

by Blainville, which belongs to quite another part of the series of strata. The phragmocone is as yet undiscovered. If a considerable number of specimens be examined, including varieties of figure—club-shaped, fusiform, and subcylindrical,—there will appear enough of resemblance to the guard of *Xiphoteuthis* to suggest the probability that the phragmocone might be slender and elongate as in that fossil. The same idea has, indeed, already been expressed by Quenstedt ('Der Jura') in reference to *Bel. clavatus*, Blainv., a fossil rather common in the Lias, and which is probably identical with *Bel. pistilliformis* of Sowerby. Quenstedt expressly proposes to join *Orthoceratites elongatus* of De la Beche, which was unprovided with a guard, with *Bel. clavatus*, still deficient of a phragmocone. And, in addition to the English example of that phragmocone from Lyme, he figures ('Der Jura,' pl. 17, fig. 9) another, having similar general characters, from the Lias of Heckingen. It occurs to me to suggest that, by renewed search among the many existing collections of *Belemnites* from Lyme, some sure indications of the phragmocone of *Bel. clavatus* may yet be discovered, which may support or disprove the conjecture here hazarded of the affinity of this species to *Xiphoteuthis*. I sought in vain for such indication among the specimens of *Bel. clavatus* which I lately obtained from the upper parts of the Lower Lias of the Yorkshire Coast.

OXFORD: Jan. 12, 1865.

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#### ABSTRACTS OF FOREIGN MEMOIRS.

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THE RELATIONS OF THE MINERAL SPRINGS OF AX AND LUCHON, SOUTHERN FRANCE, TO METAMORPHIC ROCKS AND LINES OF FISSURE. By MM. L. MARTIN and F. GARRIGOU.\*

THIS very brief but important memoir is intended to point out, by reference to the facts in a single instance, the relation that exists in nature between the direction of lines of Mineral Springs and the direction of systems of veins and recognized axes of elevation. 'The principle of parallel directions, applied with prudence in a region already geologically studied, may help to decide the age of the different disturbances which have determined the points of emergence, and therefore to class the Mineral Springs in natural geological groups, which, if this triple study be complete, would coincide with the grouping indicated by chemical analysis and medical observation.' These coincidences, therefore, are the tests of the theory.

The groups selected are the Thermal Springs of Ax and Luchon in the Pyrenees. The authors show—*first*, with regard to Ax, (A) that there are two classes of granitic rocks—I, fine-grained, with

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\* Physique du Globe: Étude géologique sur les Eaux sulfureuses d'Ax (Ariège), et sur le groupe de sources auquel elles se rattachent: Note de MM. L. Martin et F. Garrigou, présentée par M. Daubrée. Comptes Rendus, Aug. 29, 1864.

black mica, passing into gneiss, mica-schist, and aluminous schists ; 2, coarse-grained, with large bluish crystals of orthose and silvery mica, with black tourmaline, garnets, pyrites, amphibole, &c., passing into pegmatite. It is with the latter granites, forming large veins bearing N. 27° W., that the Ax springs are in relation. The two granites pass one into the other.

(B) These veins are accompanied by a system of parallel fissures, extending through the stratified rocks to the Lower Chalk, thus fixing the age of the system of disturbances, which belongs to the elevation of Mont Viso.

(C) The metamorphic origin of these tourmaline-granites is well marked in various ways :—1, in the structure of the veins themselves ; 2, because the granite-veins only traverse rocks containing all the material required for their composition ; and, 3, because these veins, which are comparatively modern, are intersected by fissures and cracks much more ancient, which is easily understood if we admit that they have been modified and brought into their present state *in situ*.

Secondly, with regard to Luchon. The granites here are perfectly identical with those of Ax. The Mont Viso disturbances are repeated ; and the springs are clearly seen to be in the direction of N. 27° W. It is not sufficient to say of them, that they rise at the contact of granites and enclosing stratified rocks. They occur in a system of parallel veins.

The Luchon and St. Béal district permit us to study the manner in which granites behave in cases where the rocks are alternately calcareous and siliceous. The granites avoid the limestone, arranging themselves in parallel planes between strata of limestone and gneiss.

It is probable that the system of N. 27° W. fissures originally permitted the issue of thermal springs containing sulphur and soda like those now issuing at Ax and Luchon ; and that the metamorphic phenomena were thus produced on the rocks through which the waters passed. The action, necessarily elective, has chiefly affected the silicated rocks, the tourmaline-granites and pegmatites having been formed at the expense of the preceding rocks. The gneiss seems to have been the rock best adapted for transformation. Where limestone was absent, the large-grained granite takes the form of veins following the fissures. Where there was an alternation of limestone and siliceous rocks, the granite is arranged in bands alternating with the unchanged rocks.

The elevation of the Western Alps has produced in the same district a system of N. 24° E. fractures. These are of secondary importance at Ax and Luchon.

A relation of a purely geological kind exists between the system of springs at Ax and those of the Eastern Pyrenees. There is also a marked chemical distinction between the waters of Ax and Luchon in the alkaline reaction of sulphuret of sodium, which is remarkable at Ax, and absent at Luchon : and thus, in certain respects, Ax agrees with the Eastern Pyrenees.

Las. Ax is placed at the intersection of three important systems of disturbance, parallel to three axes of elevation, and generally it seems to be from intersections of systems that thermal springs rise to the surface. This principle may serve to assist in making out the true point from whence the system of thermo-mineral waters issues.

