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NOTE ON THE OCCURRENCE OF JADE IN
BRITISH COLUMBIA
AND ITS EMPLOYMENT BY THE NATIVES.

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WITH QUOTATIONS & EXTRACTS FROM A PAPER BY PROF.
A. B. MEYER, ON NEPHRITE & ANALOGOUS
MINERALS FROM ALASKA.

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

PHYSICS 354

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From the Strait of Fuca northward along the entire coast of British Columbia and Alaska to the Arctic Sea, implements of jade or closely allied materials are found in considerable numbers, either in association with relics of various kinds, in shell-heaps and about old village sites, or in other cases still preserved, though scarcely now used, by the natives. Of implements which may collectively be designated as "adzes" or "celts;" those of jade form a considerable proportion of the whole. Jade is also found, in a similar manner, at least as far inland as the second mountain system of the Cordillera belt—that represented by the Gold, Cariboo and other ranges—and is notably abundant among specimens from Indian graves, etc., along the lower portions of the Fraser and Thompson Rivers, within the territory of the people of Selish stock. Elsewhere in the interior of the province, jade implements are rarer, a circumstance probably in part to be accounted for by the fact that adzes or adze-like tools have not been so much employed by the interior Indians as by those of the coast, who are pre-eminent as dexterous workers in wood, and noted for the size and superior construction of their wooden houses and canoes.

While jade was evidently a material highly prized and carefully hoarded, the aggregate quantity of this mineral in use by the Indians and Eskimo of the coast at any one time previous to the introduction of iron tools among these peoples, must have been very great—so great as to clearly indicate that its origin is proximately local, and to preclude a belief in the theory that it was obtained casually, or in the course of trade, from remote sources. The facts are indeed such as to fully bear out the autochthonous origin of this material, which has on several occasions been ably contended for by Prof. A. B. Meyer, of Dresden, whose

remarks on this point, bearing on this particular district, are quoted further on. In addition to the facts above stated, it may be added that the numerous jade implements which have been examined from different parts of the coast and from the Fraser valley, give evidence among themselves of local peculiarities of colour and texture.

Though much valued, I am not aware that there is any reason to believe that superstitious or sentimental feelings have been entertained respecting jade by the natives. In the absence of metals, its useful properties were alone sufficient to recommend it to their attention, as it is the best available non-metallic material from which to manufacture tools with permanent cutting edges. Its compactness in texture and toughness are very considerable, its hardness (6.5 to 7) greater than that of ordinary steel, and as great as is compatible with grinding down or sharpening with the only substance in the possession of the natives for that purpose—quartz or silicious rocks.

My attention has been specially drawn to the use of jade by the Indians, by the occurrence of two partly worked small boulders of that material on the lower part of the Fraser (at Lytton and Yale respectively), and the discovery in 1877, in old Indian graves near Lytton, of evidence that the manufacture of adzes had there been actually carried on. These facts seem to point to the valley of the lower Fraser or to that of its tributary, the Thompson, as one, at least, of the localities from which jade has been derived, though, so far as I am aware, it has not yet been found *in situ* in any part of British Columbia. The partly worked boulders to which allusion has been made, are more particularly described below. They resemble in shape and size the well rounded stones which are abundant in rough beaches along the more rapid parts of the Fraser River, and present a peculiarity in polish which is often found to characterize these stones, and which appears to be due to the action of the sand which is drifted by the wind along these beaches during periods of low water. All the circumstances, in fact, tend to show that they may have been picked up on the immediately adjacent banks of the river.

The term jade is here used in a somewhat general sense, as no exhaustive mineralogical examination of the various specimens has been attempted, though a typical piece of the Fraser River mineral from the vicinity of Lytton, which has been examined by Dr. B. J. Harrington, proves to be a true nephrite, and other analyses of specimens from the same region render it probable that most, if not all the jade there found, is referable to the same species. The implements here collectively classed as jade all have, however, the characteristic lustre, texture and fracture of that mineral, and a mineralogical hardness of between 6 and 7. The colours represented are very varied, as the subjoined enumeration will show, and several more or less blended tints often occur in the same specimen. The implements and fragments here particularly referred to, are those derived from the region above defined, which are in the museum of the Geological Survey of Canada, or deposited in the Peter Redpath museum of McGill College, in Montreal. The stones of a pale gray or whitish colour, of which the examples occur in the collection of Mr. F. Mercier, in the first named museum, are all from the northern part of Alaska, and are with little doubt to be classed as pectolite, as stated by Professor Meyer in passages subsequently quoted.

