SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada.....$3.50 a year.
Great Britain and Europe..... 4.50 a year.

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VOL. XVI. NEW YORK, DECEMBER 26, 1890. No. 412.

CONTENTS:

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Deaf-Mutes.

I CANNOT agree with Dr. Gillett that it is not a very great calamity to have a deaf and dumb child. Still less can I agree with him that the deafness is no calamity to the child, but "only a serious inconvenience," as baldness is an inconvenience "in fly-time or cold weather" (*Science*, Oct. 31, p 249).

President Gallaudet dissents from such a view (*Science*, Nov. 28, p. 295), and the deaf themselves will surely not indorse it. The American public also, by their appropriations in aid of schools for the deaf, have expressed a very different opinion. The average *per capita* granted for the education of hearing children is less than twenty dollars per annum, whereas in the case of the deaf it exceeds two hundred dollars.

Dr. Gillett says (*Science*, Oct. 31, p. 248), "Not two per cent of the deaf and dumb are the children of deaf parents." But, if the percentage comes anywhere near that figure, the education of these children alone would cost about one million of dollars. The number of deaf-mutes reported in the census of 1880 was 33,878, and two per cent of this number is 677. At $200 a head, the cost of education would be $135,400 per annum, or $1,083,200 if instruction were continued for eight years.

"Two per cent" may seem a very small matter to unreflective minds, but a little consideration will dispel the illusion. Not one per cent, not even one in a thousand, of the general population, is deaf and dumb. In 1880 the percentage was 0.0675: in other words, there were 675 deaf-mutes to every million of the population. Dr Gillett's "two per cent" means 20,000 to the million, a proportion nearly thirty times as great.

Nor must it be forgotten that Dr. Gillett's percentage is taken upon the whole of the deaf-mute population (which, of course, includes children and unmarried adults), whereas the deaf offspring are the products of the married couples alone.

Indeed, as President Gallaudet points out (*Science*, Nov. 28, p. 295), they are chiefly the offspring of couples in which one or both of the parties were born deaf, or came from families containing more than one deaf-mute. Sporadic deafness (if not congenital) is rarely inherited, and the majority of the marriages of the deaf are free from deaf offspring. How prolific of deaf offspring the remaining marriages must be, if their children alone constitute a percentage of the whole deaf-mute population nearly thirty times as great as the normal percentage for the country!

Dr. Gillett informs us (*Facts and Opinions*, pp. 53–58), that, of 1,886 deaf-mutes who had been admitted to his institution, 293 were known to have married (his statistics included the children then in school). Of this number, 272, or more than 92 per cent, married deaf-mutes; and 21, or less than 8 per cent, married hearing persons. We are not told how many families were formed by these pupils; but, as we know that in the vast majority of cases deaf-mutes choose partners who were educated in the same school with themselves, we may safely infer that the families formed by these pupils were very much less in number than the figures would at first sight indicate. If none of these deaf-mutes married pupils of other schools, then the 272 cases alluded to above formed only 136 families. The true number, however, is probably somewhat greater.

Dr Gillett says (*Facts and Opinions*, p. 57), "These marriages have been as fruitful in offspring as the average of marriages in society at large, some of them resulting in large families of children. It is interesting to know that among all these only sixteen have deaf-mute children." He seems to be unconscious of the fact, that, if you take an equal number of marriages of hearing people, there should not be one deaf child among the offspring (in 1880 there was one deaf-mute for every 1,480 of the general population).

"Only sixteen,"—this expression unfortunately is ambiguous. Does he mean that there were only sixteen deaf children, or did only sixteen of his pupils have deaf children, or were only sixteen of the families formed by the pupils productive of deaf offspring?

In this latter case, how many families were there,—272, or 136?—and how many deaf children? And what percentage of the offspring were deaf, and what hearing? All he tells us concerning this important point is, "In some of the families having a deaf child there are other children who hear."

We are not told in how many of these cases the parents were born deaf, or belonged to families containing more than one deaf-mute, nor how many of the marriages included a congenitally deaf partner.

What I, as a student of heredity, would specially like to know is this: what percentage of the children were deaf in those cases where the married partners were both deaf from birth, and in those cases where both had deaf relatives? I am sure, that if Dr. Gillett will make the calculation, and apply the results to the deaf population of the country, he will realize, as I do, that the question of intermarriage is one that deserves more serious consideration than he has given it in his letter to *Science*.

While, on the one hand, Dr. Gillett does not think it matters much to a child whether he is born deaf or hearing, because "deafness is neither a crime nor a disgrace, nor entails suffering," and because it is so little of a calamity as to be "only a serious inconvenience," like baldness in fly-time, on the other hand, he advocates the intermarriage of deaf-mutes without regard to heredity, because deafness is so great a calamity as to cut them off from

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.