

really protein diseases, the pathological aspects of virus disease acquire a new significance. Certain basic facts concerning one virus disease may prove to be useful in the study of other virus diseases. For example, in the case of most virus diseases it has been difficult to induce immunity without the use of active virus. Inactive virus has given poor results, yet in most cases it is dangerous to use active virus. In the case of crystalline tobacco-mosaic virus, methods have been evolved for inactivating the virus so that the inactive virus gives practically the same immunological response as that given by active virus. These methods involve careful treatment of the active protein so that the groups responsible for the virus activity are blocked or removed without disrupting the molecule as a whole. It is possible that this and similar studies on crystalline tobacco-mosaic virus may prove useful in the study of other viruses. Whether this unusual, high molecular weight, crystalline protein is regarded as living, as non-living, as a gene, as a super-catalyst, as an organizer, or as a pathological protein, a complete study of its basic properties should prove of importance. It is now possible to list protein molecules, along with living organisms such as bacteria, fungi, and protozoa, as infectious disease-producing agents.

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MATHEMATICS

Harvard Mathematician Made President of A. A. A. S.

Dean of Graduate School of Arts and Sciences,
Author of Mathematical Theory of Beauty Is Honored

OFFHAND you might not expect a great mathematician to be interested in why it is that men throughout countless ages have taken joy in looking on the moon, a shapely tree, a pearl or the rhythmical curves of a woman's form.

Yet Dr. George D. Birkhoff, Harvard mathematician, who was elected president of the American Association for the Advancement of Science for the coming year, has made the mathematical measure of art one of his main branches of research.

He has devised formulae that enable you to analyze the source of delight in the creations of painters and poets. The esthetic value of a shape or form as determined by the Birkhoff formula conforms to the emotional judgment of those who look upon it. Not that you need to be a mathematician to delight in art. Esthetic pleasure is due to an unconscious appreciation of the mathematical proportions of the object.

In a detailed treatment of esthetic measure which he published not long ago, Dr. Birkhoff has told how painters, architects and others can use consciously some rules that he has discovered. Take forms made with straight lines. The square is rated as the straight line form having the highest esthetic appeal, being rated as 1.50 compared with the diamond at 1.00 and the triangle at 0.63. Take a famous painting. Dr. Birkhoff finds that its composition involves geometric forms which are pleasing to the eye.

The pretty girl is pretty because all her measurements are in correct relation to each other—if her arms were longer or her nose shorter or her height just a little different in relation to her weight, the effect would not be at all the same.

Dr. Birkhoff's formulae for esthetic values can also be applied to music and poetry. The scale used for poetry, for example, is not the same as the one applied to pictures, but it involves such artistic qualities as rhyme, rhythm and alliteration. Dr. Birkhoff has even tried building experimental poems and musical compositions by deliberately placing in them the elements indicated by the formula.

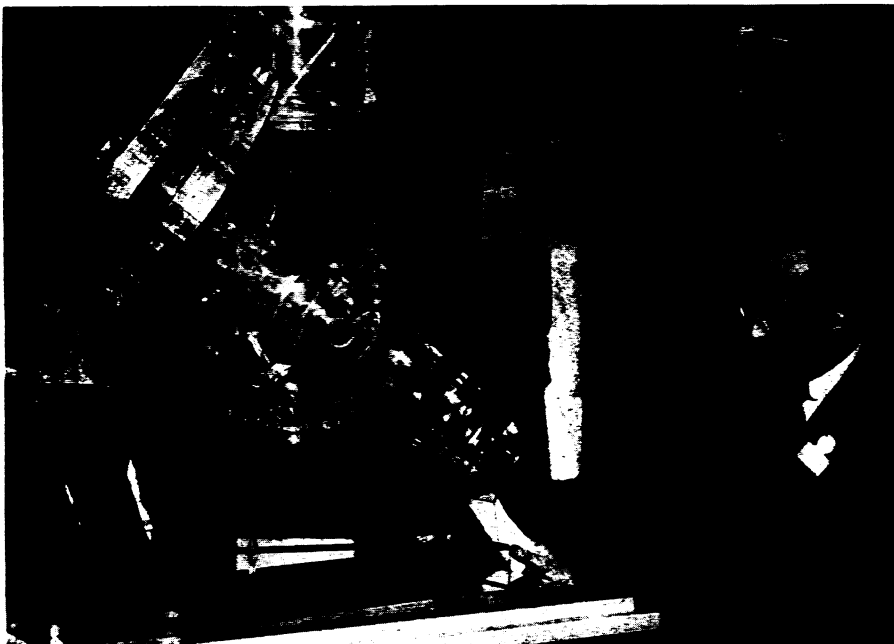
Just a short time ago Dr. Birkhoff, who is only 52, was made dean of Harvard's Graduate School of Arts and Sciences, where he has been professor of mathematics since 1919.

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PHYSICS

New Theory of Atom by New A.A.A.S. President

A NEW theory of atomic structure that may allow physicists to understand better the composition of matter was presented to the American Association for the Advancement of Science by Prof. George D. Birkhoff, of Harvard, one of America's leading mathematicians. It is called "a conceptual theory of atomic structure" and may recall to modern approval fundamental ideas that were first presented by the famous James Clerk Maxwell.



