

ments of a high order, cultivate their lands with great intelligence, are skilful workers in metals, and betray extreme taste in their decorative art. In the *Tour du Monde* for May 15, 1880, Dr. Harmand figures two native pipes and a quiver of a Stieng tribe, whose forms and arabesque designs are supremely beautiful (see Figs. 11, 12, and 13). "Their artistic instincts," this observer remarks, "are more developed and especially more original [than those of their Laos neighbours]. From them I have procured various objects betraying a refined taste, and woven fabrics with simple designs and well-harmonised colours." Amongst them there is prevalent a curious system of writing, at first sight somewhat suggestive of the Irish Ogham, but of a far more primitive character. It consists of a series of notches, varying in size and number, cut on both edges of a bamboo planchette, which is generally set up as a sort of public notice at the entrance to the villages. Thus a row made up of eight large, eleven medium-sized, and nine small notches was explained to mean: "Our village contains eight men, eleven women, and nine children." It is evident that in a system of this sort as wide a scope must be left to the imagination as in the hypothetical primitive speech, in which broken utterances are largely supplemented by signs and gesture.

A. H. KEANE

(To be continued.)

GEOLOGY OF BOSNIA AND HERZEGOVINA¹

AMID the conflict of political parties, the jealousies of rival powers, the rumours of renewed dispeace among the nations, and the smouldering embers of war that seem ready at any moment to burst forth into renewed conflagration, it is a relief to turn to a volume in which the Austrian Government has just shown to the world one of the first uses to which she has put her new acquisitions in the East. Nothing could have been more quietly and unostentatiously done, and nothing could show a more enlightened and humanising policy than the action which is modestly described in the volume before us. The story is briefly told by the Ritter von Hauer in an introductory note. It appears that immediately after the pacification of the occupied provinces of Bosnia and Herzegovina the Director of the Geological Institute at Vienna addressed to the Minister of Public Worship and Instruction (under whom the Geological Institute is placed) a letter in which he pointed out the desirability of expanding the pacific mission on which the country had entered in these provinces by organising a geological survey of them under the guidance of the Geological Institute. His representations were acceded to, and on March 9, 1879, he received instructions to commence a geological reconnaissance of the provinces with detailed investigation of such localities as might be found of sufficient importance. The task was to be undertaken conjointly by the Geological Institutes in Vienna and Buda-pest. The Director was requested as soon as possible to submit a plan of survey with proposals as to the number of geologists to be detailed and the individuals most competent for the exhaustive discharge of the duties required; and he was further instructed to put himself in direct relations with the Hungarian Geological Institute with a view to a proper sub-division of the work. Ritter von Hauer had no difficulty with one part of his instructions. Two of his staff, Dr. E. von Mojsisovics and Dr. E. Tietze, had already signified their wish to undertake the work, and Dr. Bittner expressed his desire to share in it. After some delay the Hungarian Institute made known its inability, from want of a sufficient staff, to take part in the intended survey. At last, on March

23, Director Von Hauer was able to announce to the Ministry that he was ready to begin operations. He proposed that as the work would naturally fall into two sections, (1) the preparation of a geological sketch-map of the whole occupied Provinces, and (2) a special detailed investigation of localities affording indications of salt, coal, or ores, it would be desirable to arrange the officers employed into two divisions. For the preparation of the map he suggested that four geologists should be employed, which, estimating the area to be surveyed at 1000 square German miles, would give 250 square miles to each surveyor. He recommended for this duty the three gentlemen above-named, and added the name of Prof. Hörnes of Graz as the fourth, should the Hungarian Geological Institute have no other to propose. It was of course impossible that these officers, intrusted with the task of rapidly traversing the country and seizing on the salient features of its geological structure, should have time to halt anywhere long enough to make detailed investigations for useful minerals. This part of the duties however was one in which the services of the Hungarian Geological Institute might be especially useful, seeing that the distribution of ores in the Hungarian territory bore the closest analogy to that in Bosnia. The name of Herr F. Herlich of Klausenberg was accordingly suggested as one of the most competent persons to be intrusted with this part of the survey. It was further represented that the interesting and important coal and salt-spring region of Dolnj-Tuzla would be most fittingly explored by Herr Bergrath K. M. Paul, well known for his intimate acquaintance with the mineral tracts of Slavonia, Croatia, and the northern slopes of the Carpathian Mountains. Some further suggestions as to additional assistants were made. At last on April 7, 1879, the scheme of operations received the sanction of the Minister of Public Worship and Instruction.

