PHYSIOLOGY

Scientist Tells How Chemistry Affects Color Vision

Harvard Researcher Has Isolated and Identified Three Color Pigments in Eye Which Act as Color Filters

THE FIRST explanation of the chemistry underlying color vision in an animal was reported to the Optical Society of America at Lake Placid by Dr. George Wald of the Harvard University Biological Laboratories.

Dr. Wald has isolated and identified three color pigments found in the cones of the chicken eye, the color-seeing receptors. These pigments, he said, probably act as color filters in much the same sort of arrangement used to take color photographs.

The pigments are astacene, which is responsible for the color of boiled lobsters; xanthophyll, the pigment of egg yolk, and a carotene, a pigment giving carrots their characteristic color.

The color "film" of the chicken eye, on which the filtered light falls to start the seeing process, contains a violet, light-sensitive pigment which Dr. Wald has named iodopsin. It is the first light-sensitive pigment ever found in the cones of the eye.

Dr. Wald, winner of this year's Eli Lilly prize of the American Chemical Society for his outstanding research on the chemistry of vision, gave his explanation of chickens' color vision during a paper in which he massed experimental evidence to prove that many of the complicated phenomena of seeing, a process involving man's highest mental powers, can be explained on a basis of relatively simple chemical and physical reactions which take place in the eye.

More and more, he said, scientists are learning that many of the properties of vision are derived directly from the properties of various substances located in the retina of the eye, the photographic plate on which images of the outside world are formed.

As an example Dr. Wald reported the direct chemical analysis of retinas which show that rhodopsin, a rose-colored, light-sensitive pigment found in the rods, is manufactured by the body from two different precursors, either retinene or vitamin A.

This discovery has afforded a physico-chemical explanation of varying rates of the adaptation of the eye to darkness, for the synthesis from retinene is much more than that from vitamin A and the speed of the adaptation depends entirely on which precursor is being used.

It also explains why a deficiency of vitamin A results in night-blindness, the inability to see in dim light, he reported. Without the vitamin there just isn't enough rhodopsin being formed.

In studies of experimentally induced night-blindness in human subjects, conducted by Dr. Selig Hecht and his colleagues at Columbia University and Dr. Wald, it was found that not only the rods but also the cones of the eye are affected by a faulty diet, a discovery which implies that vitamin A may be the precursor of the light-sensitive material of the cones as well as of rhodopsin.

Dr. Wald has found that visual sensitivity may decrease markedly within 24 hours on a vitamin-deficient diet. It can be cured, however, in as short a time as 20 minutes with a single dose of vitamin A or the provitamin, carotene.

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● Earth Trembles

Information collected by Science Service from seismological observatories and relayed to the U. S. Coast and Geodetic Survey and the Jesuit Seismological Association resulted in the location of the following preliminary epicenters:

Tuesday, Oct. 17, 1:22.2 a.m., EST
In the South Pacific, near the New Hebrides islands. Latitude 14 degrees south, longitude 167 degrees east (approximately). A strong shock.

Thursday, Oct. 19, 6:54.0 EST
Near point where Saguenay river flows into St. Lawrence. Latitude, 48 degrees north. Longitude, 70 degrees west, approximately. A sharp shock.

Stations cooperating with Science Service in reporting earthquakes recorded on their seismographs are:

University of Alaska, College, Alaska; Apia Observatory, Apia, Western Samoa; University of California, Berkeley, Calif.; Dominion Observatory, Ottawa; Dominion Meteorological Observatory, Victoria, B. C.; The Franklin Institute, Philadelphia; Harvard University Observatory, Harvard, Mass.; University of Hawaii, Honolulu; Hong Kong Observatory, Hong Kong, China; Magnetic Observatory of the Carnegie Institution of Washington, Huancayo, Peru; Massachusetts Institute of Technology, East Machias, Maine; University of Michigan, Ann Arbor, Mich.; Manila Observatory, Manila, P. I.; Montana School of Mines, Butte, Mont.; Montana State College, Bozeman, Mont.; Pennsylvania State College, State College, Pa.; Phu Lien Observatory, near Hanoi, French Indo-China; Seismological Observatory, Pasadena, Calif.; University of South Carolina, Columbia, S. C.; U. S. Weather Bureau, University of Chicago; Williams College, Williamstown, Mass.; University of Wisconsin, Madison, Wis.; Zikawei Observatory, near Shanghai, China; observatories of the Jesuit Seismological Association at Canisius College, Buffalo, N. Y., Fordham University, New York City, Georgetown University, Washington, D. C., St. Louis University, St. Louis, St. Xavier College, Cincinnati, and Weston College, Weston, Mass.; observatories of the U. S. Coast and Geodetic Survey at San Juan, P. R., Sitka, Alaska, Tucson, Ariz., and Ukiah, Calif.

