three separate places. On one occasion they were found among matted masses of the Polyzoan, Bowerbankia, on another in a pocket occurring in a pendulous colony of Botryllus, and on another occasion they may have been in the same situation as the last, or they may possibly—but not probably—have been present in the mantle cavity of the Botryllus colony. On obtaining these free-living Amœbæ I started a culture of them in petri dishes, and also a culture of Amœbæ from sponges. The former culture is now in a healthy condition, and there has been a large increase in the number of individuals. The culture from sponges begun on December 10 yielded an increasing number of Amœbæ, until on December 24 there were numerous specimens all over the bottom of the dish. About December 30 this culture began to decline, the Amœbæ becoming replaced by Ciliates, so that at present only occasional specimens can be found even by careful hunting. The food of the Amœbæ in these cultures was probably bacteria, but occasionally algal inclusions were to be observed, and in one case an included diatom was almost certainly a Nitzschia, a culture of which I added to the Amœbæ.

During the progress of these cultures no dividing Amœbæ were seen, although they were looked for, but a few days after starting the cultures a large number of small Amœbæ were noticed. These small ones undoubtedly grew larger, as the progress of the cultures showed. And indeed various sizes of these Amœbæ from about 30 μ by 12 μ to 80 μ by 40 μ were obtained, both from sponges and the free-living habitats mentioned above. Unfortunately in my former letter I gave the size only of what I considered to be the adult form, and have thus misled Prof. Dendy into the error of supposing that they are too large to be the germ-cells of the sponge. The mature oocytes of Sycons are about 35 μ in diameter, when stained and mounted, whereas a large, living Amœba in a spherical condition, measured about 45 μ in diameter, but even allowing for shrinkage of the oocyte, it is probable that it would be somewhat smaller in the living state than a large Amœba. Moreover, as Mr. Bidder has pointed out, the adult Amœbæ are too large to be the metamorphosed collar-cells of the sponges, and it may be added so also are probably even the smallest ones.

Indeed, the identity of the free-living Amœbæ and those obtained from sponges as indicated by their general characters and their similar behaviour under culture, apart from the fact of the ingestion of diatoms, is sufficient to establish these animals as independent organisms.

It is an interesting fact that the largest forms of these Amœbæ when flowing quickly can travel their own length in about 40 seconds. One specimen was observed to travel nearly six times its length in a little more than seven minutes, making various stops and meanderings on the way. J. H. ORTON.

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Projective Geometry.

ARE not the references to the "epidemic of projective geometries" in a note in NATURE of January 1 (p. 510) somewhat unfair?

It is complained that they "may teach pupils to copy out proofs of stereotyped bookwork." The best of the treatises contain an excellent selection of problems calculated to give the student a firm grasp of fundamental geometrical ideas. As for "problems in mechanics involving a conic, cycloid, or catenary," the geometry required is usually closely connected with the calculus, and is to be found in text-books on that subject.

Without doubt the calculus is the most important branch of mathematics, and should come as early as possible, but to those who are interested in the geometry of conics the powerful methods of projection and reciprocation form a natural and attractive sequel to the usual elementary course on the straight line and circle. H. PIAGGIO.

University College, Nottingham, January 1.

I AGREE with Mr. Piaggio that projective geometry is a pleasant and suitable subject of study for arts students, especially women, who are reading for honours with a view of entering the teaching profession. But for such students a single text-book written by an eminent pure mathematician would be better than the present array of books, the authors of many of which have not added much to our knowledge of mathematical science. Further, Mr. Piaggio forgets that these arts candidates are not the students who want their calculus so early; indeed, they flourished and prospered as well thirty years ago, taking their calculus late, as to-day, perhaps better.

It is for the science student who combines pure mathematics with mechanics, physics, and chemistry that the early calculus is most needed. The geometrical properties of space involved in the study of physical problems are almost invariably essentially metric, and a course in projective geometry will appear to such a candidate as a blind-alley, affording very little outlook. Although I liked the subject myself, I cannot remember a single outside problem to which I could apply my knowledge of it. On the other hand, the geometrical properties of conics and other curves are constantly involved in applications to mathematical physics, where their significance can only be properly understood when the curves have been studied from first principles. Mr. Piaggio considers that this geometry is contained in text-books on the calculus, but the treatment in these books—especially in the case of the conic—is quite inadequate, and, moreover, is almost invariably too analytical. The old dividing line between geometrical and analytical conics was, of course, a mistake, but its abolition has led to the failure of students to study these curves *from first principles*, with the result that the metric geometry of curves, especially conics, is neglected, and students of physics get into the difficulties mentioned in my note. Now it will be found that the authors of many of these text-books run down the study of geometrical conics, and propose these projective methods as a substitute, and my object is to point out that so far as my experience goes this substitution leaves the student of mathematics combined with physics much worse prepared than he was before.

A former pupil, now a lecturer, once brought me a proof that the path of a certain particle (I believe an electron) was a cycloid. He had worked it out analytically; but I pointed out that the result followed immediately from first principles.

By all means let projective geometry be taught, but let its place be beyond the dividing point at which students of pure mathematics and of physics branch off in different directions. There is plenty of other work which is now crowded out of the course common to all candidates, which possesses pressing and urgent claims for inclusion therein.

THE WRITER OF THE NOTE.

Zonal Structure in Colloids.

THE notice of Prof. Küster's work on zoning in colloids in NATURE of January 8 suggests to me that such an influence is often manifest in our concretionary formations.

In 1912 Prof. S. Leduc, after seeing some of my