In the section at Aston Rowant,[1] Oxon, a compact yellowish limestone band 1 foot in thickness marks the upper limit of the zone, and here we measured 19 feet for the thickness of the zone. At Hart's Lock Wood,[2] near Whitchurch, Oxon, a band of yellowish lumpy and nodular chalk (hard and soft mixed), much less compact than at Aston Rowant, is developed at the top of the zone, but this to a thickness of 3 feet, and at this place the thickness of the zone is 24 feet. In the present section, where there is no definite rock development at the top of the zone, the thickness, as already stated, is 32 feet. We can therefore surmise that the development of a hard rock band at this horizon indicates a period of arrested or diminished sedimentation, and in connection with this it is interesting to note that in this section, where no rock bed is present, the transition between the upper *Holaster planus*-zone type of Micraster with moderately inflated 'areas' to the definite *M. cortestudinarium*-zone type with strongly inflated 'areas' occupies a more extensive vertical range.

## NOTICES OF MEMOIRS.

I.—Geological Cycles in the Maritime Provinces of Canada. By G. F. Matthew, D.Sc., LL.D. Trans. Roy. Soc. Canada, 1908–9, ser. III, sect. iv, vol. ii, pp. 121–43.

THE object of this paper is to show briefly the succession and age of the several formations that were accumulated in the eastern provinces of Canada, from the earliest that can be recognized to the end of the Trias (or Jura-Trias).

As the Cambrian is well represented in these provinces by a formation that contains many characteristic faunas, it forms a basis to which the older and later formations can be co-related. The writer upon this basis affirms the presence of several formations, or systems, older than the Cambrian, and indicates the physical characteristic by which they are separable from each other (there being no fossils in these earlier groups of strata by which they can be distinguished). One of these groups is the gold-bearing or Maguma series of Nova Scotia, having the enormous thickness of 5 miles of sandstones (quartzites) and slates, the chief gold-bearing zone being near the middle of the succession. Older than this is a group containing much limestone, which the author compares to the Grenville Limestones of the Laurentian system. Younger than the Maguma series, but older than the Cambrian, are other groups of strata, many of which consist largely of effusive rocks.

Above the Cambrian (which includes also the Lower Ordovician) there is a break in the succession; the Upper Ordovician is wanting, and the Upper Silurian begins in many districts with effusive rocks and elsewhere with sandstones; these are succeeded by fine dark-grey shales, and these by paler shales and sandstones, which are also more

[1] Mem. Geol. Surv. (Expl. Sheet 254), Henley-on-Thames, 1908, pp. 39, 40.
[2] Proc. Geol. Assoc., 1908, vol. xx, p. 396.

calcareous. These are seen by their faunas, as shown at Arisaig, etc., to range from the Llandovery to the Ludlow or higher. A peculiar phase of this formation is the plant-bearing beds near St. John, N.B., which contain many types of plants that reappeared in the Carboniferous, with others that are special to this locality.

Following this formation there is a break in the succession, the Middle Devonian being absent, or at least not recognized by its marine fossils, and the next formation (Upper Devonian) by its plant remains shows a close relation with the Lower Carboniferous, yet it has many typical Devonian genera and species of plants. The Carboniferous Age began with a widely extended deposit of marine limestones spreading through nearly the whole length of the eastern provinces in a belt across their centre, but not known in their northern part. The Millstone Grit and Coal-measures followed in a widely extended tract to and under the Gulf of St. Lawrence. In a northerly direction they were covered by the Permo-Carboniferous found along the borders of the gulf and extending into the province of Prince Edward's Island.

The final geological system of this part of Canada was the Trias (or Jura-Trias), which occupied a large area in the Bay of Fundy and the Basin of Mines, and is also found in the islands of the Gulf of St. Lawrence. In the Bay of Fundy area and the Basin of Mines the system is characterized by extensive eruptions of dolerite and volcanic-ash deposits that have left a strong imprint on the topography of the country as it now appears. Subsequent to the Jura-Trias there were no great geological systems laid down in this region, and it is supposed that it remained for long ages above the sea. Only in post-Pliocene time did the sea again invade these provinces, and lay down a marine fauna closely related to and mostly of species living at the present time.

