PSYCHOLOGY

New Light on Mental Ill

A physiological difference has been found between normal persons and schizophrenics which centers about the response of the adrenal glands to stress.

➤ TWO SMALL GLANDS above the kidneys and one at the base of the brain may hold the key to a medical treatment for the mental disease, schizophrenia.

Among those engaged in the research, believed the first ever to show clear cut physiological differences between normal persons and psychotics, are: Dr. Gregory Pincus, director of laboratories of the Worcester Foundation for Experimental Biology in Worcester, Mass.; Dr. Hudson Hoagland, executive director of the Foundation; Dr. Harry Freeman, an endocrinologist associated with the group; and Fred Elmadjian, a physiologist.

Their work casts a new light on the mental disease known as schizophrenia. A schizophrenic is a person who is living in a waking dream state. He has lost contact with reality and cannot disentangle external events from those which take place in his dream world. One half of the beds in mental hospitals are occupied by schizophrenics.

The glandular differences between normals and schizophrenics center about the response of the adrenal glands reacting to stress. The adrenals are two small glands located on top of the kidneys. When a normal person is subjected to stress—any sort of stress from breathing air with a low oxygen content to waking up in the morning—the adrenal glands send out an increased flow of chemical messengers into the bloodstream.

These messengers are known as adrenal cortical hormones. They are vital to life, since they control such functions as the use of fuel by the body and storage of sugar by the liver.

The schizophrenic shows no appreciable increase in adrenal output in response to stress. Furthermore, his physiological behavior is different from normal in another important respect.

The adrenals also regulate the use of sodium and potassium salts by the brain and other body tissues. In the normal person, the body's potassium output is increased after stress, but in schizophrenics no such change is noted. This may indicate that a psychotic's brain does not undergo the same chemical responses as that of a normal person.

These isolated facts are the first scientific demonstrations of an abnormal physiology in mental patients. They may lead to the discovery of important physical differences between normals and schizophrenics.

The implication is therefore that the research in Worcester may be the first step in the eventual development of a physiological method of treatment for mental disease.

A further discovery has been made, narrowing down the area of search for the defective mechanism in the schizophrenic. It involves control of the adrenals by the pituitary, a small gland located at the base of the skull. In order for the adrenals to respond to stress, they must first receive a message from the pituitary in the form of a hormone known for short as ACTH, which is adrenocorticotrophin when spelled out in full. In answer to this message, adrenal cortical hormone is secreted into the blood by normal persons. The question in the case of schizophrenics was whether the actual deficiency lay in maladjustment of the adrenals or in the failure of the pituitary to send out ACTH.

To answer this problem, the scientists injected ACTH into the bloodstream of psychotic patients, and then measured the adrenal cortical hormone output. The fact that no increase in output was measured shows that the mechanism of adrenal output is at fault, and therefore, in all probability, the delicate operation of the adrenal glands has been in some way impaired in schizophrenics.

The breakdown of the adrenals results not only in effects on the salt and fuel economy of the brain, but also destroys general ability of the body to adapt to an ever-varying environment. For that reason, a schizophrenic cannot react to the constantly changing demands of daily life.

The why and how of this adrenal impairment is not yet understood, but in the future of research in this field may lie the eventual solution of one of the most serious problems of our civilization—mental disease and its treatment.

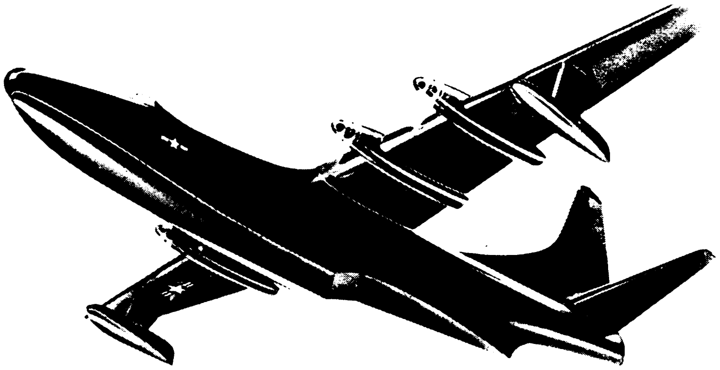
Science News Letter, November 6, 1948

BOTANY

Green Plants' Evolution

➤ EVIDENCE that green plants are the climax of a long line of evolution toward self-sufficiency in the use of the energy of the sunshine is being presented in national Sigma Xi lectures throughout the country by Dr. C. B. van Niel of Stanford University's Hopkins Marine Station at Pacific Grove, Calif.

