

HIGHHOLE COURTSHIP AGAIN.

TO THE EDITOR OF SCIENCE: On one of the last days of April I noticed a pair of highholes on the turf about forty feet away. One would drill the turf vigorously a few times, and then nod the beak repeatedly with a sidewise motion to the other—presumably the female, and this one took no part in the turf-drilling. While nothing passed from beak to beak, yet the antic play rather confirmed my somewhat jesting suggestion (SCIENCE, N. S., 1897, 921) that it is a feeding pantomime, the female, like a young bird, being receptive of the feeding attentions of the mate. A thorough study of this interesting bird through a telescope or powerful glass ought to reward the observer.

HIRAM M. STANLEY.

LAKE FOREST, ILL.,
May 7, 1900.

A CORRECTION.

In a note printed on page 753 of SCIENCE (May 11th), I inadvertently appear to advocate the view that the current year belongs to the twentieth century, which is not my opinion. The sentence in question should have read "It seems to me that that is reason enough why we should use '00 always to mean 1800, not 1900, even though the current year belongs to the nineteenth century."

E. L. MARK.

THE GRAPHOPHONE AS AN AUXILIARY ASTRONOMICAL INSTRUMENT. A SUGGESTION.

IN order to insure as comprehensive and authentic a graphic record of the appearance of the solar corona, as deliberate and close observation and scrutiny limited to the few minutes of totality can well be expected to furnish, I beg leave to suggest the employment of an ordinary graphophone for taking down the observer's talk instead of a short-hand recorder.

The graphophone if properly set agoing and manipulated will easily record all the observer might choose to say for about three or four minutes, and therefore would enable him to give his undivided attention to the examination and thorough study of the aspect of the phenomenon, without even the risk of being disturbed or interrupted at the critical moments by questions,

etc. Nothing, it would seem, could possibly defeat securing by this means a complete and authentic record of all an observer might feel prompted to utter or note, except, perhaps in the case the splendor of the corona should render him temporarily speechless. For verification, if deemed necessary, employ a second graphophone. The time of occurrence of any unexpected event can be noted and recorded upon the rotating barrel in several ways.

A trustworthy and comprehensive graphic account of the physical aspect of the corona and chromosphere, would be valuable I should think, in so far as it would supplement the colorless work of the camera.

W. E.

NOTES ON PHYSICS.

THE BLUE HILL KITE OBSERVATIONS.

MR. H. H. CLAYTON, in an interesting letter to *Nature*, April 26th, points out the bearing of recent observations of temperature and wind velocities at high altitudes upon the theories of cyclonic movements of the atmosphere. Four types of instability of the atmosphere are now recognized: (1) Instability due to heating of the lower strata of the atmosphere (vertical temperature gradient). (2) Instability due to the thrusting of large masses of warm air into cool regions or of large masses of cold air into warm regions, for example, a long continued southerly wind carries a mass of warm air northward into a region in which the surrounding air is cool (horizontal temperature gradient). (3) Instability due to accumulation of water vapor in the lower strata of the air. Such air precipitates its moisture more and more as it rises, is warmed by this precipitation and rushes upwards with increasing violence. (4) Instability of air streams which have passed beyond the region in which they are more or less of the nature of permanent states of motion. Thus the trade and antitrade winds in certain regions show the characteristics of what are called in hydrodynamics *permanent states of motion* and when they pass beyond these regions they become dynamically unstable and break up.

Each of these various types of atmospheric instability has been put forth as the principal cause of cyclonic motion by different writers

and Mr. Clayton points out that observations in the high regions of the atmosphere afford criteria for determining which of the four types of instability is most predominant in a cyclone.

The kite observations at Blue Hill seem to show according to Mr. Clayton that the first type of instability is not all important, but it must be remembered that these kite observations do not extend beyond 3000 meters above sea level, and although Mr. Clayton considers also the balloon observations which have been made in Europe, still we think that his conclusion is more or less tentative (as no doubt Mr. Clayton intends it to be) but he seems to lose sight of the fact that the vertical stability theory, No. 1, requires a high pressure area in the higher regions to be directly above a low pressure area at the earth's surface. Thus Mr. Clayton seems to think that the observations of March 24, 1899, showing a low pressure area near the earth's surface in Italy and a low pressure area in the upper air over Finland, is against the vertical instability theory. Further, after a cyclone has been some time under way the upward current near the center of the cyclone would undoubtedly produce a mass of warm air extending to enormous altitudes immediately above the center and that, therefore, the absence of a cold stratum within the range of the observations is not decisively against the vertical instability theory.

Furthermore, the force of Dr. Hann's objection to the preponderating influence of the third type of instability, that cyclones are more frequent and more violent in winter than in summer, is weakened by the fact that our position with reference to the polar and equatorial winds is very different in winter than it is in summer so that the influence of the fourth type of instability is greatly different at these two seasons and may mask the effect of the third type.

The probability is that one type of instability may preponderate in one place or one season and another type in another place or season.

The present writer is inclined to think that as a rule, the first type of instability furnishes the energy of cyclonic movement and that the fourth type determines the line of progress or the path of the cyclone; that the second type

of instability is the cause of the local disturbances which occur in the region just ahead of a cyclone such as tornadoes and thunder storms; and that the third type of instability contributes greatly to the violence of these local disturbances.

W. S. F.

APPLIED SCIENCE IN MUNICIPAL WORK.

THE city of Marshalltown, Iowa, has just issued in pamphlet form, the 'preliminary data for the design of a proposed sewage system' which illustrates in an unusually satisfactory manner, the rare case in which municipal authorities have displayed enough of wisdom and of familiarity with the resources of their country to bring to bear upon their problems of construction, the best scientific knowledge available. The committee of the city council applied to Professor Marston, the civil engineer, Professor Weems, the chemist and Professor Pammel, the botanist of the University of Iowa, for advice, and under their direction the data reported were collected. The work of the survey in detail, was done by trained students, largely, and the drawings were made by Miss Wilson. The city of Marshalltown paid all expenses and its officials seem to have heartily seconded the endeavor of the chemists and engineers of the University.

The city has a population of 12,000 and is the county seat of Marshall Co., and the commercial center of a rich agricultural country. There is some manufacturing, the principal shops of the Iowa Central Railroad and large beet-sugar manufacturing establishments being located there. The sewer system contains about ten miles of sewers and laterals. Water is supplied from drive-wells and to the amount of about 1,300,000 gallons per day, the glucose and packing houses taking a large fraction of that used for other than domestic purposes. It contains about 300 parts solid matter in the million, mainly lime and magnesia salts. Deeper wells of artesian character, belonging to the glucose company, show about 900 parts solid matter, of which about two-thirds seem to be lime and magnesia salts and fifteen per cent. organic matter, although the wells are 300 feet in depth. The city water in May, 1899,