Announcing!

AN INTRODUCTION TO THE PLANT SCIENCES

By WILLIAM C. DARRAH

Tutor in the Department of Biology and Research Curator in the Botanical Museum, Harvard University

This book offers a concise account of the nature of the plant kingdom. It is intended for use by students in a half-year or one-semester course in botany or plant biology. The chief aim of the book is to broaden the student's outlook and to acquaint him with the natural sciences. Laboratory instruction should be used to supplement the book; experiments are included, so arranged that they may be used either as demonstration exercises or as individual experiments to be performed by the student.

"Introduction to the Plant Sciences" discusses the great biological concepts as they are applied to the interpretation of living plants. Emphasis is placed upon these four recent developments: (1) the organismal concept which emphasizes the interrelations of many functions all progressing at the same time; (2) the break from traditional classifications which because of their rigidity have become somewhat misleading; (3) the physiological or biochemical approach to the study of the behavior of plant organisms; (4) the utilitarian and humanistic emphasis which is the product of current rapid world events.

The appendix offers a summary of the principles of physics and chemistry as they relate to biology, constituting a review of man's interpretation of matter, energy, the composition and divisions of matter, and the simple chemical phenomena which relate to biological functions.

This book is the outgrowth of a course in general botany given at Harvard University and Radcliffe College for several years.


332 pages  156 illustrations  6 by 9  $2.75

JOHN WILEY & SONS, Inc., 440 4th AVE., NEW YORK
THE MESotron

The life of the mesotron, middle-weight atomic fragment, is probably the shortest span of existence of anything in the universe, despite new measurements reported to the American Physical Society in Baltimore on May 1, which have given it quite a boost. Experiments carried out at Echo Lake and at Denver, Colo., last year gave it a life of 1.6 millionths of a second, in substantial agreement with previous estimates. New and more accurate measurements this year give it a life of 2.8 millionths of a second.

The experiments were made by Drs. Bruno Rossi and Kenneth Greisen, of Cornell University; Drs. Joyce C. Stearns and Darol K. Froman, of the University of Denver, and Dr. Phillip G. Koontz, of Colorado State College.

Mesotrons are born high in the atmosphere through some action of the incoming cosmic rays. But few of them live to reach the earth. In fact, many of them expire in passing from the level of Echo Lake to the level of Denver, a drop of about 5,000 feet.

However, the new experiments confirmed what was previously found, that the faster the mesotron travels, the longer it lives—as measured in our time. But measured in its own time, mesotron time, all have about the same life span, 2.8 millionths of a second. This is called the “proper” lifetime of the mesotron, and is obtained from the experimental times by correcting them for the relativity effect of velocity on time.

Thus for a mesotron a fast life means a long life, contrary to the case for human beings. But if you were a fast-moving mesotron you would know nothing about this. Consulting your own watch—a perfect timepiece—you would find that you lived not a whit longer than if you stood stock still—2.8 millionths of a second in either case, no more, no less.

But observers on the earth, consulting their own timepieces—also perfect—would find that your watch was ticking more slowly—also that your little heart was ticking more slowly. So-o, it’s all the same to you.

And if, doubting your own watch, you stopped to compare it with that of one of the observers, you would find both going at exactly the same rate. Thus, by your own heart beats, your “proper life” is always the same whether you travel or stand still, supposing you’re a mesotron.—Morton Mott-Smith.

A NEW DIFFRACTION GRATING

A diffraction grating that distinguishes between a new star and a planetary nebula was described at the meeting by Dr. R. W. Wood, of the Johns Hopkins University. The grating, 18 inches in diameter, has been made to fit the 18-inch Schmidt photographic telescope at Mt. Palomar, California, where the 200-inch telescope, the world’s largest, is to be located. The grating throws a rainbow spectrum like a spectroscope, and shows a nitrogen band for the nebula very near the bright hydrogen line. This band is not seen with an objective prism.

The whole surface of the 18-inch disk is covered with straight parallel grooves or lines, accurately spaced and 1,500 to the inch. The grooves are so shaped that nearly all the light is thrown into the spectrum and the highest intensity is in the red region, where the hydrogen line is. A novel feature of this grating is that it is built up in sections like a mosaic. These sections measure 4 x 6 inches and are replicas of one master grating. The grating, when placed over the object glass of the telescope, draws out into a spectral streak every object in the field of the telescope. Another 18-inch grating has been made with but 900 lines to the inch in order to give short spectra; this is required when the field is crowded with many stars, for otherwise the spectra overlap. This grating throws most of the light in the blue end of the spectrum, and will be used for classifying faint stars according to their spectra.

