

to the basic dykes of Bijáwar age as their possible *nidus*." So far as we know at present, the almost invariable association of the diamond in South Africa with ultra-basic rocks inclines us to believe that its birthplace occurs in a magma of this character. Hence the basic dykes so often quoted by Mr. Vredenburg may really be the original home of the gem, though the basic material itself could never endure the attrition inevitable in the formation of a conglomerate.

To use a popular expression, these Panna diamonds are "small potatoes and few in a hill," whilst their derivative character helps us very little towards a recognition of the source whence they originally proceeded. The majority of the crystals are said to be small, yet of a good water and lustre, and very seldom clouded or flawed. Their commonest defect consists in the presence of 'spots,' which are black, opaque inclusions of jagged outline. Owing to this defect a large number of the stones are unfit for the European market.

(To be concluded in our next number.)

IV.—SYSTÈME SILURIEN DU CENTRE DE LA BOHÊME, par JOACHIM BARRANDE. 1^e partie: Recherches Paléontologiques. Continuation éditée par le Musée Bohême. Vol. iv: Gastéropodes, par le Doct. JAROSLAV PERNER. Tome i, 1903; Tome ii, 1907. Traduit par A. S. OUDIN.

THIS work supplies a need that has been long felt by palæontologists studying the Gasteropoda of the Palæozoic rocks. As is well known, Barrande succeeded not only in accumulating an immense amount of material connected with the ancient fauna of Bohemia, but he also wrote a considerable number of volumes thereon. He, however, died before accomplishing the part on the Gasteropoda, and in his will desired Professor W. Waagen to continue it. Illness and subsequent death prevented this. Therefore, in April, 1900, the Barrande Commission requested Dr. Perner to undertake the work, and all the materials collected by the eminent French refugee were placed in his hands.

After a careful study of these large quartos, with due consideration for the difficulties involved, we must congratulate the Commission on the result of their choice. Dr. Perner shows not only extensive knowledge of the Gasteropoda of his own country but also of other countries, and he brings to bear on the subject a great breadth of observation, as well as a faculty for minuteness of detail. The translation into fluent French renders the work easy of comprehension by foreigners.

In the prefaces to the two parts Perner describes the difficulties he has had to contend with, the mode he has thought best to meet them, as well as the scope of the work. The material consisted of specimens, notes, and sketches accumulated between 1847 and 1883—the year of Barrande's death—and also of some 247 lithographed plates. These plates contain a superabundance of figures, not merely of different families and genera of Gasteropoda (often mixed up unsystematically), but they even include various organisms belonging to other branches

of the animal kingdom which he had mistaken for Gasteropoda. Barrande drew the figures as the material came to hand during successive years, a practice that involved much repetition. On the one hand he laid stress upon minute distinctions of little moment, while on the other hand important features of detail and ornament to which much value is now attached were sometimes overlooked. To compensate for this latter deficiency Perner has introduced numerous admirably executed drawings into the text. The indiscriminate mixture of figures has been much more difficult to cope with satisfactorily. Perner has considered it best to give the descriptions in zoological order, and has in the main followed the classification of Pilsbry in the Text-book of Palæontology by K. A. von Zittel, translated by C. R. Eastman, vol. i, 1900.

Though tome i contains the descriptions of the families Patellidæ, Carpenter, and Bellerophontidæ, M'Coy, only, the plates of necessity contain in addition the figures of species belonging to many other families. To render these plates comprehensible before their detailed description can be published more than usually full explanations and notes are given. Tome ii also comprises figures of species which cannot be described before the publication of tome iii. Though Perner has used Barrande's plates, he has not been able to adopt his explanations and descriptions, as the real structure of the fossils and their phylogeny were then imperfectly known. He has been obliged to change many both generic and specific names, while adhering as far as possible to Barrande's nomenclature. This was all the more advisable as Barrande made out preparatory tables of genera and species which he named provisionally, and he also presented specimens to many European collections with his manuscript names attached.