200-INCH TELESCOPE MODEL

Dr. Harlan T. Stetson, Massachusetts Institute of Technology, with a celluloid model of the great instrument on exhibit at the Atlantic City science meeting. Notice the scale figure of the man on base of instrument.

At the Philadelphia meeting of the Association in 1926 Prof. Birkhoff presented a paper showing how the fundamental wave equation, which had been discovered by Schrödinger within a few months, could be arrived at in an entirely different manner. This was done on the basis of a conceptual theory of matter and electricity. This paper won the \$1,000 prize for the 1926 meeting.

The principal characteristics of this theory were the following. A relativistic space-time was employed as the background for a certain "perfect fluid" which was the carrier of positive or negative electricity. In this fluid the disturbance velocity was that of light. The fluid was further endowed with a certain "atomic potential" which gave rise to a new term in the energy tensor of the fluid. In addition the positively and negatively charged portions of the fluid could freely interpenetrate. It was then shown that with suitable simple choices of the disposable quantities the same spectral frequencies would be obtained

for the hydrogen atom as arise from the Schrödinger wave equation when use is made of the Planck-Einstein law. However, in the further development of the theory considerable difficulties arose and it has only been recently that Prof. Birkhoff has studied the mechanism of radiation. Very significantly it has turned out that the arbitrary introduction of the Planck-Einstein law can be dispensed with.

Whether or not his modified theory proves to be ultimately serviceable to physicists as an actual atomic model, it presents suggestive points of interest which it is hoped will stimulate further studies of the same kind. Such studies ought to be made, Prof. Birkhoff said, since the possibility of conceptual relativistic models has not been thoroughly explored. If an acceptable model could be found which corresponded to reality, physicists would be forced to revert to the concept of the atom as bearing the stamp of the "manufactured article," in the sense of James Clerk Maxwell.

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cooperative research described by Dr. Knight are: selenium soils are found only where a particular type of shale rock has weathered out; it can cause trouble only in relatively dry regions, where rainfall is insufficient to wash the deadly stuff out of the soil; plants absorb it in varying amounts according to their own nature and also according to ecological conditions; animals eating the plants in which it is sufficiently concentrated sicken and may die.

To human beings the selenium soil situation is not directly dangerous, said Dr. Knight. If a man were living strictly under pioneer conditions on a piece of "seleniferous" land, eating nothing but what he raised on his own farm, he might get enough to make him sick. But even on the remotest prairies nowadays people bring their food from all the corners of the earth, so that a man can live all his life on selenium soil and never know it unless his livestock, which really do take all their living from the one piece of land, show selenium poisoning symptoms.

Autogiro Joins Insect War

A new combat machine has been recruited for the war against insects, that has not yet found its proper place in the military establishment. This is the autogiro, the "windmill" aircraft, that has something about itself suggesting an enormous flutter-winged insect in flight. S. F. Potts, Department of Agriculture insect fighter on the New England front with headquarters at New Haven, told something about it before the Association meeting.

The autogiro, said Mr. Potts, has certain advantages over the swifter airplane for the purposes of distributing insect poisons over woodland areas: it can fly at much lower speed, turn in smaller area, land and take off from smaller fields, and is safer to operate.

For use with aircraft, a concentrated spray mixture has been developed which Mr. Potts regards better than the poison dusts now widely employed. It drifts less, he said, it deposits itself more heavily on the foliage and sticks there better, and it can be released with satisfactory results in winds up to twelve miles an hour, as against the five-mile wind that is the limit of efficiency for airplane dusting.

Likes it Cold

A rare, exceedingly primitive insect that is happiest when it is near freezing, is ready to eat anything, and equally ready to fight anything, was de-

BIOLOGY-ENTOMOLOGY

"Moon Element," Selenium, Cause of Blind Staggers

American Association Scientists Learn of Autogiro Attacks on Insects, of How Anesthetics Wear Off

THE MOON Goddess of ancient mythology was anything but mild and kindly. Woe to the youth who spied on Diana as she raced through the forest in her short-skirted sports costume! Speedy death was the best luck he could hope for. Later, as Luna, her silver arrows struck madness into the brains of men; whence our moden term "lunacy."

Now, in our own later times, a chemical element named after another of her names, Selene, has been convicted of causing damage and death, if not to man himself, then to the poor dumb beasts he values and tends. Selenium, in dry-land areas of the West, has been found responsible for the livestock diseases known since pioneer days as blind staggers, alkali sickness, and some forms of "loco."

At the meeting of the scientists' honor society, Sigma Xi, in connection with the Christmas week meetings of the American Association for the Ad-

vancement of Science, Dr. Henry G. Knight, chief of the bureau of chemistry and soils, U. S. Department of Agriculture, summed up the story of the solving of selenium's riddle.

Thanks to a concerted attack by many minds and from many angles, the once mysterious poisonings of livestock in parts of the Great Plains area were traced to their cause in a few years. The U. S. Department of Agriculture, the U. S. Public Health Service, and the state experiment stations of Wyoming and South Dakota were all represented on this particular battle-front of research.

Selenium is a compound chemically related to sulphur, but not nearly so abundant in nature. Purified, it has a white, moon-like luster, which suggested its scientific name. The mischief it causes comes not from pure selenium but from its salts or compounds in the soil.

Among the facts developed by the