of the brothers Rogers in the Appalachian mountains of the United States. The great majority of the "deformation mountains" are shown to be undoubtedly "folded mountains," and, as may be expected in a work of this kind, the important light thrown upon mountain-origin by the study of the Scottish Highlands, as a mountain chain dissected by denudation, is admirably explained, though we miss any reference to the value of the labours of Nicol and Lapworth in this connection. The varieties of folding and the relations between folding and "thrusts" find full illustration; and the theoretical views of Heim, Steinmann, Suess, and other continental authors on the nature, extent, and results of the great complexities exhibited in the Alps, with their possible causes, are fairly stated though not fully discussed. The influence of jointing and weathering in producing the various types of alpine scenery rightly occupies a very important place in the work.

A second class of "dislocation mountains" includes curious types recognised in recent years by the geologists of the United States, with the "horsts" of German geologists. In all of these, extensive faulting—like that by which the mountains of Moab are left in relief by the great Dead-Sea fault—has been the chief agency concerned in their formation.

The mountains carved by denudation out of great igneous masses (the so-called "laccolites" and "batholites") constitute the author's third class of "deformation mountains," and are illustrated by the Henry mountains of North America and the Red Hills and Coolin Hills of Skye. It is here that we detect a little want of consistency in the classification adopted by the author. In describing his volcanic mountains he rightly refers not only to the denuded remains of small cones—commonly called "necks"—but to masses of lava, like the North Berwick Law, or of lava and tuffs like Largo Law, which are so conspicuous in the Scottish Lowlands as forming the denuded cones of great volcanoes. But the similar masses in Skye and the other islands of the Inner Hebrides do not differ from these in anything but their greater dimensions, and it seems scarcely justifiable to place them in a totally different class.

The final chapter of the book is devoted to the examples which the older geologists styled "mountains of circumdenudation," but which the author designates "subsequent or relict" mountains, of which we have such striking British examples in the great stacks of Torridon sandstone in western Sutherland and Ross.

Not less instructive than the text of this excellent work is the selection of eighty photographic plates which illustrate it. One-half of these is taken from the admirable series prepared by the Geological Survey of Scotland, and they show how rich our country is of examples of mountain structure; the other half consists of pictures supplied by photographers of Switzerland and the United States.

J. W. J.

ZONAL STRUCTURE IN PLANTS AND ANIMALS.[1]

WHEN a drop of strong silver nitrate is placed on a thin layer of 5–10 per cent. gelatine containing about 0·1 per cent. of potassium bichromate, remarkable phenomena are observed. The gelatine under the drop is coloured red-brown by the abundant precipitation of silver chromate. The nitrate spreads gradually by diffusion into the gelatine, the rusty brown area of precipitation enlarges, it forms at its periphery a dull whitish seam, and further outwards in the gelatine a system of numerous concentric rings is developed, spreading like rings on the surface of a quiet pool. These are the well-known Liesegang's rings or zones, and the central idea of Prof. Küster's investigation is that these throw light on zoned structure in cells and tissues. He has made numerous experiments with the diffusion zones formed in colloidal media *in vitro*, and he seeks to utilise the phenomena observed in the interpretation of organic structures—such as cross-striping in leaves, annular and other markings in cells and vessels, the layers in starch-grains, the markings on diatoms, the lines on butterflies' wings, on shells, on feathers, on porcupines' quills, and what not.

Ostwald's explanation of Liesegang's rings is not unanimously accepted, but no one doubts that the phenomenon will be cleared up in terms of laws of diffusion, concentration, precipitation, and the like. Prof. Küster does not go into that; his object is to make zoned structure in organisms more intelligible by bringing it into line with Liesegang's rings. He is aware of the risks of arguing from the conditions of inorganic processes to those of organic processes, of mistaking similarity for sameness—and he quotes the wise advice that Roux has given in connection with this kind of argument.

Prof. Küster admits that his suggestion is only at the stage of hypothesis, for we do not know much about the active substances the diffusion of which in cells may induce zoned structure. We cannot isolate them and experiment with them. On the other hand, Prof. Küster points out that organisms are largely built up of colloid material, and that his experiments *in vitro* were with colloidal material, that artificially induced modifications of Liesegang's rings find their parallel in organic structure, and that the zoned structure occurs in the most diverse kinds of plants. His experiments show that "rhythmic structure may arise without any rhythmic influence from the outer world, and that even simple diffusion processes can give rise to rhythmic structures." Is it not probable that analogous occurrences take place in the formation of zoned organic structure? It may be said that in living creatures the rhythms are characteristically dynamic, but our author replies to this by referring to Bredig's "pulsating

[1] "Ueber Zonenbildung in kolloidalen Medien." By Prof. Ernst Küster Pp. iii+53 figs. (Jena: Gustav Fischer, 1913.) Price 4 marks.

systems," and the like, which may point a finger from a distance to the pulsating life of the cell.

