magnesium and silicon, which precede it in the periodic table. The lightest mass-number is far the most abundant in all three cases. S^{34} appears to be about three times as abundant as S^{33} ; the two together probably amount to about 3 per cent. of the whole.

The band spectra of suitable sulphur compounds should well repay a careful study, since they should exhibit an isotope effect similar to that so beautifully demonstrated by Mulliken in the case of silicon.

F. W. ASTON.

Cambridge, June 12.

Numerical Reduction of Instars in the Metamorphosis of Euphausiids.

THE development of an animal from the zygote up to the adult condition is usually accompanied by a more or less regular and continuous increase in size. In the case of the Arthropoda, however, the enclosure of the body in a hard inextensible layer of chitin renders this impossible, and in accordance with this the chitinous exoskeleton is shed from time to time, each moult or ecdysis being followed by a rapid spurt of growth until the process is again blocked by the hardening of the new chitinous layer. In many of the better-known arthropods particular moults are associated with the attainment of particular stages of development—e.g. the penultimate and the last moult of a Lepidopterous insect—and the idea is very generally held that this applies to *all* ecdyses or moults in the Arthropoda. Consequently, when in the study of plankton it is found that specimens of the young of some particular crustacean fall into a large number of different types demarcated by slight differences in size and form, one very naturally regards these as forming typical successive stages of the life-history, the whole series being worked through by each developing individual.

The object of this communication is to record that recent work at the Millport Marine Station upon the Euphausiidae would appear to invalidate the belief indicated above. From observations upon *Meganycitophanes norvegica*, it seems clear that the individual does not necessarily go through the thirty or so moults which have been assumed to demarcate definite successive larval stages. On the contrary, the suspicion is forced upon one that the act of ecdysis does not by any means form a fixed landmark in the developmental history of the individuals. Should this suspicion turn out to be correct it will obviously involve important modification of our current conceptions of arthropod development.

R. MACDONALD.

Marine Biological Station,
Millport, May 19.

Abraham de Moivre.

TRAVELLING in countries where NATURE was not available in public libraries, it was not until to-day that I was able to consult the issue of April 17, in which my letter, with Prof. Pearson's comments, appears. I must decline to accept responsibility for the statement attributed to me by Prof. Pearson, namely, that I spoke "as if the matter in the 1738 'Doctrine of Chances' and again in the 1756 edition was a mere translation 'except for minor changes.'"¹ What I *did* write was that a translation of the pamphlet under discussion appeared, except for minor changes, in both editions. I still believe this statement to be absolutely accurate. It is, of course, true that after this translation there are in the 1756 edition of the "Doctrine" 'Remarks,' and other material. Prof. Pearson regards the Remarks as of great historical importance. I am glad that in this

connexion my letter drew forth his further comments on the history of statistics.

May I add that my letter was written with a photographic copy of the pamphlet before me, as my reference to the *Isis* article indeed suggested. Typographic considerations, which Prof. Pearson suggests, would scarcely lead me to his conclusion. But in the light of Moivre's positive statement that the contents of the pamphlet were first "made public" in 1738, it does not appear to me possible to consider the earlier pamphlet, "communicated to some Friends," as a second supplement to the "Miscellanea" of 1730.

I closed my last letter with the sentence, "It would be interesting to learn if any other copy of Moivre's original pamphlet is in existence." I have here found another copy in the Preussische Staatsbibliothek, bound in with the "Miscellanea." Are there other copies?

R. C. ARCHIBALD.

Berlin, June 2.

The Taxation of Research.

IN "News and Views" of NATURE of June 19, p. 866, it is stated that there is a "semblance of overstatement" in our letter on the above subject published in the same issue. In justice to the Chemical Society we think this remark "requires some slight modification."

The published balance sheet of 1925 is quoted as illustrating the financial position of the Society, but had the balance sheets for previous years been examined as well, it would have been found that the *actual* deficits on the years' workings were as follows: 1920, 2853*l.*; 1921, 1104*l.*; 1922, 584*l.*; 1923, 1628*l.*—a total of 6169*l.* in four successive years, despite the raising of the subscription from 2*l.* to 3*l.* in 1921. It was only by drastically cutting down published papers—even to the point of unintelligibility—that we were able to obtain a credit balance of 210*l.* in 1924 and another of 466*l.* in 1925, the latter including, however, a grant of 350*l.* from the Government Publications Grant.

It is clear that in these circumstances "solveny and bankruptcy" are closely related to "surplus and deficit" on the year's working, and that even the substantial sum given as invested capital cannot long withstand depletion at the rate illustrated above.

H. B. BAKER, President.

JOCELYN THORPE, Treasurer.

Royal College of Science, South Kensington,
London, S.W.7 June 21.

Frictional Forces in Liquid Surfaces.

MR. CHASE in NATURE of May 22, p. 724, deals with a phenomenon which probably many have noticed. The effect produced is, I think, due entirely to the surface tension of the liquid acting on the wire where it breaks the surface.

Unless the liquid surface be of large extent a resultant force is in general set up on the wire in the plane of the surface, and if the axis of rotation of the moving system does not meet the surface in the same point as the wire, free rotation is impeded.

This form of apparatus gives a great deal of trouble in use, for the forces set up may be comparatively large. It is of course theoretically possible to find the neutral point in the surface and to adjust the axis of rotation and the suspended wire so that they both pass through it, but these adjustments are difficult to maintain, and observations made with the apparatus are liable to a very uncertain source of error.

L. H. G. DINES.

73 Fairfax Road, Teddington, June 6.