The specimens referred to, classified according to colour, arrange themselves as below:—

Grey-greens to greenish greys, pale and dark, generally streaked or mottled; translucent to sub-translucent and opaque.....	23
Dark greens, varying from leek-green to sap-green, and generally translucent.....	15
Browns, shading to greenish and greyish, generally streaked, opaque.....	7
Pale bluish and yellowish greens, translucent....	6
Greyish-blue and bluish-grey, translucent (probably pectolite).....	6
Green and grey, and green and black, mottled.....	4
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The same series of specimens, classified according to form and use, show the following proportions:—

Adzes.....	44
Drill-points or borers (all from Alaska).....	6
Cut boulders.....	2

Sockets for fire-drills (both from Alaska).....	2
Mallets (both from Alaska, and probably pectolite) ...	2
Fragments	2
Spear head (?)	1
Burnisher or whetstone (from Alaska, and probably pectolite)	1
Pendant (from Alaska, and probably pectolite)	1

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Of the above specimens, sixty-one in number, seventeen show evidence, more or less distinct, of having been sawn in the manner subsequently noticed.

The chemical composition of jade is such as to show that it can scarcely be supposed to have originated from the usual materials of sedimentary rocks* by ordinary processes of metamorphism. The origin of a mineral of this kind must be sought among rocks immediately or proximally of eruptive origin, in connection with certain classes of which (as, for instance, minerals of the pyroxene group) it may reasonably be supposed to have arisen as an alteration product. This view appears to be borne out by an examination of the suites of specimens of which those here classed as jade form a part. Some of these specimens are perfectly homogenous and structureless to the eye, consisting apparently of pure translucent jade. Others are clouded or variegated in colour, more opaque, and becoming in some instances distinctly laminated. A few exhibit on polished surfaces, at right angles to the planes of lamination, a minutely lenticular structure, as though granules varying in composition or colour had been welded together by pressure acting in a single direction, in the manner frequently observed in fragmental volcanic rocks. One or two specimens, which though apparently forming terms of the same series with the jades, can scarcely be classed as such, are pretty evidently of fragmental origin, and have the appearance of altered volcanic ashes or sand. None of the examples show any definite evidence of having been vein-stones.

If it be admitted that jade has resulted from the alteration

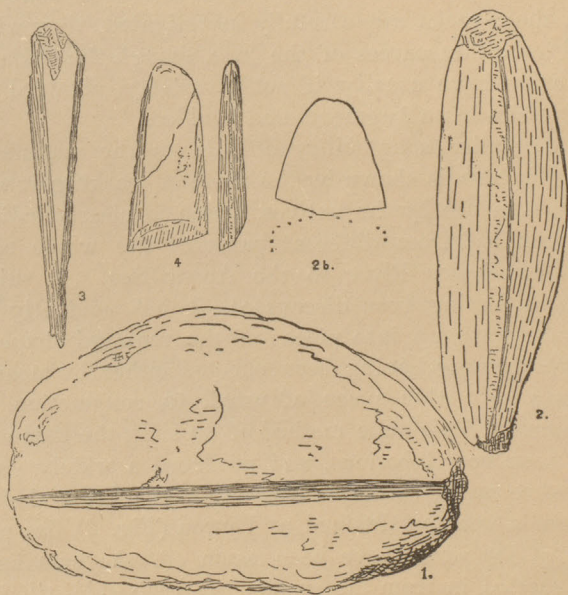
* It seems reasonable to exclude from this class certain rocks occurring among the older crystalline schists, the material of which has very possibly been originally volcanic.

of minerals or materials of eruptive origin, the important part which volcanic rocks play in the portion of the Cordillera belt which is included in British Columbia, and the great amount of alteration which some of these have suffered, go far to explain the abundance of jade implements among the natives of the same region, while the great continuity of identical geological conditions in a direction parallel to the coast, may well go hand in hand with the abundance of jade implements actually occurring along the same line. In the province of British Columbia, we find volcanic rocks forming considerable portions of at least five distinct geological systems, viz., the Cambrian, Carboniferous, Triassic, Cretaceous and Miocene. Of these, the first and last may be excluded from consideration; the Cambrian as not yet recognised in the districts in which jade tools are found, the Miocene as being in general, if not in all cases, in a nearly unaltered state. It is among the highly altered and recomposed volcanic rocks of the Carboniferous and Triassic, that silicates of the jade class might be expected to occur; and I feel little doubt that when these rocks are carefully investigated, they will be found to be the sources of the jade, though the Indians of the region have usually, if not invariably, obtained their supply from loose fragments and boulders.

