Hoar Frosts 67	Thunders 10
Lightnings 13	Hails 2
Rainbows 5	Lunar Halos 14
Lunar Coronæ 28	Solar Halos 9
Days Sleighing.....89	

The maximum temperature I know to be recorded here was 93°.1 on 9th August, 1872; and the minimum −15°.8 on 27th January of this year. In 1873 the highest was 87.°5 on 31st July, and the lowest −14°.4 on 30th January; giving an extreme range of 101°.9. The warmest day was the 3rd of August — mean 69°.54. The coldest the 30th of January—mean −2°.18.

Art. X.—Observations on some Fossil Bones found in New Brunswick, Dominion of Canada. By J. Bernard Gilpin, B. A., M. D., M. R. C. S.

These bones were taken from one of the cuttings of the Intercolonial Railway on the Jacquet River, Bay de Chaleurs, New Brunswick. After cutting through sand and gravel for about twelve feet, a bed of clay was reached. In this the bones were bedded. Abundance of the following fossil shells were found with them:

Balanus hameri. Ascanius.
Fusus tornatus. Gould.
Buccinum undatum. Linn.
Natica groenlandica. Perry.
Leda truncata. Gould.
Mya arenaria. Linn.
Mya truncata. Linn.
Tellina groenlandica. Beck.
Tellina proxima. Brown.
Saxicava rugosa. Linn.

The cutting is forty feet above the level of the sea, and one-fourth of a mile from it, and on the north side of the river. The

opposite or south side has the same exposure and fossils. The clay is postpliocene and of the Lake Champlain period. I am indebted to my friend Dr. Honeyman, who visited the Jacquet, for these facts.

The fossil bones consist of eighteen vertebra, a small portion of the atlas, about twelve fragments so thick and so marked by nearly obsolete sutures, as to prove them portions of the base of the skull, the petrous portion of one ear, about one-half of the lower jaw, a fragment of the sternum, fragments of both scapulas, one humerus, radius ulna and phalanx, one or two ribs, and numerous fragments of ribs, and spinous processes of vertebra. They are entirely free of animal matter, of a light fawn color and so dry or chalky as to leave a dusty mark upon everything they touched. From comparison with some of the recent bones in the Halifax Museum of some of the smaller Cetaceans, and with the beautiful plates of the bones of the Boston whale, (B. musculus) by Dr. Dwight, Boston N. H. Society, there can be no doubt but that they are the remains of some ancient small Cetacean inhabiting the Champlain clay period.

Of the eighteen vertebra, four are dorsals, ten lumbar, and four caudal. The four dorsal are all more or less incomplete in the neural arch, and transverse processes or diaphophices. The largest one measures in its centrum or body, two and three-fourths inches transverse section of articulating surface, and two inches in length. The height of the neural arch is one inch and three quarters, and two and one-half breadth of the floor of the arch. The spinous processes in all are incomplete. In all these four, the diaphophices or transverse processes spring from the sides of the neural arch, above the body of the vertebra, but each one a little lower down than the one preceding it. The ends of the processes show strongly marked articulating surfaces for the ribs.

Of the fourteen remaining, ten may be considered lumbar. The largest measures four inches long and three inches transverse diameter. They are all deficient in neural arch and transverse processes, but from a depression on the upper surface you can make out the floor of the arch. This in the largest one measured, measures only an inch and a half transverse diameter, whilst in others nearly of the same size, but lower down in the series, it

measures only half an inch. From studying, what of course must be a very broken series of the remains of transverse processes, we can make out a general principle, that as in the dorsal they spring lower and lower from the neural arch, so also in the lumbar, they spring lower and lower from the body of the vertebra until they become lower than the centre of the vertebra itself. Thus the neural arch with the spinal cord runs slightly oblique to, rather than parallel with, the line of transverse processes. Of the four remaining caudal vertebra, two only have a small process to mark the transverse process, but they all have a slight depression in the upper surface, making the floor of the neural arch, and chevrons from the lower surface. These chevrons though much decayed, have remains of a double process, projecting like two horns from the anterior articulating surface of the vertebra, into which, evidently, a single process from the posterior articulating surface of the vertebra next preceding it had fitted. The smallest caudal vertebra measured one and one-half inches in length, with the long diameter two and one-half inches. There were many fragments of bones composing the base of the skull, with marks of sutures, a petrous portion of the bones of the ear, and about one-half of the right jaw, the latter well preserved.

