that of a vertebrate) and a few water-fleas the only members possessing even a trace of hæmoglobin, excepting one marine fish-parasite (Lernanthropus)?

(6) The only common feature in the "conditions of life" or environment of these exceptional cases of the presence of hæmoglobin is that some of them, viz. the Planorbis snail, the larval Chironomus, and the crustacean Apus, live in stagnant fresh-water, even in black mud, where free oxygen is scarce owing to the decomposition of vegetable débris. But in what special way and to what extent is the hæmoglobin valuable to its possessors, seeing that other closely related species are associated with them and are devoid of hæmoglobin?

(7) One more case must be noted, namely, the very common presence of hæmoglobin in the blood-fluid of the Chætopod worms, both marine and fresh-water, whilst, nevertheless, it is absent from many. In some of these worms "red blood-corpuscles" replace the entire vascular system and its red fluid; they float in the cœlomic fluid. In one case, that of the large and beautiful marine worm, Aphrodite (the "sea-mouse"), whilst hæmoglobin is absent from the blood, it is present in such quantity in the nervous tissue of the great nerve-cord as to give it a ruby-red colour. It also gives a pale pink colour to the great muscular pharynx. In what way does the sluggish Aphrodite benefit by having its nerve-cord saturated with the oxygen-seizing hæmoglobin? Similarly, some few of the remarkable Nemertine worms have hæmoglobin in the corpuscles which float in the fluid of certain vessels, and others have it only in the tissue of the nerve-cord and brain.

To conclude, we might, it seems to me, arrive at some better understanding of the general physiology of respiration in animals were the cases I have cited more accurately (I mean *quantitatively*) investigated; and were the striking facts also held in view, that no Protozoon, no Sponge, and no Coral or Polyp is known to develop "hæmoglobin," whilst in only one starfish and one Holothurian (recent additions to the list may have escaped my attention) has hæmoglobin been recorded, and that in the form of "red blood-corpuscles."

E. Ray Lankester.

44 Oakley Street, Chelsea, S.W.3, May 3.

A "New" Type of Tool of Mousterian Age.

The object of this letter is to describe briefly a hitherto unrecognised type of implement of Mousterian age and to ask readers of Nature for any information they can give me as to its geographical distribution.

Considerable collections of flint—or, more correctly, chert—implements of Palæolithic types were made by myself in 1914, and by Mr. G. W. Murray, of the Survey of Egypt, in the following years. My own specimens are from the western desert, Mr. Murray's from sites discovered by himself in the eastern desert. Both series show a number of tortoise cores of Mousterian age—the age determined not only by type, but also the discovery by myself of a typical core in a hard cemented gravel recognised by Dr. Hume as of Pleistocene age—which have been worked up to produce a type of tool which, so far as I can discover, has not been recognised previously. Before describing this form of implement I must point out that typically domed tortoise cores are not common in Egypt; most cores are flatter, presumably because the nodules from which they were made were oval rather than spherical, and are so trimmed as to have, roughly, the shape of a half of a somewhat flattened pear, the notch indicating the point at which the core is struck being situated at the broad end of the pear.

Regarding the face of the core from which a Levallois flake has been struck as the upper surface, the "new" tool consists in the production at the narrow end of this surface of an upturned point or beak. In its simplest form this is produced by the meeting at the narrow end of the core of the two planes (or facets) bounding the flake-bed left by the removal of the Levallois flake, and of a facet constituting a third plane, joining these at an angle, produced by striking off a flake from near the point

