versity and the past five years a secretary of the General Education Board. Professor Tufts will be charged with the responsibility of the development of the enlarging educational program of the university. Mr. Arnett will perform the function of business manager upon the retirement of the present business manager, Wallace Heckman, next June.

DR. RUDOLF BENNITT, of Harvard University, has been appointed assistant professor of zoology at DePauw University. He takes the place of Dr. Walter N. Hess, who has been granted a leave of absence to accept the Johnston Scholarship in the department of zoology at the Johns Hopkins University.

DR. C. E. WEATHERBURN, of Ormond College, Melbourne, has been appointed professor of mathematics at Canterbury University College, Christchurch, New Zealand.

DISCUSSION AND CORRESPONDENCE

ON THE MODEL OF THE HELIUM ATOM

IN a recent paper[1] Kramers shows that the energy of the crossed orbit model of the helium atom in its normal state when computed on the basis of classical dynamics comes out too low, 5.5235 W (W = energy of the hydrogen atom in its normal state), while the best experimental value is 5.807 W. He concludes that classical dynamics fails in atomic systems containing more than one electron, an idea also confirmed by a theoretical investigation of the excited states of helium by Born and Heisenberg.[2] As a suitable modification of classical dynamics the assumption appears reasonable that the moving electrons of such systems, instead of acting gradually and continuously upon each other in the classical manner, interchange energy and momentum in a sudden discrete way. The nature and magnitude of these exchanges shall be found by demanding a correspondence between the discontinuous and the classical processes.

This idea when applied to the crossed orbit configuration of the helium atom leads to a model of the same general character as the classical one. The electrons each have half a quantum of moment of momentum along the normal of the invariable plane, and their motion in the meridian plane is an oscillation under the influence of the nucleus alone, with abrupt changes of momentum at the end points, the magnitude of which shall be determined from the correspondence requirement. The ionization potential of such a model was found to be 5.799 W. The most important question is whether this reasoning can be generalized and applied to other systems.

RALPH DE LAER KRONIG
COLUMBIA UNIVERSITY

1 *Zeit. für Physik,* 13 (1923), 312.
2 *Zeit. für Physik,* 16 (1923), 229.

PLANT LICE AND LIGHT EXPOSURE

BECAUSE the true sexes in plant lice generally make their appearance in the temperate zone in the fall, the generally accepted explanation has been that the approach of cold weather or temperature is the causal factor. Along with the decrease in temperature in the fall, there is a much more marked relative shortening of the days; and it is this relative length of day to which the insects are exposed that appears to stimulate the production of the sexes; just as Garner and Allard[1] have succeeded in making ordinary fall flowering plants blossom in summer or at any other season by the employment of a short day.

In Tennessee the normal appearance of the oviparous females of *Aphis forbesi,* the strawberry root louse, is in the month of November; but by subjecting the insects, a few days after the eggs hatched February 23, to a short day of seven and one half to eight hours, out of doors in a ventilated dark chamber, the oviparous females appeared May 7 and eggs were deposited May 22.

The method used of subjecting the plants to a short day was to place the potted strawberry plants with the lice in the dark chamber at 5 o'clock in the afternoon. The following morning the plants were removed at 9:30 and placed in the light. Garner and Allard have shown that the difference in temperature inside and outside the dark house in their experiments was negligible, as the temperature inside was but 2° or 3° F. higher than the temperature outside; hence any responses on the part of the plants could not be attributed to lower temperatures.

Having been successful in the production of the sexes by the employment of a short day, and since the fall migrants or sexuparae of various plant lice are the antecedents of the oviparous forms, it was thought possible that the migration of plant lice is also due to the relative length of daily light exposure. And such was found to be the case with several species. Males and sexuparae of *Aphis rumicis* L., *Capitophorous hippophaes* Koch. and *Aphis Sorbi* Kalt. were produced experimentally in June when the temperature is high by keeping curled dock (*Rumex crispis*), smartweed (*Polygonum sp.*) and plantain (*Plantago lanceolata*), the respective summer hosts of the above species, exposed to a short day for about seven weeks. There was also obtained some evidence, which will be published shortly, that the production of spring migrants in such forms as *Aphis Sorbi,* the destructive rosy apple aphis, where they may occur in any subsequent generation after the 3rd, is governed by the increasing length of day of the spring months. The late appearance in *A. Sorbi* of the spring migrants which may result in a destructive outbreak,

1 *Journal of Agricultural Research,* Volume 18: 553–606.