

PHYSICS

Experiments With Sound In Gases Brings \$1000 Prize

Professor Knudsen Finds New Technique For
Molecular Physics in Absorption of Atmosphere

SPECTACULAR experiments with sound in gases, that promise to affect design of auditorium and sound signalling as well as to aid study of the antics of molecules, won for Prof. Vern O. Knudsen of the University of California at Los Angeles the \$1000 prize of the meeting of the American Association for the Advancement of Science at Pittsburgh.

Some of the practical results of Prof. Knudsen's research are:

If we lived in an atmosphere of oxygen the consonants of high frequency in our speech sounds could scarcely be heard across an ordinary street.

The absorption of such high frequency sounds in a room is more influenced by the humidity and temperature of the air than it is by the walls, draperies, the audience and other sound absorbing things in the room.

It will be possible to calculate the acoustic transparency of the air at any temperature and humidity.

Sound signalling in air will be aided by the new information.

Ally of Quantum Theory

Less vivid but even more important is the aid that Prof. Knudsen's work will be to molecular physics. It furnishes a new technique for investigating not only the nature of molecular collisions but also the nature of molecular forces involved. Prof. Knudsen said:

"Acoustics has become a potent ally of the quantum theory."

Scientists have a new mode of attack on the age-old mystery of molecular composition and the behavior of objects too small to be seen individually.

The prize researches have been in progress for a number of years (*SNL*, May 13, 1933, p. 291).

Prof. Knudsen's research may give an impetus to the new art of air-conditioning in public buildings, because in a

symphony concert when the humidity is about medium, the message of the piccolo for instance gets lost before it gets to the rear of the hall.

As president of the Acoustical Society of America, Prof. Knudsen presided over the recent meetings of those scientists who study sound and his prize paper was on a joint program of that society and the American Physical Society.

Science News Letter, January 5, 1935



DR. VERN O. KNUDSEN

PHYSICS

Millikan Frames Platform On Cosmic Ray Truths

DR. Robert A. Millikan, of California Institute of Technology, told teachers at the American Association for the Advancement of Science at Pittsburgh just what can be believed about cosmic rays, which he called "the energy-bullets" with which the superbandits of the universe are shooting up our earth.

He made it clear that he had abandoned an earlier belief that all of the cosmic rays are "birth cries" or signals of atom-building or matter creation in the far depths of the universe. Scientists as yet can not suggest how the higher energy cosmic rays are created.

For the benefit of teachers who should "instruct and develop rather than to excite or mislead their pupils" Dr. Millikan wrote a platform for the cosmic ray "party."

You may believe about cosmic rays:

Article one states that the penetrating power of cosmic rays coming in to earth from beyond the Milky Way is six to a hundred times that of the gamma rays of radium so useful in cancer treatment and industry.

Article two states that the cosmic rays come from beyond the Milky Way, the part of the universe in which we live. Dr. Millikan ridiculed the idea that they

originate in the stratosphere "which has apparently become to the public a solvent of all riddles, a kind of cosmic Houdini in the performance of the miraculous."

Article three states that the energies of cosmic ray charged particles rise to the very large energies of at least six billion and probably more than ten billion electron volts, which is "one of the most amazing facts of modern physics." This is some four thousand times the energy of the most powerful radiation from radium here on earth.

Article four says we can speculate on how the cosmic rays are formed in the depths of space but that we should as yet believe nothing.

Article five says that at present believe nothing about just what is the composition of the cosmic ray bullets. All scientists admit that at least part of the bullets are electrically charged particles. The big question is whether there are also in the incoming rays some photons or gobs of superlight.

Article six states that both the long known negative electrons and the newly discovered positive electrons, named positrons, are shot off when the heart of an atom is hit by the great energy of cosmic rays. (Turn to Next Page)

Article seven states that scientists know the fate of these positrons flying out of the collisions between atoms and cosmic rays. They disappear by combining with an ordinary electron and thus create a mild-mannered radiation that scientists have detected.