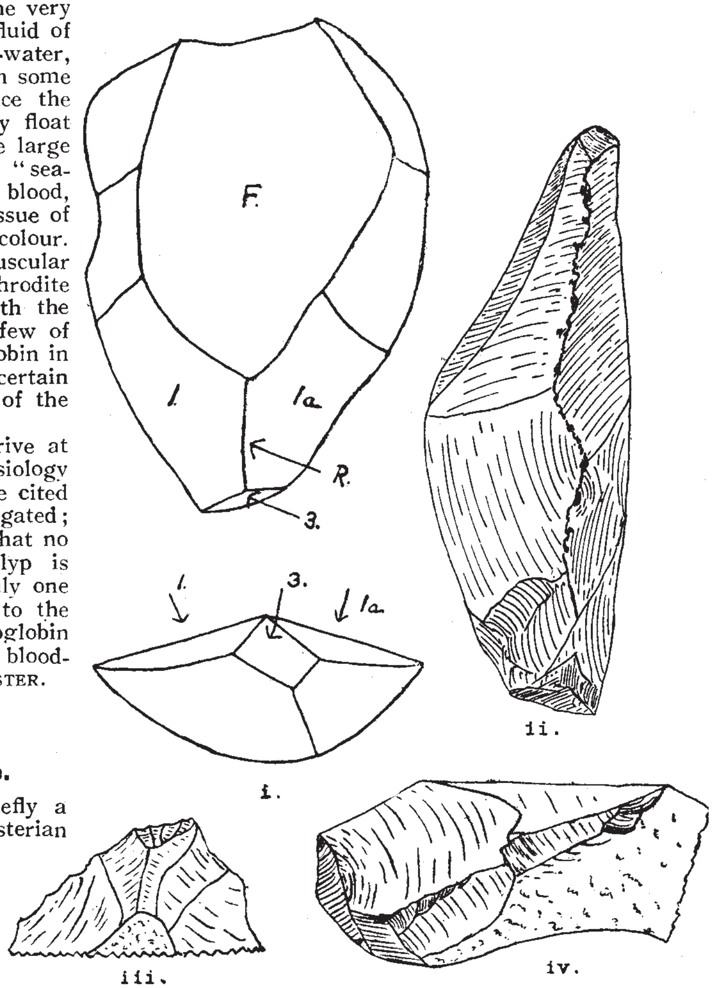

Fig. 1.

of the lower (convex) surface of the core. The diagram (Fig. 1, i.) will make this description clearer; it will be seen that the lower part of the scar-bed of the Levallois flake (F) is bounded by two narrow facets (1 and 1*a*) the intersection of which gives rise to a crest or ridge (R). This crest and its two bounding facets are terminated abruptly by the facet (3) produced by a blow struck on the convex surface of the stone.

Fig. 1, ii., is a somewhat diagrammatic rendering of the side view of an implement of the type described, and shows the heavy triangular point not unlike the beak of a chelonian, which is characteristic of the tool. It is for this reason, and not because these points are commonly worked on a tortoise core, that I propose for them the name of "tortoise point." But although the point is triangular in section in typical specimens, it seems that the blow on the convex surface of the core was not always successful, and in these cases matters were improved by a good deal of secondary working, so that points like those shown in Fig. 1, iii., are not uncommon. Further, although the great majority of tortoise points were worked on tortoise cores, the "point" was at times produced independently; thus Fig. 1, iv., reproduces the front part of a roughly bilobed pebble upon which a particularly good tortoise point has been worked.

The form of these tortoise points indicates that they were used as a heavy drawing tool, *i.e.* used with a drawing or dragging motion while the hand exerted considerable pressure. Additional evidence for this view is offered by a certain number of specimens in which the distal portion of the crest, *i.e.* that nearest the point, shows minute abrasions. The only method of holding the implement allowing this that I have been able to discover is to grip the base of the stone between the bent fingers and the ball of the thumb, the convex surface of the tool being towards the palm. The point is then brought in contact with the surface it is desired to cut or grave, the implement being but slightly inclined and drawn steadily away from the body. The suggestion may be made that these tools were used for cutting hides; such a point would furrow or cut a stiff, sun-dried hide, such as those used by the Veddas, just as it does a piece of stout millboard.

This form of implement has not, so far as I can discover, been recognised in Europe hitherto; it is certainly uncommon, for the Abbé Breuil tells me that he does not know of any example. Its existence is, however, suggested by the reproduction by Commont ("Les Hommes Contemporains du Renne dans la Vallée de la Somme," 1914, Fig. 59) of two "instruments moustériens" from the St. Acheul loess, of which one at least seems to represent the "new" implement.

