in any one term. In teaching biology I have constant recourse to the school museum. For example, a class may be taken into the museum and a demonstration given of the general characters of the animal kingdom; or certain exhibits illustrative of one particular subject can be removed from the cases to the laboratory, where, after a short description, they can be sketched by the class. A similar use of the museum for practical education is made by my geological colleague. Further use of the collections has been made for popular demonstrations to members of a local society as well as to parents of boys who visit the school on Speech Day; on these occasions the boys themselves act as demonstrators. Such, in brief, are some of the uses to which a school museum is put in the service of education.

That the knowledge of such efforts in education has not come to the powers-that-be only emphasises the deplorable fact of the present lack of co-operation between the school and the university. As assistant in the zoological departments of Manchester and St. Andrews Universities I learnt the immense value of the museum as an aid to biological education. My experience of school work is confined to the brief period since the close of the war, but I cannot believe that no effort is being made similarly to use the museums of natural history in other schools where a biologist has been added to the staff of masters.

E. W. SHANN.

Oundle School, Northamptonshire,
October 31.

Mating Dances of Spiders.

I HAVE not, up to the present, found any account of anything approaching to a mating dance, such as is common among the Salticides, in the Lycosides. The following observations tend to show, I think, that some such dance must exist among certain members of this family. I should be glad to know if any readers of NATURE have met with similar experiences with these spiders.

The species observed was *Lycosa saccata* (Blackwall), which is exceedingly common in the spring. I was watching a number of these spiders at about 3 p.m. on April 29, 1919. They were sunning themselves on a vertical wooden board leaning against a cucumber frame. I first noticed a male, which was about 1 in. from a female, going through some most curious movements. He extended one palp downwards (at about 45°) and the other upwards, at the same sort of angle. He then withdrew them and extended them again in the same way, but with their positions reversed. Each time he withdrew them he usually took a step towards the female. He repeated this two or three times, and then brought the palps to their normal position with a curious quivering movement. The front legs were also caused to quiver, being held just off the ground. The front legs of the female were occasionally seen to quiver also.

When the male got up quite close to her ($\frac{1}{4}$–$\frac{1}{3}$ in.) the female ran off, and the male searched about within 2 ft. of where he lost her, exploring crevices, etc., as though looking for her. At last he suddenly encountered her round a corner, and she ran away. He proceeded with his antics, however, without her being there.

A new male then appeared and began similar antics in front of the female, except that he merely extended each palp separately and returned them to their former position. The original male then came up and a fight ensued, in which both spiders fell off the board, leaving the female to continue her basking in the sun.

G. H. LOCKET.

Lincoln College, Oxford, November 1.

The Energy of Cyclones.

IN NATURE of October 28, p. 286, Lt.-Col. Gold refers to the theory of the late Dr. Margules, that storms would arise if two masses of air of different temperatures were in juxtaposition. The situation would be unstable, and in passing from this unstable situation to a stable one the potential energy would be reduced, part of it being converted into the kinetic energy of the ensuing "storm." The theory takes it for granted that the warm air rises and the cold air descends.

But storms are generally associated with cyclonic depressions, and of recent years the temperature distribution in cyclones has been carefully studied. Sir Napier Shaw (Meteorological Office Geophysical Memoir, No. 210*b*, p. 14) sums up the facts as follows: "The conclusions which we may draw are, first, that the pressure changes at the surface are a reproduction of the pressure changes at the 9-km. level, and that they must be regarded as produced, not by, but in spite of, differences of temperature in the air."

The theory of Dr. Margules, consequently, fails entirely to account for cyclones. On the other hand, his theory may play some part in the production of line squalls and some thunderstorms.

With regard to "polar fronts," the theory of Dr. Margules is also at fault in a great measure. The low-pressure areas over the polar regions produce the two great polar cyclones. The atmospheric columns over the poles must be relatively warmer than those over middle latitudes. As a result, the warm air is drawn polewards. But, although the atmospheric columns over the polar areas are relatively light, there are cold, dense layers of air resting on the earth's surface. These cold polar layers are pressing outwards, and where they meet the warm cyclonic inflows we have the "polar fronts."

The facts seem to point to the stratosphere as being the main source of energy of storms and trade winds.

R. M. DEELEY.

Tintagil, Kew Gardens Road, Kew, Surrey,
October 30.

DR. MARGULES wrote his paper mainly in connection with phenomena of the line-squall type, but he realised that it might have wider applications, and later investigations do indicate that discontinuity of temperature is the prime factor in the "birth" of cyclones. If one had an atmosphere with uniform pressure at sea-level, but with masses of warm and cold air, then at 9 km. pressure would necessarily be low in the mass of cold air, and a cyclonic circulation would ensue; but the energy of the motion would be derived from the potential energy of the initial state.

Differences of temperature originate in the lower atmosphere. The stratosphere may be able to draw upon a source of energy of which we are ignorant; it cannot of itself provide the energy of storms.

E. GOLD.

Luminosity by Attrition.

IN reference to the letter in NATURE of November 4, p. 310, by Sir E. Ray Lankester on the above phenomenon, it may be of interest to some to know that Thomas Wedgwood was the first to direct attention to the fact that light could be produced by the rubbing together of quartz or sugar. His paper on "Experiments and Observations on the Production of Light from Different Bodies by Heat and Attrition" may be found in Phil. Trans. Roy. Soc., 1792, part i.

C. CARUS-WILSON.

November 6.