By the beginning of May Herr Paul had broken ground in Bosnia. Before the end of the same month Herren von Mojsisovics, Tietze, and Bittner were likewise in the field, and undertook by themselves the whole burden of the map. In about three months the traverses for the construction of the map were completed, and the geological structure of a hitherto unexplored region of 1000 square German miles was added to our knowledge of the geology of Europe. One is at a loss whether most to admire the breadth of view which conceived and planned this first utilisation of an annexed territory, or the zeal and capacity which so rapidly carried out and completed the conception.

The *Jahrbuch der k. k. Geologischen Reichsanstalt* is one of the best-known and most useful geological journals in existence. The present number considerably exceeds the usual size of the periodical, since it is expanded by containing the reports of the geologists upon the recent survey of Bosnia-Herzegovina. Dr. von Mojsisovics takes West Bosnia and Turkish Croatia. In his report, after acknowledging assistance received in the country and enumerating the literature of the subject, in which the work of the veteran Ami Boué stands in the foremost place, the author proceeds to give a general outline of the topography and geology of the region examined by him. Most of his survey was done on horseback. He chose various traverses of the country, noting down by the way his observations upon the general map of Europe on a scale of $\frac{1}{300000}$, published by the Military Geographical Institute of Vienna. The first section of his report is devoted to geological topography, and includes some interesting information regarding what has been termed the "oriental fixed land"—an ancient island or nucleus round which, in the Balkan Peninsula, the Lias and more recent formations have been ranged. The second section treats of the geological formations in stratigraphical order, the more important being Triassic, Jurassic, Cretaceous, and Flysch, the last-named belonging partly to the Cretaceous

¹ *Jahrbuch der k. k. Geologischen Reichsanstalt*, Band xxx. Heft ii., containing "Grundlinien der Geologie von Bosnien-Herzegovina," von Dr. E. v. Mojsisovics, Dr. E. Tietze, und Dr. A. Bittner, mit Beiträgen von Dr. M. Neumayr und C. v. John. Vienna, 1880. The work is also published separately by Holder of Vienna, with a preface by Fr. v. Hauer.

and partly to the Eocene system. Among the younger formations the author devotes a couple of pages to sub-aërial deposits, including the results of the superficial weathering of rocks and the formation of "eluvial" accumulations. The third section describes the geological structure of different traverses of the country, and localities of geological interest, while a supplement contains observations on the mineral resources of the ground reported upon.

Dr. Tietze describes in a similar methodical way the geology of East Bosnia, while Dr. Bittner takes the Herzegovina and the south-east part of Bosnia. These reports are full of interest, especially in relation to the Cretaceous and Tertiary geology of the east of Europe. To some of the questions discussed in them we may return on another occasion. Though the geologists in their rapid marches had little time to collect specimens they nevertheless found opportunity to carry off some rocks and fossils which were found of sufficient importance to deserve special description. Herr C. v. John gives a report on some crystalline rocks of the Provinces, including granite, older plagioclase rocks, younger diabases, diorites, and similar rocks from the Flysch, gabbros, serpentines, eclogites, with trachytic and andesitic lavas. Dr. Neumayr describes a series of brackish-water shells from the Tertiary formations of the Provinces.

The Geological Institute of Vienna may be congratulated on the signal success of its well-planned and admirably-conducted enterprise. Rarely has so compendious a body of detailed information in geology been so rapidly accumulated and so promptly published. Ritter von Hauer's preface is dated March 1, 1880—that is within a year from the time when his proposal for the Survey was laid before the Austrian Government. These few months sufficed for the field-work, for the elaboration of the reports, and for the preparation of the map and engravings. The Reports form a volume of 333 closely-printed octavo pages. The map is issued in one sheet on the scale of $\frac{1}{578000}$, with twenty-one colours. ARCH. GEIKIE

MICHEL CHASLES

Born November 15, 1793, Died December 18, 1880.

"KNOW ye not that there is a prince and a great man fallen this day?" might well have been the thought of the President Becquerel when he announced to the Academy on the 20th ult. that Chasles was dead. To many the man who had surpassed in age Leibnitz by seventeen, Euler by eleven, Lagrange by ten, Laplace and Gauss by nine, and Newton by two years, was a "venerable nomen," but yet a "nomen" only.

