LES CONDITIONS CI-DESSOUS RÉGISSENT L'UTILISATION DU PRÉSENT DOCUMENT.

Votre utilisation de ce document de la Commission géologique de l'Ontario (le « contenu ») est régie par les conditions décrites sur cette page (« conditions d'utilisation »). En téléchargeant ce contenu, vous (l'« utilisateur ») signifiez que vous avez accepté d'être lié par les présentes conditions d'utilisation.

Contenu : Ce contenu est offert en l'état comme service public par le *ministère du Développement du Nord et des Mines* (MDNM) de la province de l'Ontario. Les recommandations et les opinions exprimées dans le contenu sont celles de l'auteur ou des auteurs et ne doivent pas être interprétées comme des énoncés officiels de politique gouvernementale. Vous êtes entièrement responsable de l'utilisation que vous en faites. Le contenu ne constitue pas une source fiable de conseils juridiques et ne peut en aucun cas faire autorité dans votre situation particulière. Les utilisateurs sont tenus de vérifier l'exactitude et l'applicabilité de tout contenu avant de l'utiliser. Le MDNM n'offre aucune garantie expresse ou implicite relativement à la mise à jour, à l'exactitude, à l'intégralité ou à la fiabilité du contenu. Le MDNM ne peut être tenu responsable de tout dommage, quelle qu'en soit la cause, résultant directement ou indirectement de l'utilisation du contenu. Le MDNM n'assume aucune responsabilité légale de quelque nature que ce soit en ce qui a trait au contenu.

Liens vers d'autres sites Web : Ce contenu peut comporter des liens vers des sites Web qui ne sont pas exploités par le MDNM. Certains de ces sites pourraient ne pas être offerts en français. Le MDNM se dégage de toute responsabilité quant à la sûreté, à l'exactitude ou à la disponibilité des sites Web ainsi reliés ou à l'information qu'ils contiennent. La responsabilité des sites Web ainsi reliés, de leur exploitation et de leur contenu incombe à la personne ou à l'entité pour lesquelles ils ont été créés ou sont entretenus (le « propriétaire »). Votre utilisation de ces sites Web ainsi que votre droit d'utiliser ou de reproduire leur contenu sont assujettis aux conditions d'utilisation propres à chacun de ces sites. Tout commentaire ou toute question concernant l'un de ces sites doivent être adressés au propriétaire du site.

Droits d'auteur : Le contenu est protégé par les lois canadiennes et internationales sur la propriété intellectuelle. Sauf indication contraire, les droits d'auteurs appartiennent à l'Imprimeur de la Reine pour l'Ontario.
Nous recommandons de faire paraître ainsi toute référence au contenu : nom de famille de l'auteur, initiales, année de publication, titre du document, Commission géologique de l'Ontario, série et numéro de publication, nombre de pages.

Utilisation et reproduction du contenu : Le contenu ne peut être utilisé et reproduit qu'en conformité avec les lois sur la propriété intellectuelle applicables. L'utilisation de courts extraits du contenu à des fins *non commerciales* est autorisé, à condition de faire une mention de source appropriée reconnaissant les droits d'auteurs de la Couronne. Toute reproduction importante du contenu ou toute utilisation, en tout ou en partie, du contenu à des fins *commerciales* est interdite sans l'autorisation écrite préalable du MDNM. Une reproduction jugée importante comprend la reproduction de toute illustration ou figure comme les graphiques, les diagrammes, les cartes, etc. L'utilisation commerciale comprend la distribution du contenu à des fins commerciales, la reproduction de copies multiples du contenu à des fins commerciales ou non, l'utilisation du contenu dans des publications commerciales et la création de produits à valeur ajoutée à l'aide du contenu.

Renseignements :

POUR PLUS DE RENSEIGNEMENTS SUR	VEUILLEZ VOUS ADRESSER À :	PAR TÉLÉPHONE :	PAR COURRIEL :
la reproduction du contenu	Services de publication du MDNM	Local : (705) 670-5691 Numéro sans frais : 1 888 415-9845, poste 5691 (au Canada et aux États-Unis)	Pubsales@ndm.gov.on.ca
l'achat des publications du MDNM	Vente de publications du MDNM	Local : (705) 670-5691 Numéro sans frais : 1 888 415-9845, poste 5691 (au Canada et aux États-Unis)	Pubsales@ndm.gov.on.ca
les droits d'auteurs de la Couronne	Imprimeur de la Reine	Local : 416 326-2678 Numéro sans frais : 1 800 668-9938 (au Canada et aux États-Unis)	Copyright@gov.on.ca

ANTHRACITIC CARBON OR ANTHRAXOLITE.

