We see also in the bat that nature compensates for the great weight which results from the marrow of the bones, in opposition to air, by the strength of the muscles which move the wings, and by the magnitude of the wings themselves.

Sec. IV. However it may be, I was much gratified when I perceived that the primary feathers of the eagle are hollow up to the end. I have noticed the same thing in the primary feathers of the heron and of the spoonbill ; and there is room to believe that this is also the case in many other birds.

An observation which seems to me worthy of naturalists, would be to know how the air finds its way into the feathers and penetrates into the stalks of the feathers of all birds? How then does it come into the quills of the porcupine, etc.? It is certain that there are no air-ducts which go there from the chest. In what way can this then be brought about? It is probable that it is the blood-vessels which take the air there; the same as we see that the plants carry the air into their air-ducts. Let this be as it may, it appears that nature has intended to make a mystery of this admirable peculiarity ; and notwithstanding that the celebrated Poupart [1] has made some attempts in order to discover the mechanism of it, and that Perrault speaks [2] of it in his description of the ostrich, all the other naturalists have kept silence upon this important and obscure point.

ART. VII.—NOTES ON NOVA SCOTIAN MINERALOGY. BY HENRY LOUIS, ESQ., ASSOC. R. S. M., LONDONDERRY MINES, N. S.

(Read May 13.)

THE extensive development in Nova Scotia of the palæozoic formations, the metamorphism which they have undergone, their frequent and excessive dislocations and contortions, together with the physical features of the country, all combine to render this Province peculiarly attractive as a field for mineralogical research. For, whilst violent volcanic and metamorphic agencies

1. Hist. de l'Acad. royale des sciences, année 1699, p. 56 in 8vo.
2. Mém. pour servir á l'hist. nat. des anim, part II., page 272.

have promoted the development, in the various strata, of many rare and beautiful minerals, the numerous valleys, the result of long continued glacial action, intersecting the country in all directions, render even the lowest strata readily accessible, and permit us to examine their rich and varied mineral deposits with facility.

For my own part, I find an especial source of interest in the wide differences that exist between Nova Scotian and English minerals, both as to character and modes of occurrence, and have thus been led to devote some little time to their study; having during the past year met with a few minerals which appeared, either on account of their variety or of some peculiar characteristic, to merit a careful examination, I now venture to lay before the Institute a short account of some of the results obtained.

1.—Having lately had the opportunity of visiting the well known copper mines at New Annan, I noticed several nodules of covelline while examining the heaps of material that have been extracted from the workings on the left bank of French River, where the nodule bed has been driven upon for some little distance. These nodules are for the most part very small, and some of them, but not all, differ from the nodules of vitreous copper ore (the principal ore in the nodule bed), in not being coated with carbonate of copper. The mineral exhibits all the usual physical characteristics of covelline; the fracture is crypto-crystalline or earthy, the lustre sub-metallic or dull, the colour dark indigo blue, and the streak black; the hardness is about 2, some of the specimens being somewhat friable, the specific gravity is 4.388. The following is an analysis of one of the most characteristic specimens:

Copper	64.11
Sulphur	25.64
Ferric Oxide and Alumina	3.89
Insoluble matter	5.78
Manganese, Lime, Magn., &c,.	traces
	99.42

The empirical formula deduced from this analysis is Cu_5, S_4;

Disregarding the insoluble matter, which appears to be due to an admixture of sand or shale, and is evidently an accidental constituent, the empirical formula given by the analysis, is Fe_3, Cu_2, S_6. This formula demands the following per-centage composition:

Iron	33.34
Copper	26.08
Sulphur	39.43
	100.00

The per-centage composition, as deduced from the determinaations of the three principal elements is:

Iron	33.34
Copper	26.37
Sulphur	40.29
	100.00

The correspondence between these two per-centages is, I think, sufficiently close to justify the empirical formula which I have assigned to the mineral. The constitutional formula corresponding to it is probably $Fe\,S_2 + Fe_2\,Cu_2\,S_4$ (iron and copper pyrites). This mineral approaches more nearly to Cubanite than to any other that I am acquainted with, both as regards its physical characters and its chemical composition. Dana gives the specific gravity of Cubanite as varying from 4026 to 418, its hardness as 4, and its formula as $Fe_4\,Cu_2\,S_8$, or $_2\,Fe\,S_2 + Fe_2\,Cu_2\,S_4$ so that the New Annan mineral differs from Cubanite in containing one equivalent less of iron pyrites. Although the New Annan mineral is thus not quite identical with Cubanite, and certainly appears to have a well defined composition, yet it would be extremely hazardous to attempt to found a new mineral species upon a specimen which shews no crystalline structure and contains as much as 20 p. c. of extraneous matter. It is of course possible that the mineral may merely be a mixture of sand, iron pyrites and copper pyrites, but it is hardly probable that in a purely accidental mixture the iron and copper pyrites should occur in such exact molecular equivalents. It is to be hoped that further explorations may bring to light purer specimens of this mineral.

3.—Mr. Henry S. Poole, in his Mining Report for 1876, mentions that he found in the Martin's Brook Mines, at Londonderry, a delicate fibrous mineral encrusting some of the Iron ores, which mineral was determined by Prof. How to be manganite. These incrustations occur principally in the upper levels of the mine, in bunches of very dark ore, some of which yielded on analysis as much as 14 p. c. of manganese; a great deal of this ore is of a vescicular structure, containing in some of its cavities little masses of a manganiferous mineral, varying from the size of a small pea up to that of a hazel nut; * this mineral is probably identical, in composition and origin, with the encrusting films before mentioned. It is of a light spongy texture, sometimes obscurely fibrous, has a black or iron-grey colour, semi-metallic lustre and black streak; it is friable and very soft; its hardness being less than 2; some of the masses contain a minute kernel of brown iron ore. The following is an analysis of this mineral:

Insoluble matter	4.08
Water of hydration	9.63
Manganic dioxide	67.10
Manganous oxide	10.67
Cupric oxide	0.88
Ferrous oxide	4.09
Nickelous and Cobaltous oxide.	0.65
Lime	2.49
Magnesia	trace.
Alumina (with a trace of soluble silica)	0.67
	100.26

The simplest formula that can be deduced from this composition is $3\ Mn\ O_2\ RO + 2\ H_2O$. where R O represents all the protoxides, namely, Mn O, Cu O, Fe O, Co O, NO, Ca O. Judging from its physical characteristics, this mineral must

* Since this paper was read, a magnificent bunch of this mineral has been found, showing a fibrous structure four inches in depth, somewhat resembling one of the forms of limonite or the familiar tree fungus.

evidently be classed as a Wad, although the formula which I have obtained for it does not correspond with that given by Dana for Wad; however in so indefinite a mineral species much variation in chemical composition is naturally to be expected. This mineral is probably produced by the decomposition of the Iron ore, for it has exactly the composition that would be obtained by removing all the hydrated peroxide of Iron from a very large body of ore, so that the residue would contain all the impurities originally present in the whole mass, and in something like the same relative proportions; for while the Londonderry Iron ores always contain a decided percentage of Manganese, they only contain minute and quite inestimable traces of Copper, Nickel and Cobalt. The physical characters, both of the mineral and of the surrounding ore, undoubtedly give considerable support to this view, for their open and spongy texture readily permits the percolation of water, by means of which the iron might be removed.

4.—The last mineral on my list, to which I wish to call your attention, is Native Sulphur. This mineral occurs in a gypsum quarry, situated about two miles to the west of Johnston's road station on the Intercolonial Railway. The gypsum, as usual, overlies a bed of limestone; the lower layers of it are white, moderately hard, and contain some anhydrite; the upper layers are softer, of a blackish or grey colour in places, and contain numerous loosely embedded, much shattered crystals of native sulphur, the largest of which does not exceed ¼ inch in length. The mode of occurrence of this mineral gives considerable support to the theory that these deposits of gypsum are due to the action of sulphuric acid upon the limestones, the sulphuric acid being of volcanic origin; under such circumstances, it is highly probable that the same stream that conveyed the sulphuric acid, would also carry down with it shattered crystals of sulphur, which would then be deposited amongst the gypsum, which the acid water was producing.

The percentage of sulphur in the rock appears to be small, but as I was unable to make more than a very hasty and imperfect examination of the deposit, I can form no opinion as to the probable economic importance or extent of the sulphur bearing rocks.