TRIVISION

A revolutionary advance in x-ray photography was announced by its inventor, Douglas F. Winnek, of Mount Vernon, N. Y., at the meeting of the New York State Medical Society.

Trivision is the name Mr. Winnek gives to his new technic for better x-ray pictures. By means of a special film, a single x-ray picture can be made to show length, breadth and depth—in other words, three dimensions. With the aid of a grid superimposed or printed on the emulsion plate of the film, measurements of these dimensions can be made from the same single picture.

A single trivision picture, for example, would show the surgeon whether a bullet or shell fragment was behind, in front of or to the side of a bone or other internal body structure. With the grid he could also measure accurately the distance of the bullet from the bone or other tissue. In case of broken bones, Trivision would similarly give swift, accurate information on the amount of displacement of the broken ends of the bone. To get this information present, Mr. Winnek pointed out, surgeons must have stereoscopic pairs of x-ray pictures taken, must look at them in complex viewing devices and use tedious measuring technics.

Motion can also be reproduced on the Trivision film. Such actions as the winking of an eye, the rotation of a clenched fist and the meshing of gears have been recorded and the motion studied in three dimensions.

Trivision pictures, which can be made in color as well as black and white, are taken with a scanning camera on ordinary photographic film embossed on the base side with microscopically small lens ridges or lenticulations.

MICA PRODUCTION

Threatened by the jeopardy of India with loss of high-grade mica vital to high-compression airplane motors and scores of electrical appliances, this hemisphere is looking for opportunities to begin a substitute mica industry. Not only did India produce 6,534 short tons of a total world production of 9,016 short tons, but her mica was
Of real importance to education in America at war are these two new books in sharply different fields:

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**Botany**

**THE PLANT WORLD**

HARRY J. FULLER—THE UNIVERSITY OF ILLINOIS

The key feature of this new text—which is designed for the introductory course—is its emphasis upon aspects of plant life involved in everyday experience and concerned directly with human living. Great importance is given to the economic uses of particular plant groups, the formation and germination of seeds, soil fertilization, erosion control, plant diseases, plant hormones and wood structure. The book is profusely illustrated with drawings, photographs and charts.

592 pages. $3.25

Henry Holt and Company, New York
expertly graded and split by family labor content with 9 to 12 cents per day.

Argentina, Brazil, Mexico, Canada and the United States all have rich mica deposits, now being surveyed for increased production—but there is little expert mica labor, and none willing to work for Indian wages. Neither has western man invented a machine which can grade and split the delicate mineral as expertly as the swift hands of Indian families. Consequently mica users in this hemisphere, used to the excellence of the Indian product, have scorned efforts by near-by producers in Brazil whose grading was careless.

Several plans are under study for introducing the mica-splitting industry into this hemisphere. Canada already produces a small quantity of splitting and could produce more if prices rose. Mexico and Puerto Rico have been suggested, the latter on account of its abundant supply of cheap labor. But even in Mexico and Puerto Rico labor demands far higher pay than the workers of India.

Mica is important to electrical appliances because it can be divided into thin, flexible, transparent films which are unaffected by fire, water, electricity or acid, and whose volume remains constant in extreme heat and cold. These characteristics are found in no other substance, and no synthetic substitute having similar qualities has so far been discovered.

One of the most important uses of mica is in the insulation of airplane motor spark plugs, in which the mica forms a thin wrapping for the spindle, called "cigaret mica." All tubes in radio receiving sets require from two to four pieces of mica to hold the filaments upright and to keep the internal assembly rigidly in the center of the tube. In every tank, airplane and ship, mica is essential to the condensers.

Fortunately, large supplies of mica are found in this hemisphere. The United States and Canada have for some years been sources. The crucial problem in production, should the hemisphere be separated from Indian sources, lies in the lack of trained, cheap labor to grade and split the material.

