establishment of the C. Kemble Baldwin Foundation for Research and Instruction in Aeronautics. Under the terms of the gift the income of the fund may be employed for research in any field of technology having a bearing on aeronautics.

THE N. V. Potash Export My., New York and Amsterdam, Holland, have established a five-year fellowship at the Massachusetts Agricultural College Experiment Station for investigations on the relation of fertilizers to asparagus culture. The work will be under the direction of Professor V. A. Tiedjens at the Market Garden Field Station at Waltham, and will be conducted on four definite soil types.

MRS. GEORGE E. WARREN, of Boston, who was recently elected a trustee of Rollins College, and her sister, Mrs. Homer Gage, of Worcester, have made a gift of $100,000 to the college for construction of a college building.

WILLIAM D. ENNIS, director of research of the Technical Advisory Corporation of New York, has been appointed to fill the newly established chair of economics and engineering at Stevens Institute. The chair is a memorial to the late president, Dr. Alexander D. Humphreys. Gifts amounting to $50,000 toward its endowment have been recently announced.

DR. A. N. BANTA, of the Carnegie Institution of Washington, at Cold Spring Harbor, Long Island, is acting professor of experimental biology for the present semester at Brown University, in place of Professor J. Walter Wilson, who is on leave of absence in New Mexico.

DISCUSSION

THE SPECTRUM OF THE AURORA BOREALIS

ACCORDING to the hypothesis proposed by Cario and the writer, the α bands of the nitrogen molecule that arise in the nitrogen afterglow can be accounted for by ascribing their excitation to collisions between metastable molecules of nitrogen and metastable atoms in the ^2D and ^2P levels. By using similar considerations it has been possible to account for some of the radiation of the aurora for which no satisfactory explanation has as yet been given. Although the spectra that can be explained in this manner are among the weakest in the aurora, they are of interest because of the remarkable similarity between the processes by which they are excited and those by which the α bands in the nitrogen afterglow are excited. In this short note only two of these unexplained lines will be considered, although some of the remaining lines readily fit a similar explanation. Their discussion will, however, be postponed until a full account of this work is published.

The formation of metastable molecules of nitrogen in the aurora can be readily accounted for. The second positive bands of nitrogen, corresponding to the transitions C–B, are quite strong in the aurora. The first two or three B levels are the final levels of the molecule corresponding to the strongest of these bands. The first positive bands that are radiated with these B levels as the initial states, will have as their final levels the first two or three A levels. These first positive bands lie so far in the red that their observations in the aurora would be a very difficult task. In the above manner we have accounted for the presence in the aurora of nitrogen molecules in the A_1 and A_0 levels, these levels being metastable.

Now the energy of the nitrogen atom in the ^2D and ^2P levels differs from the energy in the ^4S ground state by 2.37 and 3.56 volts respectively. Granting the presence in the aurora of metastable nitrogen atoms in the ^2P level, it is seen that most of these should radiate in a transition from the ^2P to the ^2D level, and only a few of these ^2P atoms should give up their energies by collision. Radiation corresponding to these transitions will fall at about 1.04 μ so that its observation, either in the aurora or in active nitrogen, is practically impossible with our present methods. Similar arguments can be applied to atomic oxygen. Here, however, the line corresponding to the transition $^1S_0$–$^1D_2$ is now known to be the aurora green line. We can conclude from the behavior of atomic oxygen in the aurora that the transition between the ^2P and ^2D levels in nitrogen should be much more probable than the transitions between the ^2P and ^4S or the ^2D and ^4S levels. In discussing the results of collisions between nitrogen molecules it is necessary therefore to consider only the ^2D metastable atoms. A similar argument will of course apply to collisions between atomic oxygen and metastable nitrogen molecules.

The difference B_6–A_0 in the nitrogen molecule corresponds to an energy of 2.38 volts. One should therefore expect transitions in the aurora having B_6 as their initial level. Two weak lines having wavelengths of 5176 A and 5149 A have been observed in the aurora by early investigators. The transition B_6–A_0 gives rise to a band of which the first head lies at 5178 A. The transition B_7–A_1 yields a band having its first head at 5152. It is therefore proposed that these bands are excited in the aurora by collisions of the second kind between ^2D nitrogen atoms and metastable nitrogen molecules in the A_0 and A_1 levels. This explanation is in complete

agreement with the discussion given in the first part of this note.