## II.—Brief Notices.

Fluorspar.—An important paper on "The Fluorspar Deposits of Derbyshire" has been contributed by Mr. C. B. Wedd, F.G.S., and Mr. G. Cooper Drabble to the Transactions of the Institution of Mining Engineers (1908, vol. xxxv, pp. 501, etc.). The authors give a general account of the structure of the Carboniferous Limestone area and of the associated igneous rocks. The limestone is from 1,500 to 1,700 feet thick, and forms the southern end of the Pennine anticline. The fluorspar appears to be confined to the upper 600 feet of the limestone, and is chiefly concentrated within 300 or 400 feet of the top. The upper beds of the limestone contain a good deal of chert, also secondary quartz; they are often dolomitic, are more fossiliferous than the lower strata, and contain bituminous products. Moreover, all the known sheets of igneous rock are found in the upper half of the great mass of Derbyshire Limestone. The mineral deposits occur in joints and cracks, in pockets and pipes, and in independent 'flats'. The fluorspar is remarkably free from silica; 1 per cent. is an exceptional quantity. The authors believe that local circumstances agree best with the hypothesis of deposition in fissures and to a small extent as a metasomatic replacement of the country-rock, from a heated aqueous solution containing gases and forced up from a great depth, possibly in

connection with the later phase of igneous activity. They hold that deposition, consequent on diminution of pressure and temperature, was precluded in the case of fluorspar from taking place in the lower parts of the vein-fissures, owing to the fact, pointed out to them by Dr. W. Pollard, that superheated steam decomposes calcium fluoride. The relatively low specific gravity of the mineral probably had some further influence in determining the limitation of the mineral to the upper parts of the fissures. The economic uses of fluorspar are discussed from an historic and practical point of view, and the paper concludes with a bibliography.

III.—Geological Hand-Map of the British Isles.—Mr. Edward Stanford, of 12, Long Acre, has sent us a copy of a neat colour-printed map with the above title, which he has published at the price of 6*d*. The size of the sheet on which the map is printed is about 7½ by 10 inches, and it should prove useful for handy reference in classes.

## REVIEWS.

I.—Records of the Geological Survey of India: General Report for 1907. By Sir T. H. Holland, K.C.I.E., D.Sc., F.R.S., Director.[1]

THE Director observes in his introduction that there has been satisfactory progress in mineral production during 1907, and an extraordinary increase in the activity of prospectors, "mainly inspired by the phenomenal success of those who were already prepared to meet the increased demand for manganese-ore and coal." The statement of mineral concessions during the year is indeed most remarkable, and the details of the 600 licences granted fill thirty-one pages of the report. Clearly the prospectors are in an optimistic mood.

The Director in his obituary notice calls attention to the value and importance of Mr. Griesbach's work.[2]

*Mineralogy.*—The jadeite deposits in Upper Burma have been carefully investigated, and the recent conclusions, both as to the origin and age of this mineral, differ materially from the views formerly advanced.[3] It was known previously that the jadeite formed a light-coloured layer in the midst of a dark-green serpentine, and it was conjectured that the jadeite must have separated as a primary segregation from the magma. There seemed some difficulty in understanding how a soda-alumina silicate could have segregated from a magnesian rock, but recent observations tend to show that the jadeite occurs in a metamorphosed igneous dyke intruded into the serpentine. It is concluded that the jadeite is the result of the

[1] [This review was written by our late friend and co-editor, Mr. W. H. Hudleston, and sent to us on January 20, 1909, nine days before he passed away from his active, useful life, without any illness or suffering, happily engaged up to the last moment (see Obituary).—H. W.]

[2] See Geol. Mag. for 1907, p. 240.

[3] Geol. Mag., 1907, p. 328.