Dr. van Niel, who is professor of microchemistry and an authority on photosyn-



PATROL FLYING BOAT—This is an artist's conception of the XP5Y-1, two of which are being built for the U. S. Navy by Consolidated Vultee Aircraft Corp. of San Diego. It has a quick take-off and high speed due to its four powerful, propeller turbine, Allison engines and is designed for long-range day and night search of sea areas, rescue operations, and anti-submarine patrol. The first experimental XP5Y-1 is expected to fly early in 1949.

thesis, is speaking before chapters and clubs of the Society of the Sigma Xi, the Scientific Research Society of America.

Modern plants, with their green chlorophyll, utilize the energy of the light from the sun to break down molecules of water. They build the hydrogen thus obtained, along with the carbon dioxide they take from the air, into their plant structures. The oxygen they discard in this process maintains the balance of nature and the constitution of the air.

The earliest plants, Dr. van Niel is telling his scientific audiences, could not have made use of this complicated process which combines two radically different mechanisms: First, the photochemical reaction; second, the liberation of molecular oxygen.

Evidence has been found, Dr. van Niel reports, that certain purple bacteria make use of a simpler kind of photosynthesis. This method may have preceded that which takes place in the green chlorophyll. It is accomplished by a photochemical decomposition of water as in green plants. In both types of photosynthesis the hydrogen is transferred to carbon dioxide. But only in green-plant photosynthesis is oxygen evolved. In bacterial photosynthesis an oxidation product other than oxygen takes its place, and this must be continuously reduced. That requires the simultaneous oxidation of a reducing substance, for example a secondary alcohol. All these reactions take place under the influence of various enzymes.

It is reasonable, Dr. van Niel found, to regard the evolution of photosynthesis as proceeding from organisms with highly developed synthetic mechanisms but not yet endowed with photochemically functional pigment systems.

The pathway of development would then lead in the direction shown by the mechanisms in use by the purple bacteria. Their pigment systems were present in their colorless ancestors, but they were not yet independent of extraneous reducing chemicals.

"The next step in the evolutionary sequence," Dr. van Niel reports, "would then be concerned with changes whereby the 'oxidation product' of the photochemical reaction becomes capable of self-regeneration through the elimination of molecular oxygen. This is the mechanism operative in green plants."

"Interpreted in this manner, green plant photosynthesis appears as the ultimate result of that line of physiological evolution which represents the gradual development of synthetic mechanisms, and in which the organisms become progressively more independent of an external supply of reducing substances. Only with green plant photosynthesis has complete independence been acquired."

Science News Letter, November 6, 1948

Letters To The Editor

Autumn's Colors

If many readers of the SCIENCE NEWS LETTER are like myself they are curious to know what are the causes and contributing factors resulting in "Golden, crimson, purple, russet, scarlet—autumn's brave banners . . ."—J. Edward Johns, Columbus, Ohio.

The yellows and orange-reds in autumn leaves are due to the presence of a group of pigments known collectively as the xanthenes. Carotene, which gives carrots, rutabagas, squashes, etc., their characteristic color, is one of the xanthenes. The purples and deep crimsons are due to another group of pigments, the anthocyanins, which are also responsible for the colors of such things as purple cabbage, beets, and red-foliaged ornamental plants.

The xanthenes are present all the time, but are covered up by the more abundant green pigment, chlorophyll. As autumn advances, the chlorophyll dies and loses its color, while the xanthenes remain. Formation of the anthocyanins is promoted by the clear, sunny weather of the "Indian summer" type, cool but not frosty. Frost, if it comes too early in autumn, actually prevents the development of good autumn coloration.

The outside influences that set the leaves on the way towards their autumnal glory are complex, hence not well understood. They are not unlike the complex of causes that produce the ripening of fruit; indeed, an autumn-colored leaf might well be regarded as a RIPE *leaf rather than as a dead one.*

Question Box

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