

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.

#### BIOLOGY-ENTOMOLOGY

## "Moon Element," Selenium, Cause of Blind Stagers

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

**T**HE 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 modern 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

#### 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-

scribed by Dr. Harlow B. Mills and Prof. J. H. Pepper of Montana State College.

The creature is known in common parlance as "ice bug" or "alpine rock crawler" because of its preference for cold spots. Entomologists give it the rather formidable name of *Grylloblatta campodeiformis*, which translates roughly as "cricket-cockroach shaped like a caterpillar." Even to the experts it must look queer.

Dr. Mills and Prof. Pepper, who were fortunate enough last autumn to secure about 150 specimens in all stages of development, reported that the ice bug prefers a temperature of 38 degrees Fahrenheit, at which most other insects become dormant with cold, and that it suffered heat prostration at 80 degrees. Most common insects are normal at that temperature, and do not succumb to heat prostration until 120 degrees is reached.

The ice bug lives only at high elevations, from 5,400 to 8,600 feet. It is extremely solitary in its habits, and apparently of a mean disposition, although it can neither sting nor bite effectively. Scientists regard it as a "living fossil," for it is the sole survivor of a group that has been off the map for many millions of years.

### Head-First Recovery

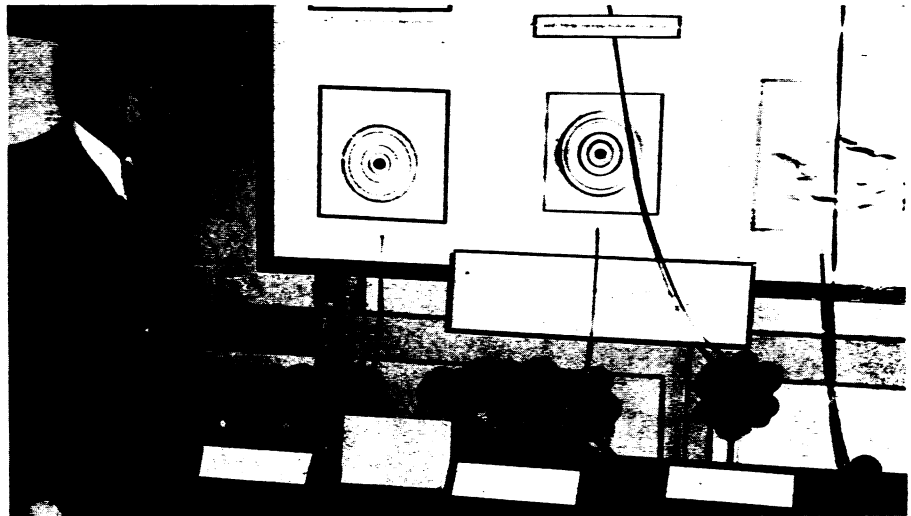
When the effects of ether anesthesia are wearing off, the recovery goes head-first. That is, the head and related parts are first to be able to feel and respond to stimuli again; then the forepart of the body and the front limbs; finally the wave of recovery sweeps all the way aft.

Albert C. Cornsweet, of the psychology faculty at the University of North Carolina, reported that he found this head-first, tail-last recovery to prevail in white rats which he had kept anesthetized for periods of from four to seven minutes.

An interesting feature of the experiments was that even though the animals showed evidence of recovery of feeling and response in this fore-to-aft fashion, they could not stand up and move about normally until their hind legs and tail regions were fully recovered.

Mr. Cornsweet is now investigating with other animals and other anesthetics, to find how widespread this phenomenon is in the animal world. He is also making tests on smaller body areas, to determine more narrowly the direction and rate of travel of the recovery wave.

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### SOIL MOLECULE MODELS

*Dr. Dean Burk, U. S. Bureau of Chemistry and Soils, with the Bureau's exhibit at the A.A.A.S. meeting. Bureau studies show that the colloidal content of all soils is of only two types. The models were made by Dr. Lewis Maxwell.*

MEDICINE

## Find a Possible Relation Between Glands and Cancer

**G**LAND activity may be a factor in the causation of at least some kinds of cancers, it appears from the report of Dr. J. Halsey Bagg of the Douglas Research Laboratory, Memorial Hospital and Cornell Medical College in New York City, to the American Association for the Advancement of Science.

Malignant tumors, or cancers, of the sex organs of fowl result, Dr. Bagg found, from chemical irritation with zinc chloride acting under the normal seasonal influence of the sex hormones which occurs during the early part of the year when the sex glands are most active.

At other times of the year, when the sex glands are inactive, the chemical irritation of zinc chloride failed to produce cancers. However, if the anterior pituitary hormone of sheep was used to stimulate the sex glands before injection of the irritating chemical, the cancers were produced even during the seasons when the sex glands were normally inactive.

Prolonged stimulation of the glands by pituitary hormone treatments alone without the chemical produced no tumors.

The tumors produced were malignant, grew very rapidly and were simi-

lar to those seen in man, Dr. Bagg reported. He pointed out that spontaneous tumors of the sex organs in birds are very rare.

### Yeast Extracts Pinch-Hit

Yeast extracts seem to be able to replace the secretion of the very important internal gland, the pituitary, in stimulating at least partially normal growth in male sex organs, zoologists at the meeting heard from a three-man Harvard University research team: Drs. F. L. Hisaw, R. O. Greep and H. L. Fevold.

The pituitary is sometimes styled the "master gland" because of its apparent control over a large number of bodily activities. Among other things, it must normally provide an essential and continuing stimulus during the growth of the sex organs. If the pituitary is diseased or otherwise put out of action, the individual does not mature.

Yet when Dr. Hisaw and his associates removed the pituitaries from a number of young male rats, and then kept them supplied with an extract made from brewer's yeast, the primary sex glands failed to degenerate and carried on nearly normal growth. Accessory sex structures, however, did undergo regression.

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