The peculiar adaptability of jade to the manufacture of implements is shown by the mode of working it which has been in use by the natives, which is clearly indicated by specimens from different parts of the whole region from the Fraser River to the Arctic Sea. A suitable fragment having been discovered, it has evidently been carefully sawn up into pieces of the required shape and size, the sawing having been effected either by means of a thong or a thin piece of wood, in conjunction with sharp sand. This rude method of dividing the stone must have been very laborious, and produced a widely gaping cut before any great depth was obtained. From the fragment of a boulder obtained at Lytton (Fig. 2) flat pieces intended for adzes have been sawn off, the cuts having been carried in from the surface, on each side, till it became possible at length to break the central rib by whic

the piece to be detached was still united to the main mass. The boulder from Yale (Fig. 1) shows the same process in an earlier stage, though deep cuts have been made on both sides of the stone, one of which is shown in the illustration. Several of the adzes or chisels show that the same method of sawing was adopted to trim off the edges of the flat pieces first obtained, and to render them parallel sided. Pieces thus cut from the edges of adzes are represented among specimens from graves near Lytton. Figure 3 represents a selvage piece of this kind, which has been sawn through on two sides. Figure 4, presents front and side views of a small adze from the same place, the edge still showing the median rib between two opposite saw-cuts, which has not been ground of.

Having been thus roughly blocked out by sawing, the surfaces of the adze were next generally ground flat. In the more finely worked specimens, this subsequent grinding has almost or altogether obliterated the original shaping furrows, and the surfaces have eventually been well polished.



(All the figures one-fourth actual size.)

Description of Figures.

- Fig. 1. Partially cut boulder of brownish, opaque jade, found in an excavation at Yale by Mr. T. Eales.
- Fig. 2. Portion of a boulder of green, mottled, sub-translucent jade obtained from the Indians at Lytton by Rev. Mr. Good. The figure shows the surfaces of two deep sawn-cuts, with a rough intervening projection where the stone has eventually been broken.
- Fig. 2b. Section of the same specimen at right angles to the last, showing depth and gaping character of the saw-cuts.
- Fig. 3. Selvage piece, probably cut from the edge of an adze, ground flat on two sides, and sawn from back and front at both edges. Pale green translucent jade from old Indian graves near Lytton.
- Fig. 4. Front and edge views of a small adze, showing saw-cuts from front and back nearly meeting, and a narrow intervening broken rib. Jade nearly identical in appearance with the last, and from the same place.

EXTRACTS FROM A PAPER BY PROF. A. B. MEYER, ON NEPHRITE
AND ANALOGOUS MINERALS FROM ALASKA.

[*Über Nephrit und ähnliches Material aus Alaska. Jahresbericht (xxi) des Vereins für Erdkunde zu Dresden, 1884.*]

"The hypothesis has been contended for, principally by Prof. Heinrich Fischer of Freiburg in Baden, and has even recently maintained, that the rough material for the nephrite and jadeite implements which have been found throughout America, is of Asiatic origin. I opposed that hypothesis in my work, 'Jadite und Nephrit-Objecte,' (1882-83) and in my essay, 'Die Nephritfrage, kein ethnologisches Problem,' (1882-83), taking for my ground general arguments which, however, forced irresistible conclusions upon me, and in particular I had, by induction, become convinced of the presence, in America, of the required rough material.

"Meanwhile, sooner than I could have expected, the discoveries of later travellers have brought to light facts which establish the occurrence of rough nephrite at least, in North-west America; consequently, the theory of importation of *this* material falls to the ground, as far as it refers to impor-

tation into America, and it will be the same as to American jadeite. It is also autochthonous. This might, in advance, be confidently asserted; how much more so now that the rough nephrite has been discovered.