BULLETIN NO. 2

OF THE BUREAU OF MINES.

A REPORT BY

PROF. A. P. COLEMAN, PH.D.

PUBLISHED BY AUTHORITY OF HON. J. M. GIBSON, COMMISSIONER OF CROWN LANDS FOR THE PROVINCE OF ONTARIO.

TORONTO, NOVEMBER, 1896.

PRINTED BY WARWICK BRO'S & RUTTER, TORONTO.

ANTHRACITIC CARBON OR ANTHRAXOLITE.

On June 16 last Mr. C. H. Collings of Chelmsford, in the district of Algoma East, reported to the Bureau of Mines that he had found in the township of Balfour a seam of coal of the "smokeless" variety, ten feet in width; and having heard that an offer was made by the Ontario Government for discovery of coal, he wished to know if this was the case. He was answered on the 18th that no reward of the kind was offered by the Government, but was assured that if the discovery was a real one, and if the coal existed in workable quantities, the market for the product would be ample compensation. "The finding of coal in Balfour in large quantity," he was told, "whether of smokeless or any other variety, would be an extraordinary occurrence, and would make the reputation as well as the fortune of an explorer." Mr. Collings was asked to send to the Bureau a sample of the article by express. A box containing a few pounds was received on the 26th, and a hasty examination of the mineral was made by Prof. Coleman, who was leaving next day for the gold fields of the Rainy River district. He found the specific gravity to be 1.843, or higher a little than any anthracite mentioned in Dana, and the hardness also somewhat too high. "It is probably an earthy graphitic anthracite," he stated; but advised that a sample should be supplied to Dr. Ellis of the School of Practical Science for analysis, when the exact character might be determined. It was arranged that the Professor should visit the property upon his return from the Rainy River country. On the 27th a specimen was sent to Dr. Ellis, and one also to Dr. George M. Dawson at Ottawa, Director of the Geological Survey. On the 29th Dr. Dawson wrote me the following descriptive note: "The mineral appears to be that called anthraxolite by Prof. Chapman, viz, an inspissated bitumen passing by further metamorphism into anthracitic carbon. This of course occurs in veins cutting the formation, or in little pockets in which bituminous matter has collected. Occurrences of it have frequently given rise to reports of coal near Quebec, and it has also been found in Cambrian rocks in Labrador, Hudson Bay, and near Port Arthur. I have asked Dr. Hoffman to make some examination of the mineral, and will advise you of the result." On July 2 Dr. Dawson sent on the report of Dr. Hoffman, analyst and chemist of the Survey, who described the mineral as consisting of an association of what is designated as anthraxolite and quartz, "the latter constituting 55.95 per cent. by weight of the whole." In commenting on the amount of ash in this case Dr. Dawson properly observed that it "renders the material entirely useless as fuel, even if present in sufficiently large quantity." These results were communicated to Mr. Collings, and at a later date to Prof. Coleman at Rat Portage. Dr. Coleman's work in the field was prolonged beyond the usual time; and partly for this reason, but chiefly because the reports of Dr. Dawson and Dr. Hoffman appeared to settle the question of the economic value of the mineral, he did not visit the property when returning home, as had at

first been planned. But owing to the discussion in the newspapers and elsewhere as to the character of the mineral and its practical value as an article of fuel, it seemed to be necessary that a further and more complete enquiry should be made, and the work was entrusted to Prof. Coleman, whose report is attached. The analysis made by Dr. Ellis was only finished recently, and it is given in Dr. Coleman's paper. The samples supplied to Dr. Hoffman and Dr. Ellis were from the same lot; yet the difference in ash as shown by the two analyses is large, and indicates the variant composition of the mineral. Other analyses which have been published show even greater differences than these, and as so much depends upon selection—for fragments of the mineral are almost pure carbon—it may be well to suggest to the owners of the property that they should have a test conducted upon a commercial scale. Let a ton or a few tons be provided and tried in the forge and under the boiler, and the question of its value as a fuel may be quickly and finally determined. The question of quantity will obviously take a longer time.

Office of the
Bureau of Mines,
Toronto, November 7, 1896.

ARCHIBALD BLUE,
Director.

PROFESSOR COLEMAN'S REPORT.

