on original research of a high order. The research work under this fellowship will be carried on at the New York Hospital and Cornell University Medical College. The fellowship will be available on July 1 at the beginning of the academic year. Applications for the year 1940–41 should be addressed to The Committee of the Lewis Cass Ledyard, Jr., Fellowship, The Society of The New York Hospital, 525 East 68th Street, New York, N. Y., and should be in the hands of the committee by February 15. It is expected that the award will be made by April 1.

SEVERAL grants in support of medical research work have been received recently by the Medical School of the University of Minnesota. A gift of $5,000 has been made by Mrs. John Dwan, of St. Paul, to support the serum center which she had previously started with an endowment. From the John and Mary R. Markle Foundation $1,000 has been granted for work by Dr. Albert V. Stoesser, who is investigating water and electrolyte metabolism in tractable asthma. An annual grant for cancer research, made in the sum of $9,000 three years ago by the Citizens Aid Society of Minneapolis, has been increased to $10,000 a year for the next three-year period. The cancer research is being done by the departments of surgery, pathology and x-ray therapy in University Hospital. Minnesota also has received a fourth fellowship for special graduate training in cancer research from the National Cancer Institute. Another recent grant was that of $16,000 from the Barber Oil Company of Minneapolis to support investigations of the relation of diet and activity to cancer.

DISCUSSION

TWO PARADOXES

IN the archives of the Royal Society there are to be found a number of papers, many of which have never been published, showing that an animated discussion took place in the seventeenth century over the answer to this question: "Is the effect that can be produced by a moving body proportional to the first or to the second power of its velocity?" There were eminent names on both sides of this controversy, the followers of Descartes arguing for the first power, while Leibnitz led the opposition. The discussion was not purely theoretical in character, as each side could cite experimental evidence in support of its contention. An example stated in modern terms will make this clear.

A bullet is fired into a ballistic pendulum. If we focus our attention on the velocity imparted to the pendulum we find this to be proportional to the first power of the velocity of the bullet; but if we regard only the vertical height through which the pendulum is raised, this will be proportional to the second power of the velocity of the bullet.

Simple as this appears to-day, it was a real paradox two centuries ago, for though momentum (or quantity of motion) was a familiar idea to Descartes and Newton, the concepts of work and kinetic energy were yet over a hundred years in the future, and the discussion finally died out without reaching any decision.

It is instructive to note the way in which the nineteenth century finally resolved this paradox. The first step was a clarification of the question and a differentiation of the involved phenomena into two classes—momentum effects and energy effects, the latter class requiring the introduction of a new concept, which was so defined as to be consistent with previously existing mechanical theory. The rather vague ideas of Descartes and of Leibnitz assumed the forms of the conservation of momentum and the conservation of energy.

We have before us to-day a similar paradox dealing with the nature of the electron. Is it a charged particle or a little group of waves? And, as before, there is experimental evidence for both sides of the question. This is well brought out by the diffraction rings obtained by G. P. Thomson,[1] when negative electrons were shot through very thin films of metal. The electron must have a wave aspect, or there would be no interference pattern; it must also have a charged particle aspect, or the whole ring system would not be deflected by a magnet, as it is found to be. Perhaps the solution of this paradox, like that of the seventeenth century, will involve the same elements of clarification, differentiation and the introduction of a new concept.

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OXYGEN RELATIONS IN HYDROPHYTES

IT has been shown by experiments that the roots of willow cuttings obtain oxygen from two separate sources—the atmosphere of the soil and from the shoot.[1] That the roots of herbaceous hydrophytes may also use internal (photosynthetic) oxygen as well as atmospheric oxygen is suggested by certain features of habit and structure.

The root systems of herbaceous hydrophytes are, in a very large number of species, adventitious, arising from some type of underground stem, as rhizomes. Among plants with root systems which are formed

[1] G. P. Thomson, *Proc. Roy. Soc.*, 117: 600, February 1, 1928.
[1] W. A. Cannon, *Plant Physiol.*, 4, 1932.