LEONHARD UND GEINITZ'S NEUES JAHRBUCH FÜR MINERALOGIE, GEOLOGIE, UND PALEONTOLOGIE. Jahrgang 1864. Heft 6.

SO much interesting matter is contained in this number of the 'Jahrbuch,' that our space will not allow us to devote more than a few words to the consideration of the subjects treated of in the several papers, of which there are seven.

In the first paper (Ueber die geologische Aufnahme Schwedens) Professor Erdmann gives a notice of the progress recently made, and of the results obtained, by the Geological Survey of Sweden. It is illustrated by lithographed sections, to which, however, no special reference is made in the text; a circumstance the more to be regretted as the sections appear sufficiently remarkable to merit careful description.

The next paper, 'On the Occurrence of Freshwater shells at the Irmelsberg, near Crock, in Thuringia' by Dr. Gümbel, with a Note by Dr. Geinitz, is sufficiently important and interesting to British geologists to call for special notice, and will be treated of separately.

Dr. Weiss, in his paper on Von Dechen's Geological Map of the Saarbrück Coal-formation, makes known the occurrence in the 'Lower Dyas'\* of a new Crustacean, which the author refers to the genus *Estheria*, but which Dr. Geinitz describes, in a note, as belonging to the genus *Leiaia*,† under the name of *Leiaia Bäntschianna*, after the discoverer, Herr Bäntschi. The chief interest of this discovery lies in the fact that the three varieties of the only species of *Leiaia* hitherto known—namely, *L. Leidyi*,‡ *Lea* sp., *L. Leidyi*, var. *Williamsoniana*, Jones, and *L. Leidyi*, var. *Salteriana*, Jones, are of Carboniferous age. The new species is very similar to the varieties *Williamsoniana* and *Salteriana*.

Passing by Herr Deicke's paper 'On the Formation of the Molasse-rocks of Switzerland,' and that by Herr Bölsche 'On a new Discovery of Fossils in the Rauchwacke § of the Southern Margin of the Hartz,' we come to an important memoir by Herr Wolfgang Eras, 'On the Felsite-tuffs of Chemnitz' (Die Felsittuffe von Chemnitz), in which the author describes, and gives analyses of, the three principal varieties of the Felsite-tuff of the Zeisgwald near Chemnitz, as well

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\* The 'Lower Dyas' (Geinitz), comprising the Rothliegendes ('Lower Red Sand-stone' of the Durham geologists), may be regarded as the 'Lower Permian' of Murchison.—ED.

† Dr. Dawson has lately met with a specimen of *Leiaia* (and two or more of *Estheria*) in the Carboniferous rocks near Horton, Nova Scotia.—ED.

‡ Either of Lower Carboniferous or Upper Devonian age.

§ A member of the 'Zechstein' or Magnesian Limestone.—ED.

as the compact Claystone of the 'Kreuzbruch' near Chemnitz. From his chemical investigations he deduces the probability of the origin of the Felsite-tuff being exclusively derived from the minerals felspar, quartz, and mica, as they contain all the chemical substances necessary to its formation; and he also shows that the composition of the compact Claystone is so similar to that of the Felsite-tuff, that the materials of both appear to be identical, although certain other facts, especially the columnar character of the former, show with equal clearness that plutonic forces contributed actively to its formation, in contradistinction to the purely sedimentary origin of the Felsite-tuff.

The last paper is 'On the Occurrence of Hatchettine at Wettin,' by Herr Wagner, and relates merely to the occurrence of that mineral, in masses which have hitherto been supposed to be Ozokerite, in the Royal Coal-mine at Wettin, in association with a notable quantity of rock-oil.—H. M. J.

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#### REVIEWS.

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THE PHYSICAL GEOLOGY AND GEOGRAPHY OF GREAT BRITAIN. Six Lectures to Working Men, delivered in the Royal School of Mines in 1863. By A. C. RAMSAY, F.R.S., Local Director of the Geological Survey of Great Britain. Second Edition. 12mo. STANFORD, 1864.

PROFESSOR RAMSAY'S Lectures make a charming little book, written with all the freshness and simplicity of a novice taking up the pen for the first time, and contrasting as much with the stilted phraseology of the 'text-book' writers as the natural voice of a singer or preacher refreshes the ear wearied with *falsetto*. The Lecturer is under no such disciplined restraint as Professor Phillips imposes upon himself in the work lately noticed, but gives the reins to his fancy, and makes a succession of flights at all the great speculative questions of the day.

If the 'working men' expected no more than a dissertation on Practical Geology, they must have been agreeably surprised to find themselves flattered, instead, with an exposition of the most 'advanced' views of their lecturer. For, while exhibiting in a lively and intelligible manner the Geology of this country, of Wales, and of Scotland,—the topographical distribution of the strata and their various character, with their influence on the scenery, and on the occupations of the inhabitants,—he contrives to discuss the origin of rocks and rivers, the action of glaciers and atmospheric agencies in moulding the surface of the land, the excavation of lake-basins, the formation of mineral veins, and many other subjects of equal interest. 'Denudation' very properly forms a prominent topic; denudation in all its aspects—by rivers, by rain, by glaciers, by the sea. Every formation is but so much old material worked up again, with a small