SYNTHETIC PLANT HORMONES

New synthetic growth-promoting substances, or plant hormones, many times more powerful than those now in use experimentally and by greenhouse men, have been prepared at the Boyce Thompson Institute for Plant Research, Yonkers, N. Y., by Dr. P. W. Zimmerman and Dr. A. E. Hitchcock. Applied to plants in the form of vapor, spray, emulsion, lanolin paste, or added to the soil, they induce profound changes in growth, and they can also induce the formation of seedless fruits from unpollinated flowers at points on the stem a foot or more from the place of application. Treated plants are so changed that sometimes they look like different species.

The new hormones are prepared from various milk organic acids, which have no effect on plants in their ordinary state, by the addition of atom-groups containing chlorine, iodine or bromine, either singly or in combination. One very effective compound of this sort is known as dichlorophenoxyacetic acid. It has been found to be fully 500 times more effective in producing plant changes than indolebutyric acid, one of the synthetic plant hormones now widely used. Solutions as weak as 10 to 25 parts (by weight) in a million parts of water have been found most effective.

In all, eleven different compounds of the new class have been prepared. All seem to share the same great power over the growth and development processes of plants, and all seem to depend on the addition of one or more of the chlorine-iodine-bromine triad of elements (halogens, the chemists call them) to a weak organic acid foundation.

Drs. Zimmerman and Hitchcock warn against rushing into attempts at practical application without further experimentation: "Considering the activity of these new growth-modifying hormones and their capacity to cause extreme types of distortion, caution should be exercised in their practical application. In view of the tendency to include various types of hormones in fertilizers, fungicides, insecticides and other commercial preparations, the use of these new compounds should be preceded by extensive experimentation to make sure that they will not be detrimental to crops. Phenoxy compounds are known to have insecticidal value and now that they are also known to be plant hormones there might be a tendency to incorporate them in commercial sprays and fertilizers. The idea would be good, but the results might be disastrous."

THE CHEMICAL DICOUMARIN

Horz that the haystack chemical, dicoumarin, which reduces the clotting ability of the blood, may have wide usefulness as a life-saving remedy appeared in reports from two groups of investigators, although both stressed the fact that it is too soon after dicoumarin’s discovery to be sure of its exact value.

Its use was reported at Atlantic City in cases of thrombosis (blood clot), diseases of the blood vessels including one kind of artery hardening, and subacute bacterial endocarditis (a form of heart disease) by Dr. Ovid O. Meyer and Dr. James B. Bingham, of the University of Wisconsin, and Dr. Irving S. Wright and Dr. Andrew Pandoni, of New York.

Dicoumarin, formed in the spoiling of sweet clover, was first isolated and then made synthetically without the haystack’s aid by Professor Karl Paul Link and associates at the University of Wisconsin. He had become interested in the problem because when cattle eat spoiled sweet clover their blood loses its ability to clot and slight bruises may cause fatal bleeding. The possibility of using this chemical to prevent formation of frequently fatal blood clots which sometimes follow operations was suggested.

Success in preventing formation of clots in the large blood vessels of the legs after operation and in preventing a second clot on the lung in patients who have already had one, have been reported by Dr. Edgar V. Allen and Dr. Nelson W. Barker, of the Mayo Clinic and the University of Minnesota.

Dicoumarin, it is emphasized, does not dissolve or cure a blood clot once it has formed, and in Dr. Meyer’s opinion there is not yet enough evidence to say that it prevents clot formation.

It has also a dilating effect on the small blood vessels
near the surface of the body and in the fingers and toes. This effect may be useful in cases where these small blood vessels are growing narrower because of disease such as artery hardening. Dr. Prandoni reported that it apparently acts to heal vascular ulcers through this dilating effect.

The chief disadvantage of dicoumarin is the danger of its causing severe bleeding. The chemical can be used safely if the dose is carefully controlled and the patient is in the hospital having tests made frequently enough to detect the advent of dangerous bleeding. Dicoumarin can be given by mouth as well as by hypodermic injection. This, with its cheapness, gives it an advantage over another anti-clotting chemical, heparin, obtained from animal tissues. Heparin acts immediately, however, whereas dicoumarin requires 24 hours to take effect. The bleeding that may follow dicoumarin can be controlled by transfusions of fresh blood but not by the anti-bleeding vitamin K. This and other evidence suggests that dicoumarin exerts its anti-clotting action on the blood in the liver.