"It was, indeed, long a matter of doubt, whether there occurred in America any nephrite implements, or whether all the so-called mineral from that continent was not jadeite. Both Prof. A. Arzruni, of Breslau, (*Zeitschrift für Ethnologie*, 1883, p. 172), and myself, arrived at the conclusion that there had not yet been produced any positive proof of the occurrence of nephrite in America. Since that date, Prof. Arzruni has been able to declare, with certainty, after microscopic examinations, that an axe from Venezuela was made of a nephrite of typical structure, (*Z. f. Eth., Ver.*, 1883, p. 528): 'It is the one in the Ethnological Museum in Berlin, from the Karsten collection, (1852), V. A. 25, on the catalogue.' Prof. Fischer had already made mention of this specimen in 1875 (*N. u. J.* p. 47, fig. 62), but could recognize it only as 'approaching a nephritoid composition.'

"I shall, therefore, be all the more justified in describing here two nephrite implements which Messrs. Arthur and Aurel Krause brought from the Thlinket Indians in south-east Alaska, and which in the 'Catalogue of the Ethnological Collection from the country of the Chukches and South-east Alaska,' by these two gentlemen (Supplement to part 4, Vol. V, of 'Deutschen Geographischen Blätter,' 1882) is thus described:—

No. 143. Small stone axe, named *tayéss*.*

No. 168. Battle-axe of nephrite, with wooden handle, named *ket-oo'*. The sharpened stone is called *tzoo-ūta*, the handle, *ā'-shak-tee*.

"The specimens belong to the Bremen Natural History collections and the director, Dr. Spengel, was so good as to trust them to me for examination, after Prof. Arzruni had kindly called my attention to their presence in this museum.

* This is probably Tai-i (Tye of Gibbs' vocabulary), a Chinook jargon word, meaning 'chief' or 'chief's,' commonly used to denote anything especially valuable or of superior quality.—G. M. D.

“ On p. 10, of the catalogue is appended the following remark: ‘ As to the origin of the stone weapons and utensils, the Thlinkets can give no other information but that they are very old.’ The specimens bear now the numbers 2303 and 2316.”

Prof. Meyer then proceeds to describe in detail the two implements above referred to. The colours of the first (No. 2303) are said to be, by Radde's scale, grass-green, yellow-green, and yellow-green-grey; the specific gravity 2.96. The second and larger implement (No. 2316) is grass-green, yellow-green-grey, and green-grey; the specific gravity, 2.92, and the hardness less than usual in nephrite, owing to an incipient decomposition, which is clearly apparent on microscopical examination. Under the microscope, the mineral is found to possess a very peculiar netted fibrous structure, which is minutely described by Prof. Arzruni. It is said to resemble closely a nephrite from the Kitoj River in Siberia.

An analysis by Dr. Frenzel of this specimen (No. 2316) shews it to be a nephrite, with large proportions of alumina and water. An analysis of a specimen from Point Barrow, also quoted, clearly resembles the last, but contains less alumina and water.

“ As already stated, nephrite axes which were known to come from North America, have been previously believed to have originally been derived from Asia; they were assumed to be the first stage of the supposed advance of nephrite eastward. Prof. Fischer was not the only one to contend for this view till even quite lately, as seen in particular in the XVth Vol. of ‘*Archiv. für Anthropologie*,’ (1884, p. 164); where it is said that a nephrite borer from the Mackenzie River agrees very well with the Siberian nephrite, and that it would therefore be difficult to prove that the rough material is of North American origin, a view which after the above communication is now indefensible. Nordenskiöld has also in his work ‘*The Voyage of the Vega*’ broken a lance for the same contention.* In the

* Prof. T. W. Putnam in a communication to the Massachusetts Historical Society in 1868 still maintains the probable Asiatic origin of jadeite objects found in Central America.

2nd vol. (1882), is represented a harpoon-point of bone and nephrite* from Port Clarence (about 65° N. latitude, north of Norton Sound), and he says: † ‘Among these (*i. e.* the ethnographical objects obtained in Port Clarence by barter), may be mentioned bone etchings and carvings and several arrow-heads and other tools of a species of nephrite so puzzlingly like the well known nephrite from High Asia, that I am disposed to believe that it actually comes originally from that locality. In such a case, the occurrence of nephrite at Bering Strait is important, because it cannot be explained in any other way than by supposing that the tribes living here have carried the mineral with them from their original home in High Asia, or that during the stone age of High Asia, a like extended commercial intercommunication took place between the wild races as now exists, or at least some decades ago existed, along the northern parts of Asia and America.’