In a recent discussion of the aurora green line Sommer suggested that the lines 5176 and 5149 correspond to the transition ^2D–^4S. The wave number difference between 5176 and 5149 is 101 cm^{-1}, and according to Compton and Boyce the difference between the ^2D levels is only 5 cms^{-1}. It is therefore difficult to see how the assignment of Sommer can be correct. In addition to this objection it should be noted that the most probable location of the lines corresponding to the transition ^2D–^4S is at about 5207 A, and the difference between this and the two lines mentioned above is too large to be ascribed to experimental error.

Three other bands, 5925, 6465 and 6323, have been explained by the writer by considering collisions between metastable nitrogen molecules and metastable oxygen atoms. A preliminary account of this has been given in a paper before the February meeting of the American Physical Society.

We wish further to call attention to a striking characteristic of the five α bands that have been mentioned in this note. Normally, the bands each possess several heads. In the aurora, however, the bands appear with only a single head. Such curtailed bands have been observed by the author in some experiments in which the aurora green line was excited in active nitrogen. This peculiar development of the α bands is, however, not understood at the present time and a further study of this phenomenon is to be made.

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FEBRUARY 5, 1929

SOUNDS REPORTED ACCOMPANYING THE FALL OF A METEOR

THE appearance of a large meteor coming to the earth or so near to the earth as to be both seen and heard, although not entirely unusual, is nevertheless of such interest as to justify permanent record. On June 23, 1928, such a meteor appeared in southwest Texas. Although falling in daytime on a bright afternoon, this meteor was of such brilliancy as to attract wide attention and to be seen for two or three hundred miles. It appeared in the sky, according to the most reliable observations, at or near 4:40 in the afternoon, and traveling with great swiftness in a northeasterly direction, disappeared without, so far as evidence has been obtained, reaching the earth.

The general appearance of the meteor is given by several observers. All agree that it flashed out in the sky to great brightness suddenly, and that its course was traversed in a few seconds. All who were near observers agree that although approaching the earth it ceased to be visible or disappeared by explosion before reaching the ground. The meteor is variously described as "a ball of fire shooting across the sky," as having "the appearance of a skyrocket," and as "a dark ball with a fiery tail." Phenomena usual to meteors were observed, including light, sound and a cloud or train.

To those who were near at hand the light of the meteor appeared as "brilliant," "incandescent," "similar to the light of the sun," "not blinding but very bright," "as bright as the sun." One observer says that although he was looking through smoked glasses the light of the meteor was a strain to the eye. Some describe the light as having a play of colors; others failed to observe any such variation in color. To those at a greater distance the light appeared for the most part a dull red. Obviously the condition under which the light was observed and the distance from the meteor affected its appearance. Those who were looking towards the sun seem to have seen the meteor with essentially the same distinctness and as showing the same brilliancy as those who were looking away from the sun.

The cloud which attended the meteor was seen from almost as great distances as was the light itself, and was seen in fact by many more people, for while the flash of light marking the path of the meteor lasted no more than one or two seconds, the cloud floating in the clear sky continued visible from some points of observation for more than an hour. This cloud doubtless appeared different from different viewpoints, and it is variously described. By those who saw it earliest the cloud is described as being at first a wisp or thread of smoke forming in the path of the meteor and gradually spreading into a cloud. It is described by all observers as light in color and cloud-like in appearance. Observations on the duration of the cloud are as follows: From localities east (looking toward the sun), seven to ten minutes, ten to twenty minutes, thirty minutes, thirty to forty-five minutes, nearly an hour; from localities west (not looking toward the sun), one hour and twenty minutes, and "until sundown"—about three hours. The length of the cloud according to the best measurements obtainable approximated fifteen miles.

Instrumental measurements on the cloud supplemented by approximate records as to the time required for the explosive sound to reach the earth indicate that at the time of final disappearance from view the meteor was between five and nine miles above the earth. The rate of travel of the meteor based upon an estimated duration of the flash of light and the length of the cloud appears to have been between five and seven and a half miles per second.