In chapter 1 (tome i) Perner gives a chronological list of some forty-three works in which Bohemian species of Gasteropoda have been quoted. Amongst them is Bigsby's "Thesaurus Siluricus," 1868, where about 244 species are recorded whose names were transmitted by Barrande. Perner considers the Gasteropod fauna of the Bohemian basin more or less peculiar to that area, with the exception of there being an almost complete connection between the Gasteropoda of f2 (Devonian) and those of the calcareous deposits of Lower Devonian age in other countries. As Barrande's title "Système Silurien" is somewhat misleading, it may be well here to give a reminder that his étages, D, E, F, G, whose Gasteropoda are described in the volumes before us, include not only the Silurian formation as now understood but also the Ordovician and the Lower and Middle Devonian.

Perner divides the families into groups usually differentiated as genera and subgenera, the exact value of which cannot at present be accurately determined owing to the lack of sufficient material. He has, however, found it advisable to divide the family Bellerophontidæ, M'Coy, into two larger groups in the first instance, and then to subdivide these into genera, laying great stress on the presence or absence of a dorsal band, the first group, *Cyrtolitoidea*, being devoid of it, while the other, *Bucanioidea*, possesses it. This family and the Patellidæ, Carpenter, contain respectively 20 and 8 genera and subgenera (some of them new), comprising 153 species and varieties.

Tome ii describes many of the most interesting families, which are 13 in number and contain 105 genera, comprising 326 species and varieties. Thus we have a total in the two volumes of 133 genera and 479 species. In addition 147 other Gasteropoda are mentioned whose state of preservation does not admit of their being referred with certainty to any species or even genus.

Tome iii will contain the descriptions of five more families, comprising among others many species already figured in tome ii. The Capulidæ may be mentioned as an instance of this, 52 plates in tome ii being exclusively devoted to that family. The same volume will also furnish more particulars about the relationships between the Gasteropoda of Bohemia and those of other countries.

The families described in tome ii are the Pleurotomariidæ, Murchisoniidae, Euomphalidæ, Trochoturbinidæ, Delphinulidæ, Neritopsidæ, Solariidæ, Scalaridæ, Littorinidæ, Loxonematidæ, Turritellidæ, Chemnitziidæ, Subulitidæ. Of these the Pleurotomariidæ ought by rights to have been described in tome i as the first family of the Rhipidoglossa, but as the plates destined for that part contained but few members of the family Perner thought it better to give the Bellerophonitidæ the precedence.

There is considerable difference of opinion among palæontologists with regard to the respective limits of the families Pleurotomariidæ and Murchisoniidae, Koken. Perner considers the form of the aperture the most important feature to be taken into account. Thus shells with more or less rounded aperture he places in the former family, and those with an oval aperture prolonged into a short canal in the latter. The possession of a nacreous inner layer, or of an elongated form, he regards merely of generic value. Both the *Murchisonia*, d'Arch. & de Vern., and *Pleurotomaria*, Sow., should strictly possess a slit in the outer lip, the filling up of which during growth gives rise to the formation of a band on all the whorls. Perner states that if *Pleurotomaria* be restricted to forms agreeing with the Mesozoic types, *P. anglica*, Sowerby, and *P. tuberculosa*, DeFrance, it is not represented in the Palæozoic rocks of Bohemia. But he nevertheless considers that there exist several groups with certain features in common which may be placed with *Pleurotomaria* (taken in a more extended sense) in the family Pleurotomariidæ, and many of these have merely a sinus and not a slit in the outer lip. These groups he regards as constituting genera and subgenera; they number twenty-five, twelve of which are new, and most of the species are also new. Some of the old genera are extended so as to include more species, while others are restricted. Among the latter is *Lophospira*, of which the types given by Whitfield are *L. bicornata*, Hall, and *L. helicteres*, Whitfield. Ulrich considerably extended this genus, dividing it into numerous sections; Perner, however, restricts it to the *perangulata* section of Ulrich, of which *L. perangulata*, Hall, is the type. He includes some of Ulrich's species of *Lophospira* in *Worthenia*, de Kon., and he creates a new genus, *Coronilla*, for the *robusta* section of Ulrich, of which *P. robusta*, Lindstr., is the type. In the latter genus he gives four new species, all from the Upper Silurian (e2). In *Worthenia* he has also four new species from the

same horizon. *Lophospira* is represented by six species, all from the Ordovician (d4 and d5). Two of these are identified with the American *L. medialis*, Ulrich & Scofield, and *L. tropidophora*, Meek.