“Already in my essay, ‘Die Nephritfrage, kein ethnologisches Problem’ (March 1883), I expressed the following view: ‘Nephrite implements, from the Aleutian Islands, and from the Eskimo on the American side of Bering Strait, may just as well have come from sources in the New World,’ and that without trusting ourselves to pass judgment in advance on the matter. In the meanwhile, Mr. Baird’s ‘rough material’ was discovered (Ausland, 1883, p.p. 456, 540, 580), though as we shall see farther on, it was not nephrite, but only a mineral exteriorly very similar to nephrite. Capt. J. A. Jacobsen, however, brought from Alaska, real rough nephrite, which seems to set the question at rest.

“Prof. Arzruni was so good as to place at my disposal, the following statement:—

“According to kind communications of Capt. Jacobsen, green nephrite is known to the Eskimo *in situ*, in the extreme north-west of Alaska. Capt. Jacobsen obtained a number of objects, made of this mineral, and also some

* Page 229, Fig. 3, of English translation, by A. Leslie, London, 1881.

† Page 236 of English translation.

rough pieces which he thought to be nephrite. Thanks to the courtesy of Mr. Bastian, I was enabled to examine, microscopically, splinters of this mineral. The worked object which furnished me splinters, is a chisel which Capt. Jacobsen obtained on Queen Charlotte Islands. In its microstructure this nephrite does not at all differ from that described above. According to Capt. Jacobsen, there are also objects of this green nephrite all over Vancouver Island and in the Chilkat territory on the continent.

After describing the colours of the objects, Prof. Arzruni continues:—"Capt. Jacobsen states that the rough stone is obtained at five days' journey inland. He did not visit the spot himself, though he knows the position of the rocks. The best of the extracted pieces are chosen for working. Only two Eskimo shamans know the locality, and keep it secret. Of the rough pieces obtained and supposed to be nephrite, two proved to be such, namely, numbers 407 and 409. No. 407 is described by Mr. E. Krause as a rolled pebble or boulder, which, by the whetting of knives, etc., on it, has been superficially ground, but not for the purpose of working it. A slice of this piece presented a microscopic appearance quite analogous to that of the slices from the two nephrite implements previously described. No. 409, on the contrary is, according to Mr. Krause, a small piece of nephrite, altogether untouched for the purpose of working. It agrees in all points with No. 407. It is of a beautiful green, semi-translucent, of a structure somewhat laminated, and with magnetite inclusions. It was found during Capt. Jacobsen's stay at Norton Bay, near St. Michael, at the Kwichpak mouth, about twenty miles north of the Yukon river, and is a rolled pebble. A quite similar structure is seen, according to Mr. Krause, in No. 408 of the collection, a boulder or rolled stone, which has been used in its natural shape as a whetstone, whereby it has been superficially smoothed. In reference to the absence of any other rough specimen, Capt. Jacobsen remarks that nephrite constitutes for these people their most valuable property, which they naturally do not allow to lie unutilised, any more than we ourselves our money, but

which they work up immediately they have obtained it from the shamans who quarry it in the mountain. Moreover, whether the pieces be rough, partly or altogether worked, does not affect the question of the actual occurrence of nephrite there in the country, for any one who will not acknowledge the fact of the occurrence, until it has been reported by an European eye-witness. Nobody will, any more than Capt. Jacobsen, doubt the correctness of the reiterated testimony of the natives, considering the large number of nephrite objects which are scattered in the whole district, and especially along the west coast and on the islands.' ”

“Henceforth the occurrence of rough nephrite in Alaska must be considered as established, and it is quite certain that it is also worked in the country itself. The nephrite comes neither in a rough nor in a wrought state from Asia; such a view cannot be any longer entertained. Capt. Jacobsen remarks also as against such hypotheses, that if Siberia were the place of origin, there would surely be found in the Chukches country larger quantities of rough and of worked specimens for transportation, but they are there scarcely known.

“In reference to the described nephrite chisel from Queen Charlotte Island, Mr. Arthur Krause called attention to the following passage in Dawson's report,—Geological Survey of Canada, 1878-79, p. 146 B—where, on the subject of the stone implements in the island, it is said:—‘The material of these tools appears to be a matter of indifference, as I have seen them made of hard, altered igneous rocks, like those so common in the country, of a hard, sandy argillite and of the peculiar greenish jade, which the natives of some other parts of the province prize so highly. This latter mineral is not, according to the Haida, found in the islands, but has occasionally been obtained in the course of trade.’

