Letters to the Editor.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Embryology and the Theory of Polyhedra.

A NEW volume of *Proceedings* of the Bologna Mathematical Congress begins with a short paper by Max Brückner, on the old problem of how many different polyhedra are possible of n sides—with the limiting condition that all the corners shall be trihedral. In my book on "Growth and Form" I dealt with the kindred problem of the possible number of arrangements of a plane assemblage of cells, their partition-walls all meeting three-by-three, as is actually the case in a system of soap-bubbles or of living cells. The problem of the polyhedra is just as interesting to the biologist; for any natural clump of cells, such as a totally segmented egg or 'morula', may be looked on as a polyhedron and may be studied accordingly.

Eighty years ago, Kirkman showed that the total number of 8-sided (convex, Eulerian) polyhedra, with trihedral corners, was *thirteen*; and Cayley, Steinitz, and others have extended the problem by a few stages. The number of possible arrangements increases rapidly; and now Brückner (whose results I only quote approximately) tells us that, for

	n=13,	14,	15,	16, the number of
n-sided polyhedra =	5×10^4,	4×10^5,	3×10^6,	$2{\cdot}7\times10^7$.

An 8-sided polyhedron, or 8-celled egg, may have its sides, or cells, arranged in 13 different ways; there is room for variety, but withal so limited that we must expect to find the same arrangement, or cell-pattern, repeated again and again in the 8-celled stages of divers organisms. But we no sooner come to the 16-celled stage than nearly 30 million arrangements of these sixteen cells are found to be possible. And it becomes plain that the study of 'cell-lineage', or the mapping-out in detail of the cell-arrangements after repeated cell-divisions, is only possible under the severest limitations—if it be possible at all.

D'ARCY W. THOMPSON.

St. Andrews.

Effect of Certain Substances and of Heat on Cells of *Abraxas*.

IN continuation of the work already carried out last year on the effects of phosphorised olive oil on the male germ cells of *Abraxas*, we have investigated material from larvæ injected into distilled water, 2 per cent NaCl in water, phosphoric acid, and phosphorus in paraffin oil. We have also tried various temperatures for several hours.

In many of the preparations, in addition to the cytoplasmic inclusions, the spindle bridges, or parts thereof, swell up and form separate bodies, which are very similar to the abortive acroblasts already described. In material treated with phosphoric acid, heat, 2 per cent NaCl in water, and phosphorised paraffin oil, no very large bodies of the type already described[1] have yet been found. There is at present some doubt as to the actual mode of origin of some of these large elements in the spermatocytes and spermatids of *Abraxas*.

J. BRONTË GATENBY.
JOYCE C. HILL.

Trinity College, Dublin.

[1] Gatenby, J. Brontë, *Jour. Exper. Zool.*, vol. 58; 1931.

Paramagnetism of Bivalent Silver.

IN collaboration with Mr. F. H. Burstall, one of us has recently prepared a series of silver salts of the type [Ag 3 dipy]X_2 in which dipy represents $\alpha\alpha'$-dipyridyl ($C_{10}H_8N_2$) and X a univalent anion (*J.C.S.*, 2594; 1930). The complex kation is therefore bivalent.

If this is due to the presence of bivalent silver, then an electron must have been extracted from the inner levels (probably the N level) of the silver atom, which consequently should be paramagnetic. We have therefore measured by the Gouy method the susceptibility of the chlorate at 20°. Parallel measurements were made in the same apparatus with copper sulphate, since the bivalent copper ion contains a similar incomplete sub-group. The following results were obtained:

Substance.	χ.	χ_M.	p.
$CuSO_4{\cdot}5H_2O$	$5{\cdot}86\times10^{-6}$	1457×10^{-6}	9·2
$[Ag\ 3dipy](ClO_3)_2$	$1{\cdot}93\times10^{-6}$	1434×10^{-6}	9·1

The molecular mass susceptibilities of the silver and copper compounds are equal within the limits of the experimental error (5 per cent). The Weiss magneton number p is calculated on the assumption that the Curie law holds, and no allowance has been made for the diamagnetism of the rest of the molecule. The values are, however, in fair agreement with those found for other atoms in which a sub-group lacks one electron: for example, $Cu^{\cdot\cdot}$, 9·2; NO, 9·2; $VOSO_4$, $3\frac{1}{2}H_2O$, 8·95, $V_2O_2Cl_4{\cdot}5H_2O$ 7·94. These values are taken from the International Critical Tables.

G. T. MORGAN.

Chemical Research Laboratory,
Teddington, Middlesex.

S. SUGDEN.

Birkbeck College,
Fetter Lane, E.C.4.

Forestry Practice and Research.

THE leader on forestry research in NATURE of May 16, and previous letters from Dr. Rayner and Prof. Tansley, would suggest that attempts to grow timber on poor land are in their infancy, and that the work of the Forestry Commission and other State forest departments throughout Europe is being carried on in complete ignorance of fundamental principles. It is fairly evident that no representation of this kind was intended, but at the same time the impression might be conveyed to the casual reader (if such an individual ever reads NATURE) that research in connexion with afforestation has been practically ignored. This view may be perfectly correct in certain directions, but I think the practical forester is as fully aware of the value of genuine research as those engaged in any other industry influenced by biological factors. As regards the British forester, whether in the capacity of employer or employee, I scarcely think that he is guilty of the charge advanced by Prof. Tansley. Forest botany and pedology he may have failed to study through lack of opportunity, but in connexion with geographical botany, estate owners throughout the British Isles have carried out most valuable work for practically two centuries in testing exotic species on varying soils and situations. These tests of exotic species have already enabled two or three cubic feet of timber to be grown where only one grew before in connexion with the planting of species like Douglas fir or Sitka spruce, while they have conclusively proved the unsuitability of other species for the British climate, although strongly advocated by enthusiasts.

We know that many of the empirical methods adopted in farming and gardening have been explained,