C. G. SELIGMAN.

Toot Baldon, Oxford.

Molecular Structure and Energy.

THE difficulties with the Lewis-Langmuir theory expressed by Prof. Partington in NATURE of April 7 have been felt by the writer, and doubtless by others. They may, perhaps, be met in part by the following considerations:—

(1) In the case of molecules such as carbon dioxide and nitrous oxide the central octet is postulated as tetrahedral, with pairs of electrons at each apex, rather than as cubic. Such an arrangement would diminish rigidity in the axis passing through the three atomic nuclei and permit a measure of rotational energy about this axis. Again, it must be recalled that at higher temperatures the ratio of the specific heats for even diatomic gases falls below 1·4, and that this can well be accounted for by the increasing importance of energy of intramolecular vibration—that is, to-and-fro oscillation of the component atoms. In the case of triatomic gases such as carbon dioxide, the specific heat is much more affected by rise of temperature than in diatomic gases, frequencies of vibration in this case corresponding doubtless to the three well-marked spectral bands of carbon dioxide in the infra-red. For this reason alone the value of γ for carbon dioxide might well be expected to turn out, even at ordinary temperatures, lower than that anticipated for a gas with molecules exhibiting only two degrees of rotational freedom, provided that vibrational energy in this case is not negligible at ordinary temperatures in comparison with translational and rotational energies. The halogen gases consist of pairs of atoms sharing, according to the Lewis-Langmuir theory, only one pair of electrons, which acts as though it were located at a point. It is worth pointing out that this less rigid connection permits the ratio of the specific heats for these gases to fall well below 1·4 even at ordinary temperatures, in consonance with the above suggestion.

(2) In the case of nitrogen the specific heat data offer no difficulty if, as may be inferred from the models of Langmuir and of Sir J. J. Thomson, the positive nuclei in their ovoid electronic envelope are sufficiently far apart to allow an appreciable moment of inertia in two directions of rotation.

As the writer has already hinted elsewhere, however, an acetylenic type of union of the two octets concerned may indeed prove more satisfactory in explaining other facts, such as those of molecular dimensions as estimated by Perrin or Rankine or such as will be brought forward in a forthcoming publication from this laboratory by R. N. Pease.

ALAN W. C. MENZIES.

Princeton University, U.S.A., April 19.

British Laboratory and Scientific Glassware.

THE inclusion of scientific glassware in the proposed Key Industries Bill seems to have aroused a sense of apprehension in some quarters, partly on the ground that if Continental products are prohibited users may not be able to procure satisfactory apparatus, and partly because it is feared that, if given comparative security in the home market, manufacturers may lose their incentive to improve the quality of their goods and increase prices unduly.

The lack of confidence in British chemical glassware expressed in certain quarters is probably due to unfortunate experience with some of the earliest productions of the industry, when the experience of the blowers was practically negligible and the demand for the goods so urgent that nothing usable was allowed to be sorted out.

Increased experience, both on the part of the actual glass-blowers in the manipulation of the glass and on that of the technical staffs in the methods of obtaining desired results, has achieved great improvement in the quality of the products, and the better classes of British laboratory glassware compare favourably with any other.

As regards the quality of the glass itself, very thorough tests have been made by a trustworthy and impartial authority (see Journal of the Society of Glass Technology, 1917, vol. i., p. 153), and in the conclusions arrived at appears the statement: "Taking all the tests into consideration, the six best glasses are B, C, D, E, F, and G, and this list includes all the British glasses in the market. . . . *Jena glass, A, comes seventh on the list.*" Samples of post-war Jena laboratory ware with the well-known "Schott" stamp are inferior in all but appearance to the pre-war goods.

Further scientific investigation into the problem of annealing laboratory glassware and the adaptation by manufacturers of the information so obtained have led to great improvement in the direction of reduced liability to cracking in use due to temperature differences. This was formerly a frequent cause of complaint, but methods of annealing now in use are so efficient that British laboratory glassware will fulfil any reasonable requirements.

The average standard of British graduated apparatus is distinctly higher as regards accuracy of