalo were killed only the tongues and part of the carcass surrounding the hump were utilized for food. Modern slaughtering methods have made possible many other choice cuts from the American bison, and a variety of steaks, chops and roasts will be on the market marked with government inspection stamps.

Not all the buffalo meat will be eaten fresh. A number of the animals will be used to supply food to destitute Eskimos and Indians in Canada's far north. The meat is dried and shipped to the northern police posts, where the constables will distribute it to families in want.

In the West buffalo robes and buffalo coats will be worn this year. Modern fur dressing methods have produced buffalo pelts superior to those which once were found in the homes of the early western settlers. And the Mounted Police will have a new supply of buffalo coats to wear on the Arctic trail.

Besides the herd of buffalo at Wainwright, Alberta, the Dominion has small herds at other western game preserves and a herd of approximately 15,000 animals in Wood Buffalo Park, at the boundary of Alberta and the North West Territory, where a 17,000 square mile reserve is maintained for the buffalo. Nearly 7,000 buffalo have been shipped in recent years from Wainwright to Wood Buffalo Park.

ITEMS

THE new cycle of sun-spots has begun. Dr. Seth B. Nicholson, of Mount Wilson Observatory, California, has observed two spots opposite in magnetic polarity to the old procession of gigantic disturbances on the sun that have held sway for the past ten and a quarter years. This was announced by the Carnegie Institution of Washington, of which the Mount Wilson Observatory is a part. One spot was seen the first three days of this week, while another very small one was observed October 10. It is now the time of sun-spot minimum. The sun was nearly inactive in July and August, slightly active in September and nearly inactive in October. The new family of spots now beginning will continue to troop across the sun's face for nearly eleven years.

CALIFORNIA is in for another winter with temperatures below normal and little rain. Thus Dr. George F. McEwen, Scripps Institution oceanographer, has interpreted the trend of weather-making factors off the West Coast, following his custom of the past several years, in which he has scored a high percentage of hits. He was right regarding both low temperature and scanty rainfall for the winter of 1932–33. The coming winter is not expected to be as chilly as last year's, though it will still be below normal in temperature averages. On the other hand, the precipitation trend indicates a drought even more severe than last season's. The values of the seasonal precipitation, as he has calculated them, range from 60 to 85 per cent. of the average.

GREAT wave-like disturbances far beneath the surface of the sea, that never show themselves at the top, are being studied by a noted Swedish oceanographer, Professor Otto Pettersson. He first noticed them while he was getting data on the salt content of the waters in the Kattegat, outlet strait between the Baltic and North seas. He found that the boundary between the salt water at the bottom and the fresher Baltic water at the surface was subject to great wave-like undulations, as much as two or three yards, although the tide changes at the surface were measurable in mere inches. Since his Kattegat observations, Professor Pettersson has found even greater submarine or internal waves, especially in partially landlocked waters. In Gullmarfjord, at the western end of the Skagerrak, they reach a height of over thirty yards. Professor Pettersson has found a twelve and a half hour cycle in these submarine wave movements, and also other cycles corresponding to various lunar periods. He has advanced the hypothesis that these internal waves depend on the vertical component of the moon's tide-producing force. Not all oceanographers are in agreement with him on this point, and the discussion of the cause of these internal waves is still in lively progress in scientific circles.

MOLTEN lava, so hot as to destroy in a moment any living thing it flows over, has nevertheless become a record book of ferns that once grew on the slopes of the great volcano Kilauea. The story of these "volcano fossils" is told by John E. Doerr, Jr., park naturalist of Hawaii National Park. One hundred and one years ago, a lava flow broke out on Byron's Ledge, a wall-like isthmus separating the craters of Kilauea and Kilauea Iki. The shallow streams of lava running down the wooded slope into Kilauea Iki destroyed all vegetation in their pathway, leaving them covered with black, shiny tongues of the hardened material. A recently made trail cuts through some of these century-old lava sheets, the thinner ones of which can be pried up in slabs. On the under sides of the slabs there are abundant hollow moulds of the stems and leaves of ferns, showing many fine details of their structure, even to the long narrow sori or fruiting bodies.

TYPEWRITER script can be read with almost the same speed and accuracy as the printed type produced by the linotype, Dr. Edward B. Greene found in tests conducted at the University of Michigan. Students, in ten-minute tests, read the linotype material a little faster than the typewriting when both were in 7-point size, but found the typewriting easier when in 10-point size, the "elite" size more commonly used in typewriters. The differences were so small, however, that linotype and typewriter script may be considered practically equal in legibility. It must not be assumed, however, that they would necessarily be equivalent for students not so advanced, for other kinds of type, or for longer periods of reading. The comparison of the two kinds of type was undertaken by Dr. Greene because the recent perfection of quick and inexpensive photoprinting processes in the printing of books and periodicals has made the question of legibility of typewriter type of increasing importance.