Prof. Küster has opened up an exceedingly interesting line of inquiry, and he states his case in cautious and undogmatic manner. It appears to us that at this stage he would not have weakened his position by leaving out the reference to such complicated "structural rhythms" as the striping of vertebrate animals.

SHACKLETON'S TRANSANTARCTIC EXPEDITION, 1914.

THOUGH Sir Ernest Shackleton has adopted plans for an antarctic expedition that were formulated and published by me even before his return from his last expedition, and details of which have appeared since that time in various scientific journals, and in the public Press,[1] my view has always been that one explorer should not stand in the way of another, but as soon as one has secured money—a task more arduous than carrying out any plan whatever in the field—he should carry out whatever plan he pleases, and should receive, if he desires, any assistance that the other may be able to give. Therefore I welcome Sir Ernest Shackleton entering what has for a century mainly been, so to speak, the Scottish sphere of influence in the antarctic regions.

It is a curious fact that those who have done the most strenuous work on antarctic land have been seamen, while landsmen have been left to carry out the most strenuous work in antarctic seas, and it is, perhaps, for this reason that Sir Ernest Shackleton concentrates his attention again mainly on the land, whereas, as I have already pointed out,[2] it is a study of "antarctic seas that is at present most urgent, including an exploration and definition of the southern borders of those seas," that is to say, the coastline of the antarctic continent. This part of the programme cannot be efficiently carried out in the time that Sir Ernest Shackleton proposes to allow himself, either for necessary preparation or for his expedition. Hurry is unfavourable to detailed scientific research.

But no one is better fitted than Shackleton to carry out to a successful issue the transcontinental journey, as is shown by the brilliant way in which he conducted his south polar expedition in 1907–1909. Shackleton is a trained seaman and a capable business man, appreciative of the work that scientific people carry out under his leadership. Abundant testimony to this fact has been given by his former colleagues, especially Dr. D. Mawson, Prof. Edgeworth David, and Mr. James Murray. It is certain, therefore, that he will give his scientific staff every opportunity of carrying out important scientific research.

Granted that his ship is able to reach Coats Land or Luitpold Land—and this is entirely dependent on whether it is a good or bad ice year in the Weddell Sea—the expedition should endeavour to unite and chart in more detail Coats Land and Luitpold Land. It should endeavour to map out the coast line between Coats Land and Enderby Land, between Coats Land and Luitpold Land, and between Luitpold Land and New South Greenland. The investigation of New South Greenland is in itself one of the most interesting and difficult problems of Weddell Sea. Detailed soundings should be taken, especially to the south and west of those of the *Scotia* and *Deutschland,* so that, if new coastlines are not actually discovered, their presence and general outline may be indicated. This can be arrived at with a wonderful degree of accuracy. It is of great interest to obtain considerable quantities of bottom deposits, especially macroscopic specimens, along with indications of the distribution and drift of icebergs which have been the means of carrying them to the place where they have been deposited. The important discovery of Archæocyathinæ at a depth of 1775 fathoms in lat. 62° 10′ S., long. 41° 20′ W. is a lucid example of the value of this type of research, for it most certainly indicates that the Cambrian rocks found by Shackleton in the vicinity of the Beardmore Glacier stretch across Antarctica towards the shores of the Weddell Sea, and possibly form part of that mountain system seen by Morrell in about lat. 69° S.[3]

But will Shackleton be able to spend time to carry on these researches when the main object is to cross the antarctic continent? On her outward voyage the ship will be full to the gunwale with stores and equipment, and every effort must be made to find a suitable landing place along a practically unknown coast, to build a house, and set up the base camp for the tremendous task of crossing Antarctica, and this along a coast that Ross failed to reach because of heavy ice in 1843, that the *Scotia* failed to reach in 1903, where the *Scotia,* in 1904, was heaved right out of the water, and left stranded on the top of the ice, her keel being 4ft. above water-level, and where the *Deutschland,* in 1912, was beset and driven northward helplessly during the whole winter.

These are difficulties that may be met with again in the Weddell Sea, difficulties which have never been experienced by any ship in the Ross Sea, where no one has ever failed to reach the Ross Barrier. It is therefore to be hoped that Shackleton will not meet with such conditions, but will find a favourable season such as Weddell and Morrell found in 1823.

Once landed at or in the vicinity of Coats Land —more likely to the east than to the west—Shackleton starts his main objective. A meteorological station here will be of immense importance, and should be cooperative with those of the Argentine Republic in Scotia Bay and South Georgia. Detailed discussion of the meteoro-

[1] *Scottish Geographical Magazine*, vol. xxiv., No. 4, April, 1908; vol. xxvi., No. 4, April, 1910. NATURE, March 24, 1910, p. 101; and October 27, 1910, p. 551. "Polar Exploration," by W. S. Bruce, chap. x., pp. 252, 253. (Williams and Norgate, 1911.)

[2] "Polar Exploration," by W. S. Bruce, p. 247.

Morrell's Voyages, 1822–31, Capt. Benjamin Morrell, 1832, chap. p. 69.