Only two species of the Pleurotomariidæ are mentioned as common to Britain. One of these from the Silurian (e2) is referred to *P. Lloydii*, Sow., which occurs also in Gothland, and is placed in the genus *Phanerotrema*, Fischer, by Perner. It shows a different structure above the band, but seems too badly preserved for accurate determination. The other is referred with a query to *P. (Bembexia?) Champernowni* (?), Whidborne, sp. It is merely an internal mould, so there can be still less certainty about its identification.

Perner also places in the family Pleurotomariidæ the genera *Stenoloron*, (Ehlert, *Catanostoma*, Sandberger, and *Agnesia*, de Koninck, though he does not regard them as belonging to *Pleurotomaria*, s.l.

Stenoloron contains two new species, *S. pollens*, Barr. (f2), and *S. ambigena*, Barr. (e2), which are especially interesting for showing distinct traces of the very narrow grooved band, which had evidently possessed orifices along it at unequal distances represented by a row of elongated tubercles.

The Murchisoniidae are divided by Perner into four genera, viz., *Pseudomurchisonia*, Koken, *Murchisonia*, d'Arch. & de Vern., s.l., *Sinuspira*, n.g., and *Ectomaria*, Koken. *Murchisonia*, s.l., he subdivides into eleven subgenera, of which five are new. The other three genera are distinguished from *Murchisonia*, s.str., by having a sinus and not a slit in the outer lip, and by not possessing a distinct band on all the whorls; indeed, the two last-named have no band, and *Pseudomurchisonia* (which is represented by one species) has a band on the later whorls only.

The new genus *Sinuspira* (which is also represented by only one species) is particularly interesting in that it apparently forms a link between *Murchisonia* and *Loxonema*; the lines of growth make a deep tongue-shaped sinus without any interruption in their course to form a band. Thus it comes near those species of *Loxonema* which have very sharply sinuated lines of growth, but it may be distinguished by the sinus being of greater depth, and the whorls being more convex and not adpressed at the suture.

Among the new subgenera *Leptorima* may be mentioned as remarkable for having a narrow deep band situated between two swellings high up on the whorl just below the upper suture. *Donaldiella*, Cossmann (*Goniospira*, Donald), is but doubtfully represented by two species, neither of which has so prominent a band as the type. *Ptychocaulus*, n.g., of which the type is the well-known *Murchisonia Verneuli*, Barr. (MS.), is distinguished by the peculiarity of a fold on the columella clearly shown by well-drawn sections of the shell. Another interesting feature in the Murchisoniidae is pointed out by Perner, namely, the fact of the upper part of the spire being partitioned off in several instances.

The Murchisoniidae range from the Ordovician (D-d5) up to the Middle Devonian (G-g1).

Previous authors such as Koken, Ulrich, and Scofield differ greatly in the genera they include in the family Euomphalidae,

De Kon., and they also give many of them the rank of families. Perner considers it best to regard these latter as sub-families of the Euomphalidæ, and he divides these sub-families into genera. He states that true members of the Euomphalidæ, like the type *E. pentangulatus*, Sow., do not exist in Bohemia, and that the family takes quite a secondary place in the Gasteropod fauna. Only one new genus is described, comprising one species; it resembles *Euomphalopterus*, but has certain distinctive features. The family occurs as early as the Ordovician (D-d17), is most numerous in the Silurian (E-e2), and is only represented by one species in the Devonian (F-f2).

He adopts the family Trocho-Turbinidæ, Koken, for shells bearing a certain external resemblance to *Trochus* or *Turbo*. This group is very extensive in Bohemia, including no less than nineteen new genera and subgenera created by Perner. By far the greater number of species occur in the Silurian (E-e1 and 2), but one, *Trochonema excavatum*, Barr., is found in the Ordovician (D-d4), and others range up to the Devonian (F-f2). For the genus of which *Euomphalus discors*, Sow., is the type he prefers retaining the name *Polytropis* given to it by De Koninck, as it has been so used for twenty years in spite of its preoccupation by Sandberger. In a note to plate 107 he states that he did not see Clarke & Ruedemann's "Guelph Fauna," where they suggest the name *Polemnita*, till this work was in the press.