**THE ANTI-PELLAGRA VITAMIN**

Nicotinic acid, the anti-pellagra vitamin, has proved to be a successful remedy for Ménière’s disease, according to the report of Dr. Miles Atkinson, of the New York Hospital and Cornell University Medical College, which appears in the Journal of the American Medical Association.

Ménière’s disease is a disabling condition characterized by prostrating dizzy spells, ringing in the ears and even deafness. Only certain cure for the condition so far discovered has been a delicate and difficult nerve-cutting operation. Search for a cure for the condition without surgical operation led to the announcement by Mayo Clinic physicians two years ago of histamine as a chemical remedy for the disease. Nicotinic acid, however, succeeds in many more cases than histamine, in Dr. Atkinson’s experience. He reports recoveries under nicotinic acid treatment of patients who had relapsed after temporary improvement or gotten worse on histamine treatment.

The histamine treatment was based on the theory that the patients were sensitive to this chemical which is normally produced in the body, somewhat as hay fever patients are sensitive to pollens. The treatment consisted in giving doses of histamine to desensitize the patients. Less than one fourth the patients, Dr. Atkinson finds, are actually sensitive to histamine. Inexperience with the test for histamine sensitivity, he believes, has led doctors to use the treatment for many patients who are not sensitive.

At first this treatment seems to help even the large group that are not sensitive to histamine, because this chemical acts to dilate the small blood vessels. But these patients sooner or later develop a resistance or immunity to the histamine action on small blood vessels. Then their small blood vessels become more constricted than ever, and the patients are worse off.

Nicotinic acid, like many other chemicals, dilates the small blood vessels, but patients do not become immunized to its effect, so it continues to help them over long periods, and, of course, it is safe to take for indefinite periods. A still better chemical remedy for Ménière’s disease may be discovered, Dr. Atkinson points out, but nicotinic acid is the best that he has found as yet.

**ITEMS**

According to reports from Dr. Ellice McDonald, director of the Biochemical Research Laboratories at Newark, Del., and Dr. V. W. Murray Wright, of Philadelphia, a new chemical remedy against germs, expected to be particularly useful in treatment of war wounds, has now been tested on ninety patients in the Philadelphia hospitals. This new remedy, H-I, is extracted from germs that live in the ground. It has proved very effective against infections with germs in the gram-positive group, which are the ones found in 80 per cent. to 90 per cent. of wounds.

**DISCOVERY** of a new parent chemical for vitamin A which will double the amount of the vitamin that can be obtained from whale and probably other fish liver oils was announced at the meeting of the American Chemical Society by Dr. Norris D. Embree and Edgar M. Shantz, of the laboratories of Distillation Products, Inc. Whale liver oil contains a chemical, named kitol, which can be turned into vitamin A in the laboratory by simply heating the oil to 500 degrees Fahrenheit. The kitol of whale liver oil has hitherto been discarded as an impurity when vitamin A was extracted from the oil. Its ability to become vitamin A was not suspected because animals can not convert kitol into vitamin A as they convert the green and yellow coloring matter of plants into the vitamin. On the other hand, carotene or the other vitamin A parent chemicals has not been converted into the vitamin in the laboratory. Kitol occurs most plentifully in whale liver oil but is also found in all other liver oils except those of certain fresh-water fish.

**ADDED** to the recent troubles of Hawaii is the discovery by Joseph E. Alicata, that a common rat flea of the islands is capable of spreading the germs of endemic typhus fever. This is not the European typhus fever dreaded as a war plague, but the much milder variety found in non-epidemic form in the United States. Reporting his discovery to the Washington, D. C., Academy of Sciences, Mr. Alicata explains that he let sticktight fleas feed on laboratory animals infected with typhus fever germs, to see whether or not this kind of flea, like some of its relatives, could pick up the typhus fever germs and pass them to other animals. The finding that it can do so is of considerable interest because sticktight fleas are commonly found on rats, dogs, cats, mongooses and chickens in the islands. According to one survey, sticktight fleas were found on 13 per cent. of rats trapped in Honolulu and made up about half the fleas collected on rats of the island of Oahu. Fifty-nine cases of typhus fever were reported in Hawaii in 1941, but health officials do not know whether these were endemic or European typhus fever.
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