MR. ARCHIBALD BLUE, DIRECTOR OF THE BUREAU OF MINES:

SIR,—As instructed, I have examined the supposed coal deposit in Balfour township west of Sudbury, and find it one of much interest. The deposit occurs on lot 10, concession 1, about seventeen miles west of Sudbury, five miles southwest of Chelmsford, and a mile and a quarter south of the nearest point on the Canadian Pacific Railway. It is on the property of Messrs. J. R. Gordon of Sudbury and J. M. Clark of Toronto; and I have to thank the former gentleman for serving as guide to the property and for providing a conveyance from Sudbury to the spot and back.

The coaly material occurs as an irregular vein in black fissile slate, mapped by Dr. Bell as Cambrian. The vein runs about north and south up a somewhat steep rocky hill, turns a little to the east on the hill top and pinches out. Towards the south the lower end of the vein is buried under the boulder clay which covers the valley. The length of the vein exposed is about seventy feet, but further excavation may show that it continues south beneath the boulder clay. In width the coaly matter measures at its widest part twelve feet, but, allowing for the dip, its real thickness is probably six to nine feet as estimated by Mr Gordon.

The coaly material does not form a bed as in a true coal seam, but cuts across the slate, which has a strike of about 60° east of north. The slate walls show a dip running from nearly vertical to 55° towards the east; and they are somewhat irregular and broken, fragments several feet long lying at one point as "horses" in the coaly material.

Up to the present very little work has been done on the property, the only excavation being a pit three or four feet deep, so that there are no data to determine the depth of the deposit.

The pure mineral is lustrous black, resembles anthracite or albertite in appearance, and forms small plates or irregular cubic blocks, the largest observed being three-quarters of an inch square. Between the plates or cubes there is generally more or less quartz, and in some weathered portions on the surface the quartz remains as a porous, cellular mass. The quartz varies much in amount, specimens from the bottom of the small pit containing less than those from the surface. The only other important mineral present is iron pyrites, which is scattered through parts of the vein, accounting for the sulphur found in some analyses of the material.

During my visit some of the coaly substance was heaped over a bed of kindling wood on a blacksmith's forge and after some minutes blowing burned with a short, reddish flame, glowed strongly, and gave out a good heat, said to be quite sufficient for working steel. There was some smell of sulphur from the flame, and a large amount of porous reddish ash remained after the fire had gone out.

In order to determine the character of this interesting material an analysis was made in Dr. Ellis' laboratory in the School of Science, with the following results:

	Per cent.
Hygroscopic moisture	2.67
Volatile organic matter	4.78
Fixed carbon	55.85
Sulphur	1.06
Ash	36.50
Total	100.86

A select specimen of the pure mineral when burnt gave only 4.10 per cent. of ash. As the specimen analysed came from the surface of the deposit, it seemed probable that the amount of ash might be above the average. On this account assays were made of a general sample of the specimens taken by myself and of a picked sample representing good material from the bottom of the pit. The results are as follows:

	Average sample.	Best sample.
Volatile matter (including four per cent. of moisture)	5.3	5.3
Fixed carbon (coke)	64.7	74.2
Ash	30.0	20.5
Total	100.0	100.0
Specific gravity	2.0784	1.8708

It will be seen that the results of the different analyses vary greatly in the amount of ash, which is less in the sample from the bottom of the pit than in those from nearer the surface.

For the sake of comparison some analyses of anthracite, or hard coal, may be given. The first is of coal used in the Waterworks, Toronto:

Moisture	3.60
Volatile organic matter	6.85
Fixed carbon	80.79
Ash	8.76
	100.00

The analysis was made in Dr. Ellis' laboratory, School of Science.

The following table, showing analyses of various anthracites, is taken from Percy's Metallurgy (Fuel), p. 331 :

Locality.	Sp. gr.	Composition, per cent., exclusive of water.					
		C.	H.	O.	N.	S.	Ash.
South Wales, Near Swansea ..	1.348	92.56	3.33	2.53	.....	.....	1.58
South Wales	1.392	90.39	3.28	2.98	0.83	0.91	1.61
South Wales, Vale of Neath ..	.....	87.02	3.14	2.16	0.90	0.67	6.11
Pennsylvania	1.462	90.45	2.43	2.45	..	.....	4.67
"	.....	92.59	2.63	1.61	0.92	.....	2.25
"	.....	84.98	2.45	1.15	1.22	.....	10.20

The first sample of Pennsylvania coal is from Pottsville, the second from Lehigh Summit, and the third from Mauch Chunk.