The present craze for the new was condemned by Dr. Millikan. If this demand for novelty regardless of the true, in art, science, society and government goes much further, "the remedy may be found in the prospect that a nugget of

sober, uncolored truth may become the most exciting news there is just because of its rarity."

"I venture the prediction," said Dr. Millikan, "that our present age, because of its craze for the new regardless of the true will be looked back upon by our children's children with more amazement and ridicule than we ourselves feel because of the credulity of the Middle Ages or the smugness and hypocrisy of the Victorian Age."

Science News Letter, January 5, 1935

growth is also largely determined by the race or breed to which the bird belongs, these investigators now find.

Success in raising young, and thus persistence of the species, depends in doves and pigeons upon the secretion of an adequate supply of this crop-milk. The same amount of hormone, however, produces very unequal results in birds which differ in constitutional or genetic endowments.

"Apparently certain of these individuals must secrete much more prolactin in order to obtain an adequate response from their laggard crop-glands," Dr. Riddle said, "or else some hereditary difference causes a rapid destruction or elimination of the injected hormone in some individuals and not in others."

"Certainly an inherited difference in the utilization of a hormone is involved, and differences of this type probably have been of consequence in the survival and evolution of vertebrates."

The discovery of the ability of the hormone to arouse an important instinct was made in a study of hens of various breeds. Most laying hens of breeds which normally "go broody" now and then could be readily made broody by three or four injections of prolactin, Dr. Riddle and associates found.

Such hens begin to cluck two to four days after the first injection, and begin to incubate or "nest" 12 to 24 hours later, Dr. Riddle reported. Hens that were not actively producing eggs, though of broody races, could only be made to "cluck." They would not incubate eggs and thus show complete broody behavior. Most hens of a non-broody race like the White Leghorns, from which some element necessary for the development of the incubation instinct has been eliminated by selective breeding, could only be made to cluck. Two Cochin roosters were made to cluck but they gave no attention to eggs and nests provided for them.

A series of other hormones were shown to be incapable of inducing broody behavior in similar hens. The study showed that the other now recognized hormones of the anterior pituitary gland (growth hormone, follicle-stimulating, thyrotropic and luteinizing) were not the hormones responsible for the onset of broody behavior. The two female ovarian hormones, estrin and progesterin, were also shown to be unable to release or initiate the incubation instinct.

Science News Letter, January 5, 1935

PHYSIOLOGY

Two New Functions Found For the Body's Hormones

TWO new and important functions of hormones, powerful chemical substances produced by certain glands of the body, have been discovered by Drs. Oscar Riddle, Robert W. Bates and Ernest L. Lahr of the Carnegie Institution's research laboratories at Cold Spring Harbor, N. Y.

Hormones may influence behavior by arousing instincts and they play a part in the survival of races, these scientists told members of the American Association for the Advancement of Science.

"Instincts are the material of which much of behavior is made," Dr. Riddle pointed out. "The conscious behavior of man is no exception, and the extent to which consciousness itself was gradually evolved from the elements of simple ancestral behavior is yet to be learned. The results of this study are therefore thought to have important bearing on the problem of behavior in addition to providing further information concerning the functions of one of the hormones of our own studies."

Prolactin, a hormone formed in the anterior pituitary gland, plays a necessary part in arousing the ancient, species-preserving "incubation instinct," or broodiness, in domestic fowl, Dr. Riddle and associates found. Prolactin is the hormone responsible for exciting milk secretion in man and other animals that nurse their young, for the formation of crop-milk in pigeons, and for reducing the activity of germ-glands in birds, Dr. Riddle and associates had previously found. These activities and also the release of the broody instinct are all intimately concerned with the feeding and care of the young.

This same hormone from the pituitary gland causes cyclical thickening of the crop-gland of pigeons as well as the formation of the crop-milk with which pigeons feed their young. The amount of thickening or of weight increase in the crop wall is proportional to the amount of hormone injected into the bird. The amount of this new

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