Several small families follow such as the Delphinulidæ, Fischer, with one new subgenus; the Neritopsidæ, Fischer, containing only two genera, *Naticopsis*, M'Coy, with eight species named by Barrande in manuscript, and referred by him to *Natica*, and *Turbonitella*, De Kon., with five species, all also of Barrande in manuscript, except one which Perner considers identical with *T. Ussheri*, Whidborne.

The suborder *Otenobranchia*, Schweigg, comprises two sections: (1) Pteroglossa, Troschel, containing the Solariidæ, with two new genera, and the Scalaridæ, Chenu, with eight genera, of which four are new; (2) Tænioglossa, Troschel, in which are grouped the Littorinidæ, Gray, Loxonematidæ, Koken, Turritellidæ, Gray, Chemnitzidæ, Koken, and the Subulitidæ, Lindström. Among these the families Littorinidæ and Chemnitzidæ each contains one new genus, while the Loxonematidæ has two new genera, namely, *Auriptygma* and *Katoptychia*. The former unites some of the characteristics of *Naticopsis*, *Holopea*, and *Macrochilina*. The latter greatly resembles the Triassic *Anoptychia*, Koken; each is represented by two species. *Auriptygma* is confined to the Silurian (E-e2), and *Katoptychia* to the Devonian (F-f2). Only three of the genera into which the family had been previously divided occur in Bohemia. Of these *Loxonema*, Phillips, comprises the greatest number of species, eleven of which Perner refers to *Loxonema*, s.str., and nineteen to a new subgenus which he calls *Stylonema*. None of the species have been previously described, and they range from the Silurian to the Devonian (E, F, and G). He confines *Loxonema*, s.str., to shells of the type of *L. sinuosum*, Sow., characterized by having oblique sutures and lines of growth strongly sinuated or almost subangular near the middle of the whorl. *Stylonema*, on the contrary, has the lines of growth in the main simply curved and seldom sigmoidal, with sutures more nearly horizontal.

Conditions of space render it impossible to notice more than a selection of the new and interesting forms treated. We trust, however, that enough has been written to show what a wide field has been ably traversed by Dr. Perner, and to awaken the desire to study his elaborate work *in extenso*.

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V. — EARTHQUAKES: AN INTRODUCTION TO SEISMIC GEOLOGY. By WILLIAM HERBERT HOBBS, Professor of Geology, University of Michigan. New York, 1907.

THE work before us is one deserving of special attention from geologists. It cannot be denied that recent and very important advances made in the study of earthquakes have tended to throw the science of Seismology into the domain of the physicist and mathematician, rather than into that of the naturalist. The construction of delicate recording instruments, the unravelling of the complicated results of different kinds of wave-movement, and the discussion of the conclusions to be drawn from these as to the nature and disposition of the materials entering into the composition of our globe, make seismology (like the study of underground temperatures, terrestrial gravity, or terrestrial magnetism) an important branch of geo-physics. But while this aspect of the subject is not lost sight of, it should ever be remembered that the geologist has at least an equal claim with the physicist to be heard in the discussion of seismological problems. The records of the history of the earth's crust, as studied by the geologist, supply evidence concerning the nature and the effects of seismic action which cannot be neglected if we are to obtain the fullest possible amount of light upon the subject. It is true that the idea, formerly held by geologists, that there is a direct connexion between volcanic and earthquake phenomena, has been steadily losing ground; but, on the other hand, the intimate relations between earthquake movements and the geological phenomena of jointing and faulting—or, as our author prefers to express it, the effects of constant readjustment of blocks of the earth's crust to one another—are coming to be regarded as the essential factor in all great earthquakes. The interpretation of the phenomena of the past, by the study of forces in action at the present time, which is so fully recognised as the true principle of reasoning concerning the external agents operating on the earth's crust, is now felt to be equally applicable to the internal forces acting upon it. 'Seismic geology,' though divorced from Vulcanology, must still be regarded as one of the essential branches of Geological Dynamics.

In the earlier chapters of this work the author, inverting the usual method of treating the subject, deals with the evidences so familiar to the geologist of constant strain and intermittent fracture within the earth's crust, and demonstrates the existence of unstable belts where such conditions attain their maximum. He then shows