It will be seen that the coaly substance from Balfour township has considerable resemblance to anthracite, the main difference being in the large amount of ash. If the pure specimen previously mentioned, which gave only 4.10 per cent. of ash, had been analysed it is probable that the resemblance in composition would have been close. Nevertheless it is better to give this substance a distinct name. Anthracite is found in beds associated with rocks containing carboniferous or later fossils, and is held by geologists to have been deposited as vegetable matter where it is now found ; but the mineral here discussed occupies a vein cutting very ancient slates, and must have reached its present position long after these rocks were formed.

Years ago Prof. Chapman of Toronto University examined specimens of similar material and named the substance anthraxolite. He describes it as—

" Black, lustrous, resembling anthracite in general characters, but very brittle. Hardness, 2.25–2.5 ; specific gravity, 1.35–1.55. Generally decrepitates when heated. Before the blowpipe a small fragment loses its lustre, but exhibits no further change. Composition, essentially carbon, with from 3 to 25 per cent. of volatile matter, including a small amount of moisture. The ash as at present observed varies from nothing to 10 or 11 per cent. When present it exhibits under the microscope no trace of organic structure. This substance, in all probability a product of alteration from petroleum or asphalt, occurs in narrow veins in rocks of various kinds, and in small masses and thin layers or coatings in strata of the Utica and other formations. Occasionally also it is found in the interior of orthoceratites and other fossil shells. As it differs essentially by these conditions of occurrence from anthracite proper, the name anthraxolite has been given to it, but simply as a convenient term for present use. It occurs in narrow veins, associated with quartz amongst the altered strata of Lotbiniere, in the Eastern Townships ; and also in regularly banded veins

with quartz and iron pyrites on Thunder bay, lake Superior. . . . . The substance occurs likewise in narrow broken veins, or filling small cracks, *per se*, at Acton and other localities in the Eastern Townships, as well as on the island of Orleans, at Beauport and Point Levis near Quebec, and elsewhere in the neighborhood of the latter city. The variable percentage of volatile matter (exclusive of moisture) is evidently due to the greater or less amount of alteration to which the original bituminous matter has been subjected."*

Besides the localities referred to by Prof. Chapman, examples of a similar mineral have been obtained from other points in Canada ; one very anthracitic-looking specimen in the School of Science collection comes from the Cambro-Silurian near Kingston.

It should be understood, of course, that the coals and related substances show wide variations. They are not sharply defined chemical compounds like most minerals ; and this fact makes it unwise to be dogmatic or over-precise in naming them.

Looked at from the economic side, it is probable that the anthraxolite from Balfour may have considerable value as a fuel for local use. Hard coal is sold in Sudbury for $9 per ton, and this fuel could be laid down in that town for less than half that amount. If it should prove to contain less ash than at present on sinking upon the deposit, the anthraxolite should have the ordinary uses of anthracite. It appears to be too fragile, however, for use in iron furnaces, which require a fuel capable of resisting a considerable crushing force, and the amount of quartz which it contains would necessitate an extra amount of flux, which would probably limit its usefulness for furnace purposes.

The amount of anthraxolite available can of course only be guessed at. If the vein goes down a hundred feet with its present area of about five hundred square feet, it would contain about 3,000 tons, and two hundred feet would of course double that amount.

It does not seem probable that the supply is very large as compared with that of coal regions, and it is likely to be worked out in a comparatively short time, as was the case with the somewhat similar vein of albertite in New Brunswick some years ago.

The source of the anthraxolite is probably to be looked for in bituminous matter contained in the adjoining beds of slate, which carry 6.8 per cent. of carbon. By metamorphic action most of the volatile matter has been removed from the once fluid or plastic bitumen, leaving the present cracked and quartz-cemented solid anthraxolite.

As to the age of the deposit, there is no evidence to show that the slates are later than Cambrian, as decided by Dr. Bell ; but it is evident that these slates must have been consolidated and fissured, probably also faulted, before the original bitumen flowed into its present position. In what geological age this took place, it would be rash to venture an opinion.

Other finds of a similar mineral are reported from the Sudbury region, and a very coal-like specimen was given me from Fairbank township, some miles southwest of the Balfour deposit. An assay showed, however, only 10.3 per cent. of carbon, so that if this is an average sample the material is worthless as a fuel.

A. P. COLEMAN.

School of Science, Nov. 7, 1896.

*Minerals and Geology of Ontario and Quebec, pp. 143-4.