almost every thing in life worth living for — excepting marriage with one another. "Shut out," he says, "from church privileges, as preaching of the Word, prayer-meetings, socials, receptions, lectures, concerts, parties, what remains to them of all that makes life pleasurable to us? . . . To forbid them, as some would, matrimony, the one remaining but most helpful and enjoyable of all social and family relations, is a monstrous cruelty with very little reason" (*Science*, Oct. 31, p. 248).

But Dr. Gillett need not feel disturbed about this matter. Neither I, nor any one else, so far as I know, proposes to practise this cruelty upon the deaf. My position upon this subject is substantially that taken by President Gallaudet (*Science*, Nov. 28, p. 295). I thoroughly agree with him in all he has said concerning intermarriage, and thoroughly disagree with the rest of his article.

Dr. Gillett advocates intermarriage because the affliction is so great, and ignores heredity because it is so slight. President Gallaudet's position is, I think, equally inconsistent. He advocates a certain system of education, while at the same time he deprecates its results. Segregation and the sign-language are the chief causes that have led to the intermarriages of the deaf and dumb. He advocates the causes, while he deplores the result. I may have more to say upon this subject at some future time.

ALEXANDER GRAHAM BELL.

Beinn Bhreagh, C.B., Dec. 10.

The Geology of Quebec City.

IN reference to the geology of Quebec, I can only say that practically the discussion of the citadel rocks has at present passed into the hands of the paleontologist. There is nothing conclusive in the stratigraphy of the region itself to show their exact horizon. They are bounded on all sides by faults of great extent, by which they are brought into contact with rocks of Sillery (Upper Cambrian) age on the mainland above Quebec City, with rocks of Levis (Lower Silurian) age at the west end of the Island of Orleans, and with the typical Hudson River rocks to the north of the city. The equivalents of the citadel rocks, as seen on the south side of the St. Lawrence River on Gaspé peninsula (see "Report of the Geological Survey," 1881–82), are, by a fault, brought in contact with Sillery rocks also; and the limited outcrops of these at Etchemin, on Crane Island, and at several other points, show a precisely similar arrangement.

The principal stratigraphical evidence bearing on the age of these rocks of Quebec City must, then, I take it, be looked for elsewhere. In the southern part of the province about Lake Memphremagog, graphitic shales containing graptolites, described by Lapworth as similar to those from Quebec City, also occur. These are in connection with certain gray and blackish slates and limestones which are an integral part, in so far as we can determine, of the series of slates and limestones which have been already described as Lower Trenton, or possibly Upper Chazy. The statement in Lapworth's paper, published in the "Transactions of the Royal Society of Canada," pp. 171 and 175, seems to be very clearly confirmed; and, from all the evidence at present in our possession, I can see no reason for changing the statement made in my report on this section ("Geological Survey Report," 1887–88, pp. 83, 84, K); viz., that these rocks represent a peculiar development of strata of Trenton age, and probably even down in that formation.

R. W. ELLS.

Ottawa, Dec. 16.

REFERRING to the article on the above subject in your issue of Dec. 5, I may say that Mr. Ami should have restricted his observation to paleontological facts; and the appropriate heading would have been, "On the Paleontology," etc., not "On the Geology of Quebec." As it stands, the article is an instance of what I have elsewhere designated "paleontological stratigraphy."

I was, I believe, the first to point out in 1876–77, and purely on stratigraphical evidence, the fact that the rocks of Quebec City were not, as mapped by Sir William Logan, Levis, but that they were certainly the extension of those on the north shore of Orleans Island, described on p. 200 of the "Geology of Canada" (1863) as Hudson River, and contain certain fossils, figured and described on the same page. I at the same time, 1877–78, traced out, and delineated on the map, the approximate course of the fault which cuts off the Levis formation, with its characteristic fauna, from the north side of the river. At that time no fossils had been found in the rocks of Quebec City, though mapped as part of the Levis formation (see *Geology of Canada*, 1863, p. 200); but, having determined by close and careful stratigraphical observation what these rocks were, I sent our collector, Mr. Weston, to Quebec to seek for the fossils, which I felt confident must be there, I told him, and that they would prove to be the same as those of Orleans Island, north shore. As Mr. Ami states, some forty or fifty species have since been found by Mr. Weston and others in these rocks. Some of them are from conglomerate bands, and therefore, like some of those in the Levis conglomerates, may be derived from older strata. Mr. Ami says these strata cannot be referred to the Lorraine nor to the Utica, but he fails to give any sufficient reason for this positive assertion. He then states Sir William Logan's opinion, but does not state mine, though he admits, without saying by whom it was determined, the equivalency of the shales on the north shore of the Island of Orleans with the Quebec City rocks. He still wants to separate the rocks at Montmorency Falls, which he, following Logan and myself, now recognizes as Utica, Hudson, or above the Trenton. The structure is diagrammatically shown in my section (*Descriptive Sketch*, p. 14) and in Logan's section (*Geology of Canada*, 1863, p. 234). The two sections are practically alike, and I believe are in a general sense correct. There is not a particle of stratigraphical evidence of any break between Montmorency and the Island of Orleans; but there is much folding, the result probably of the faults 1 and 2,— a slide down and a shove up respectively (see Fig. 1 in *Descriptive Sketch*). Mr. Ami's contention is based solely on his own determination of certain very imperfect specimens of fossils. These determinations may or may not be correct. They do not agree with Logan's (*Geology of Canada*, 1863, p. 200). Ami omits from his list *Eraptolithus bicornis, pristis,* and *ramosus,* stated to be Utica-Hudson species (I believe these do occur in Mr. Ami's lists, but under new names). But, even suppose Mr. Ami's determination to be correct, it would not in the least change my opinion as regards the position, in what we call the Cambro-Silurian system, of these rocks; viz., that they constitute a part of the great Calcareo bituminous shale formation which overlies the Trenton limestone, and which is known as Utica and Hudson, or Utica-Lorraine, or Cincinnati group, and which has nowhere, from the Lower St. Lawrence to Lake Superior and Wisconsin, ever been seen beneath the Trenton.

I cannot see my way to construct a map or a section, having regard to the known stratigraphical facts, which would bring the Quebec City rocks below the Trenton; nor do the fossils (see lists in *Annual Report of the Geological Survey of Canada*, vol. iii. part 2, pp. 77 K to 81 K) seem to point in that direction, such as *Asaphus* (Canadense?), *Trinucleus, Leptæna sericea,* and the graptolites above named (*bicornis, pristis,* and *ramosus*). I see no reason for Mr. Ami's remarks about the name "Hudson River," or that there ever was any confusion in its use. The name and the equivalent terms — Lorraine or Cincinnati — are well known, and have always been applied to formations above, or supposed to be above, the Trenton, and below the Medina. The only confusion has been in defining the areas occupied by these formations.

There are, in connection with the old Quebec group area from Vermont to Cape Rosier, still a few doubtful points: 1. The question whether the rocks of Cape Diamond and Quebec City are above or below the Trenton limestone, i.e., Utica, Hudson, or Chazy; 2. The question whether the group of strata originally designated by Logan as "The Magnesian Belt," and by myself as the "Volcanic Group," which include the serpentines, with asbestos and other altered igneous rocks, are Upper Archæan or Lower Cambrian. No fossils have yet been found in any of the strata of this group; but from other considerations, physical, lithological, and stratigraphical, I am inclined to think they are pre-Cambrian, and about the age of the upper part of what we designate "Huronian" in the Lake Superior region.

ALFRED R. C. SELWYN.

Ottawa, Can., Dec. 16.