As far back as the present generation can remember Chasles has been a prince of geometers, and it has come upon many of us as a surprise to hear that he was still walking and working in our midst. A few years back a telegram was sent him from Boston conveying congratulations, and expressing the hope that the illustrious mathematician might see the close of the present century, in which event he would have surpassed the years of Pythagoras. Length of days is not always a boon, but Chasles's was a pleasant old age, and he died in harness: in such a case he might say with one of old, "nihil habeo quod incussem senectutem." "La vie de M. Chasles a été heureuse et simple; il a trouvé dans la Science, avec les plus grandes joies, une gloire qui sera immortelle, et dans la vive affection de ses amis, dans leur assiduité empressée aux réunions où il les conviait avec une grâce si aimable, dans leur respectueuse déférence en toute circonstance, la consolation de sa vieillesse."

Born at Epernon (Eure-et-Loir), he entered the École Polytechnique in 1812. At this early date he would communicate to students in the rival colleges the problems and exercises of the week, asking in return the questions proposed by their masters: "Dans cet échange organisé

par le jeune lycéen, on peut croire aisément que le futur géomètre avait souvent la meilleure part." After taking his place in the defence of Paris in 1814 he passed out in engineering, but he re-entered the school in 1815. And this is the reason: Chasles was on the point of leaving for Chartres to show his uniform and to bid farewell to his mother before going to Metz, when he was waited on by the father of one of his comrades. "Mon fils," said the father, "est le premier des élèves qui n'ont pas obtenu de place; vous avez hésité, je le sais, à accepter l'épaulette; votre refus aurait assuré à votre camarade une carrière qui lui plaît et pour laquelle j'ai fait les derniers sacrifices; il m'est impossible de les continuer pour lui en préparer une autre." Chasles made no reply: he went to Chartres; on his arrival his choice was made, and he told his mother he would stay with her. The army lost him as an officer, the world gained him as a geometer. On finally leaving the establishment, in spite of the high position he held amongst his companions, he voluntarily renounced public employment (Larousse states however: "Fut agent de change et plus tard aux affaires pour les sciences") and went to Chartres, where he spent some ten years. He was working quietly however: "Toujours passionné pour la géométrie, il résolvait de beaux problèmes, comme au collège, trouvait chaque jour d'élégants théorèmes, inventait des méthodes-générales et fécondes, sans attirer l'attention des maîtres de la science et sans y prétendre. 'Que de talent perdu!' disaient les plus bien-veillants, sans songer même à traiter d'égal ce jeune homme obstiné à approfondir les théories élémentaires et qui bientôt peut-être devait, par elles, s'élever bien au-dessus d'eux." Elected a Corresponding Member of the Academy in 1839 ("decorated" the same year), he was made "Professeur de Machines et de Géodésie" at the École Polytechnique, in succession to Savary in 1841. This chair he occupied for ten years, when, in consequence of some alterations ("profondes et très regrettables" ¹), he sent in his resignation, and ever afterwards did all in his power to combat these, as he thought, dangerous reforms. His affection however continued unabated: "C'est ainsi qu'il acceptait avec tout d'empressement la présidence du Comité de la Société amicale des Anciens Elèves; c'est ainsi qu'il entraît au conseil de perfectionnement, et que, tout récemment encore, malgré son grand âge, il acceptait le renouvellement de son mandat, avec le désir, disait-il, de continuer jusqu'à son dernier souffle à entretenir ce foyer de travail, d'honneur et de dévouement au pays." With the ardour which so distinguished him, M. Chasles had undertaken to write a history of the school; an extract from this history he recently published: "Exposé historique concernant le Cours de Machines, dans l'Enseignement de l'École Polytechnique" (see notice in NATURE, vol. xxiii. p. 75). M. Laussedat informs us that the veteran's wish is in great part attained, and that it was with great pleasure Chasles learned before his death that the *Journal de l'École Polytechnique* is to be revived, and that the revision of the "programmes de l'enseignement" was decided upon. In France the professorial chairs are *special*.² Poinsoy was, for some years, desirous that a chair should be appointed for the Modern Geometry, and in 1846 this chair was created by the Faculté des Sciences, and Chasles was elected to be the first occupant. In 1851 he was elected a Member of the Academy, and in the same year, as above stated, gave up his appointment at the Polytechnic. In 1854 he became Foreign Member of our Royal Society, in 1865 he was awarded the Copley medal, and in April, 1867, he was elected the first (and for some time the only) Foreign Member of the London

¹ Note, p. 583, to the admirable "Discours d'Inauguration de Cours de Géométrie Supérieure de la Faculté des Sciences de Paris" (December 22, 1846), which follows the second edition of the "Traité de Géométrie Supérieure" (1880).

² "Toutes les chaires ont un titre special." "Rapport sur les Progrès de la Géométrie," Paris, 1870, pp. 219, 376.