This fragment measured three and one-half inches in length and two inches in depth. There were three large neural foramena and the symphasis showed that it was blunt or round, and that there were small teeth about half way down the jaw from it. There are a few fragments of spinous processes which show that at their anterior roots were processes pointing forward. A fragment of the sternum remains, nine inches long, irregularly triangular, and having on its left side very deep marks of articulation with the ribs. It is slightly convex on its external surface, and slightly concave on its internal surfaces, and was evidently much longer. The fragments of both scapulas remain. They are unevenly convex on the external, unevenly concave on the internal side, but very flat, with no spinal ridge. The acromion and coracoid processes are well developed, but upon the same plane as the large humeral articulating surface. From the fragments, it seemed that it had resembled a pole-axe, the head being the cavity for the humerus. The humerus is very com-

plete, with the head large, the shaft short and thick, and the muscular marks and processes very bold. It has two articulating surfaces at the lower end for the ulna and radius. Its length was four and one-half inches, and breadth at the head two and one-half. A very perfect radius, broad and flat, with a convex anterior, concave posterior edge, and two articulating surfaces at its lower extremity, length four inches, breadth one inch and a half,—a fragment barely enough to show it to have been an ulna, its olecranon gone, and one small phalanx completed the bones of the upper extremity. Of the very numerous fragments of ribs, but two or three remain so entire as to show their original shape. Their articulating surfaces both vertebral and sternal are large, an appearance of neck longer or shorter is in all, and whilst one of the shortest or sternal measures nine inches, the largest or abdominal with a very flattened extremity measures two feet.

From comparing these bones with recent specimens of Cetæ both Delphinus and Phocenæ, in the Halifax Museum, and with the excellent plates of B. Musculus, by Dr. Dwight, Boston Natural History Society, there can be no doubt that they are the remains of a small Cetacean. The fragment of the lower jaw so exactly resembles the cut in Dana's Geology of Beluga Vermontana, as to hazard the conjecture that they are closely allied, if not identical, with its remains found also in the same deposit but many miles distant. We also notice the want of parallelism between the line of spinal cord, and that of the diapophises, which is shared also by a recent skeleton of a Delphinus in Halifax Museum,—the process projecting forward from the root of the spinous process, which also obtains in the recent Delphinus where it anchyloses with the preceding spinous process—the peculiar articulation of the chevrons and the want of spinal ridge in the scapula, this ridge first appearing in the Dudongs or herbivorous Cetæ, which, singularly enough, has pectoral mammæ instead of abdominal, and in suckling clasps its young to its bosom.

Of the age of these bones as they were found in the Champlain clay deposit, or that period when the river terraces were formed, we may infer that he had lived and died in some ancient ocean, from which the present ocean level has receded, or its bed has

been elevated, and then the sands and gravels and clays of the terraces heaped above his remains,—that he was a fossil, unchanged and undisturbed, centuries perhaps before the Mastodons and Mammoths, whose bones were found in the peat deposits of N. America, including the tooth and thigh bone found in Cape Breton, which has been referred by Geologists to the later genus, had begun their existence.

Art. XI.—Agriculture allied to Chemistry. By A. P. Reid, M. D., L. R. C. S., Edin., &c.

(*Read before the Institute Dec.* 9, 1873.)

In taking up this subject, I do not expect to give anything new, or broach any form of theory, but rather to give a resumé of the previous and present ideas that to a great extent rule with those who have paid most attention to the scientific cultivation of the soil.

Previous to the present century these sciences were held to have but few links in common, the authorities in either, with few exceptions, did not trespass their imaginary boundary line. Even Sir Humphrey Davy in his lectures on the "Elements of Agricultural Chemistry," (1802–1812), did but shew that there was a relation between the *science* of Chemistry and the *art* of Agriculture.

Strange to say Boussingault, in 1836, after long study, experience and observation, came to the conclusion that the value of manure was to a great extent indicated by the amount of nitrogen and ammonia it contained—a theory that was rudely shaken to the winds by the accomplished Liebig; but it has again asserted itself, and is not likely to be displaced, for experience has proved the security of its foundation, and the accuracy of the study and observations of its founder.

In 1840 Liebig propounded a most comprehensive, clear and definite theory of plant nutrition that took the agricultural world by storm and ruled for years, but it vanished, and was even given up by its illustrious founder, long ere his late decease. I will very briefly run over its landmarks, for it had much to do with the extended and accurate observations of the past thirty years.