CHEMISTRY

U. S. Chemistry Ready But Sees Loss in War

AMERICAN chemical industry stands ready to go into chemical wartime production but will do so only with the greatest reluctance. This is the thought behind the leading editorial in the official journal of the American Chemical Society, *Industrial and Engineering Chemistry.*

In contrast to 1914, American chemistry has an abundance of plants and trained men to meet almost any conceivable expansion of the nation's chemical needs.

But the chemical industry is wary of going into a terrific wartime expansion. Having once gone through a fever of war orders, hasty over-building of plants, hurried research to develop unfamiliar methods and then the final collapse at the war's end, chemical manufacturers are most reluctant to risk the same road again.

No sane chemical concern is willing to hazard its permanent research programs of peacetime activity for hasty war booms. Just before the European conflict, orders from abroad for certain war articles of chemical manufacture went begging in the American market. Only if America enters the fight will this policy change.

Some readjustments common to all industries are foreseen due to the war, but increased demands from countries now at war can be handled without undue plant expansion.

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ANTHROPOLOGY

Ancient Russian Skull Like American Indian's

See Front Cover

THE HALLOWE'EN appearance of the front cover of this week's SCIENCE NEWS LETTER is given it by the skull of some ancient of Russia just brought to America for Dr. Ales Hrdlicka of the Smithsonian Institution.

A new discovery, it strongly supports the theory that the American Indians came from Asiatic races, because it is almost identical in appearance with skulls of North American Indians.

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ENGINEERING

Lighted Guide Lines Make Night Roads Safer

LATEST idea for making the roads safe for night driving: Illuminated guide lines a yard or two long set into the road's center every fifty feet made of tubular lighting covered with a red phenolic transparent plastic. The idea is also applicable to runways on airplane landing fields.

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ECOLOGY

NATURE RAMBLINGS

by Frank Thone

Clocked by the Sun

SCIENTIFIC evidence points very strongly to the powerful influence of the daily hours of light timing the occurrence of all kinds of biological processes. Some are initiated by the gradual lengthening of days in spring, others by the gradual shortening of days in autumn.

The phenomenon, now known by the technical name of "photoperiodism" was first discovered in plants by two research workers in the U. S. Department of Agriculture. They found that lengthening days stimulated spring flowers to bloom, and that shortening days had the same effect on plants that blossom in late summer and autumn, like asters, cosmos, gentians and the pestiferous ragweed.

Basic method of experimentation was simple, though it involved some fairly heavy equipment. Growing-houses for the plants were so arranged that daylight could be completely cut off before sunset if desired. For the opposite effect, large numbers of electric lamps supplied artificial sunshine after the sun had gone down. By proper manipulation of their lengths of day, plants could be made to bloom practically at the will of the experimenters, or kept from flowering for several seasons on end.

First tests for possible effects of length of day on animals were made by a western Canadian zoologist. He caged small birds of migratory species when days were shortening in the fall, and gave them artificially lengthened days, simulating spring. When released, the birds flew north instead of south.

Since these pioneer experiments, some twenty years ago, the results with both plants and animals have been confirmed and greatly extended by biologists in this country and Europe. The importance of length of day in the reproductive cycle of animals having a definite breeding season has been established especially by work done in Connecticut.

The mechanism by which changing day-length affects plants is not yet definitely known, partly because plants have no special light-sensitive organs, like the animal eye. But it is apparently pretty well proven that in animals the light stimulus works through the eye on the internal glands, especially the pituitary "master gland," situated beneath the brain. The secretions of these glands in turn have important effects on the behavior of the animals.

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ARCHAEOLOGY

Museum Exhibits Pair of 1500-Year-Old Horseshoes

A 1500-YEAR-OLD pair of small iron horseshoes which probably once shod the hooves of a Swiss Lake Dweller's horse is now on exhibition at the Field Museum of Natural History. It represents the last cultural phase of the Lake Dwellers of Lake Neuchatel. Iron horseshoes were known by the fifth century.

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CHEMISTRY

Peat Yields Kerosene In New Soviet Plant

FROM Soviet scientists, according to Tass: Peat is yielding kerosene, benzine, carbolic acid, wax, ammonium sulfate, etc., through a year-round artificial drying of peat under pressure in autoclave at 180-200° Centigrade. Waste left is used for production of alcohol and yeast.

The first plant near Leningrad is nearing completion with a capacity of 300,000 tons dry peat annually. Oil spouts from three wells off the coast in the Caucasian Sea near Baku like the petroleum drilled from under the sea off U.S.A. California coast.

Science News Letter, October 28, 1939