“After the discovery of rough nephrite in Alaska, there is no need of referring to Asia to account for the nephrite implements of North America, nor indeed any part of America, which besides, on general considerations, would never have been necessary.

“Mr. Arthur Krause further called the attention of Prof. Arzruni, to another passage on a rough mineral in North America,—respecting which, it indeed remains to ascertain whether the mineral is really nephrite. In Sir John Richardson’s work, published in 1851, ‘Arctic searching Expedition,’ we read (Vol. I., p. 312): ‘At a cascade in Rae River, ten miles above its mouth, walls from eight to twenty feet high, of bluish-grey quartz-rock, in thin layers, hem in the stream. . . . At this place, Mr. Rae discovered (1849) among the limestone and quartz-rock, layers of asparagus-stone or apatite, thin beds of soap-stone and some nephrite—or jade—a group of minerals which belong to primitive formations.’ The Rae River empties into Coronation Gulf, about 115° W. longitude, and 67½° N. latitude, and the Mackenzie River, the nephrite borer from which Prof. Fischer would not acknowledge to be of American origin (see above), flows half-way between the gulf just named and Cape Barrow.

“Mr. Virchow has lately (*Zeitschrift für Ethnologie*, 1883, p. 482) endeavoured to contest the belief as to the occurrence of nephrite in Alaska as follows: ‘Nothing could be more natural than that even Mexico and Central America should have been provided from the north-west coast, and there would be nothing surprising if, after the nephrite question has been seemingly altogether set at rest for America, the old way of the Toltecs were again suddenly proved to be the commercial path of nephrite.’ Herewith the transportation hypothesis which has fortunately been set aside as to commercial intercourse from continent to continent, is again taken up by Mr. Virchow, in reference to inter-regional trading in America, a view against which I not only entertain the gravest doubts, but hold to be undefensible, for it will be found there are in America quite as many different localities yielding nephrite (and jadeite) as have already been recognized for Asia and for Europe. I propose shortly to develop the last point. A number of well known general considerations are opposed to Vichrow’s contention, especially the fact that the Alaska nephrite is of a type different from those of Venezula and

Brazil. Axes from both these countries have been mentioned by Prof. Arzruni (*Zeitschrift für Ethnologie*, 1883, p. 482), who has since informed me that the Brazilian axe represents a type of nephrite so far unknown, from which that of the Venezuela axe again differs."

The latter part of Prof. Meyer's paper relates to a white or grey mineral which has been referred to as 'jade,' but which proves to be pectolite. His remarks on this subject may be summarized as follows:—

The rough mineral from Alaska reported on by Mr. Baird, and previously alluded to, proved to be neither nephrite nor jadeite, but pectolite. Specimens altogether unworked, were not found, but so many that were only partly worked that there can be no doubt of their local origin. Small pieces of a rolled boulder, which had been used as a hammer for breaking bones, and which was obtained at Point Barrow, behave chemically in just the same way as pectolite from Bergenhill, New Jersey. Both were decomposed by acids, after heating to redness and gelatinised. The composition approaches the formula $(Ca, Na, H_2) Si O_3$.

Capt. Jacobson also collected many implements of the same mineral in the region between Kotzebue Sound and Cape Barrow, and also in the tundra, between the rivers Kosksquim and Yukon. Most are cylindrical hammers, some as long as 20 cm. with a diameter of 8 cm.

Colour sometimes turning to neutral gray in spots that are also much less translucent. Hardness near that of quartz (7), greater than usual in pectolite (4-5). Also abnormal in not being dissolved in acids with separation of silica of jelly-like consistence; but in these two peculiarities, agreeing with pectolite from Knockdolian, Scotland. Optical qualities and cleavage normal.

The mineral is said, by the natives from Kotzebue Sound to Cape Barrow, to be obtained in the mountain chain which extends along that coast; one particular locality being the side of a mountain about twenty-five miles from Nulato, on the Yukon, another on one of the streams flowing into Kotzebue Sound, where a vein, or perhaps

dyke, extends from the water up to the crest of the hill. The Innuits of Koviak Peninsula, near Bering Strait, make many tools of the same stone obtained from mountains in the immediate neighbourhood.

In southern Alaska, from Norton Sound to near Bristol Bay, the mineral is altogether, or nearly altogether, unknown to the natives. On Bristol Bay, however, fine pieces obtained by Mr. McKay, indicate another locality in that district.

On the Siberian shore of Bering Straits, fragments are rare, and were said to come from the American side.

