tracting its juices, which are then swallowed by the worker. When the mass has reached a pulp like consistency it is distributed to the feeding larvæ which occupy the cells of the nest. This habit has been thought to arise by imitation of the queen or an older worker, but that it is independent of such example is proved by the fact that it is acquired in all its perfection by wasps which have had no association with others of their kind.

3. The locality study. This is a mere desultory alternation of short flights and strolls, by means of which the wasp comes in contact with objects surrounding its nest. It appears to use these objects to some extent as landmarks, but experiments indicate that the olfactory sense is also an important factor in guiding it.

4. In a way the wasp remembers. This is indicated by its behavior when a change is made in its nest, and also by its accustoming itself to the appearance of strange objects.

5. Wasps learn nothing from one another. Instinct and individual experience account entirely for their complex activities, and their apparent cooperation is due to the accident of being born in the same nest.

At the session of November 28 Mr. C. M. Child gave a brief account of some zoological observations made during a recent trip to Florida, and showed a number of specimens.

Following this, Mr. E. R. Downing discussed 'Recent Experiments on Sea-Urchin Eggs,' referring chiefly to the work of Driesch.

The last session of the club for the autumn quarter was held December 12. This was devoted to a paper by Mr. C. C. Adams, entitled 'Geographical Distribution of Variations in *Io*.' The paper was illustrated by a number of lantern-slides, showing series of the shells from different localities.

The following abstract gives an outline of Mr. Adams's work on this form:

The gasteropod genus *Io* is found only in the headwaters of the Tennessee River and its tributaries. By the aid of a grant from the American Association for the Advancement of Science the Clinch and Powell Rivers were explored and the following facts concerning its geographical distribution and variations were discovered:

These shells are remarkably variable, all intermediates being found between a smooth shell (*Io fluvialis* Say) and a very spinose shell (*Io spinosa* Lea). The extremes of variation do not occur promiscuously in all localities, but are quite definite in their occurrence. In the headwaters of both streams the smooth shells form the dominant population, but farther down stream, in the case of the Clinch River within 60 miles, the entire shell population changes from a smooth to a very spinose shell. In the intermediate region the shells are mixed, smooth, spiny and intermediate.

The headwater shells in the Powell are more globular and relatively stable, have low or no spines, distance between spines small and slightly variable. Down stream the shells are less globular and relatively variable, spines high and fairly stable, distance between spines wide and variable.

In the Clinch the headwater shells are more globular (similar to those in the head of the Powell) and relatively variable, low or no spines, distance between spines small and slightly variable. Down stream the shells are less globular and relatively stable, spines are high and variable, distance between spines wide and stable.

Thus these parallel streams have parallel differences in their *Io* shells.

C. M. CHILD,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE U. S. NAVAL OBSERVATORY.

TO THE EDITOR OF SCIENCE: Every reader of SCIENCE must have been greatly interested in two recent editorials discussing the Naval Observatory at Washington and its work, but many of them will regret that where so much is said and so well said, the real meat of the controversy is left untouched, although in the last paragraph it seems to be 'scented.' Is it not true that the question in the minds of most thoughtful people is—what, in the name of reason is the use of having the Observatory for astronomical research under the Navy Department, any way?—why not just as well a geological survey? If this question be pertinent it cannot be impertinent and why do scientific

men continue to beat about the bush when they know exactly where the real quarry is?

A few years ago the pressure for a reformation in the management grew to considerable proportions and it was shrewdly met by the Navy Department in the scheme for an astronomical director. Many hopeful people without much experience rejoiced at this which they thought was a great step in the right direction. When a year or two ago the continued dissatisfaction had grown to the extent of demanding the appointment of committees by the American Association for the Advancement of Science and the Astrophysical Society, it was again as shrewdly encountered by the appointment, by the Secretary of the Navy, of the Board of Visitors whose report is unhappily meeting with criticism fore and aft. A distinguished statesman whose loyalty to the interests of the Navy Department has long been known was made chairman of this Board and it is an open secret that he peremptorily cut off all suggestions looking to the real emancipation of this great institution.

The scientific members of the Board, all most excellent astronomers, but possibly not well informed as to the methods sometimes resorted to by great statesmen, were restricted in the recommendations to proposals for repair rather than reconstruction. In spite of their limitations they succeeded in getting in a most interesting and valuable report—one in which symptoms are admirably set forth, although there is 'much silence' as to the real nature of the complaints. Is it not perfectly true that the Naval Observatory, as such, has been of little value to astronomical science, although *astronomers* attached to the establishment have contributed greatly to the glory of American science? But this is in spite of, not on account of the character of the administration of the Observatory. This administration is and must always be, and properly so, while it is under the Navy Department, military in its character. The utter incompatibility of this sort of control and direction with the best interests of scientific research needs no demonstration. The very existence of a comfortable retiring pension for astronomers who survive their sixty-second year has been unfortunate in its results, in that it has led to the appointment, through the use of influence, other than that of merit, of men whose principal ambition was old age under these conditions. Why should a regularly appointed astronomer be detailed as inspector of apparatus for fire protection at the Navy yards? What would be thought of a civil establishment which detailed one of its best paid professors of astronomy to the duties of superintendent of grounds and buildings? M.

REPRODUCTION OF DIFFRACTION GRATINGS.

To the Editor of Science: The communication of Professor R. W. Wood in your issue of January 4th (p. 33), concerning diffraction gratings, is of interest to me. I have, during the past year, made some experiments on the reproduction of gratings. Obtaining through the kindness of Professor Rowland and Mr. Schneider, a fine flat glass grating, it was silvered on its face in a silvering solution, then electroplated with silver and afterward with a heavy coat of copper. With care it could be readily removed from the glass especially if warmed. I had used the process to make concave mirrors from lens surfaces about six or seven years ago and the results were excellent, even the most minute scratches or imperfections of the glass appearing in the silvered surface with the utmost fidelity, while the polish and brilliancy was such that one could scarcely believe that the surface was not one of glass instead of polished metal. With the glass grating the experiments gave excellent reproductions of the ruling and great brilliancy, but the surface of the metal grating was not optically flat but slightly warped. This condition varied in different trials and the result would probably have been more perfect if the temperatures during the electro-depositing had been maintained rigorously the same.

It is possible that had the glass been convex the resultant concave grating would have been without distortion. Lack of time has so far prevented my trying another expedient which ought to give good results. It is to first silver the glass grating as before, then, having coated a flat glass surface with a thin layer of adhesive cement, like hard pitch or shellac warmed, or with a cement like glycerine and litharge which