

## A CURIOUS CLAY:

### *The Use of a Powdered White Substance in Coast Salish Spinning and Woven Blankets*

---

LIZ HAMMOND-KAARREMAA\*

COAST SALISH FIRST NATIONS wove their robes and blankets from yarn spun from processed wool fibres.<sup>1</sup> A curious fact, usually mentioned in passing by early explorers, ethnographers, and settlers, is that, in the preparation of wool fibres, a powdery, silky “white clay” was beaten into the wool using a sword-like wooden stick. This practice is confirmed by traditional knowledge preserved by Coast Salish people on Vancouver Island, the mainland of British Columbia, and in Washington State. While museums with extensive Coast Salish collections have no “clay” objects in their collections that are associated with weaving and spinning, they do have lumps of diatomaceous earth as well as tools associated with both diatomaceous earth and the spinning and weaving of wool. Is diatomaceous earth the same as the white clay mentioned in the historical accounts? Or are they different from one another? If so, were they both used? Do they have the same properties? In this article I assemble the historical and ethnographic records of this curious clay in order to clarify the enigmatic first step in the processing and preparation of Coast Salish wool.

Coast Salish wool came from several sources. In an area where few wool-type fibres were available, different types of fibres were often blended together, including down feathers or plant-based fibres such as fireweed or cattail fluff.<sup>2</sup> The yarns made from these fibres were skilfully

---

\* Special thanks to those who assisted my writing of this article in a variety of ways: Lorne Hammond, George Mackie, Richard Mackie, Kjerstin Mackie, Bill Pennell, Nicky Haigh, Colby Laughlin, Gary Manson, Steven Earl, Leola Witt, Brian Seymour, Susan Heald, Luschiim Arvid Charlie, the Royal BC Museum, Pitt Rivers Museum, and the Canadian Museum of History.

<sup>1</sup> See also Liz Hammond-Kaarremaa, “Coast Salish Spinning: Looking for Twist, Finding Change,” in *Textile Society of America 2014 Biennial Symposium Proceedings, New Directions: Examining the Past, Creating the Future*, Los Angeles, California, 10–14 September 2014, available at <http://digitalcommons.unl.edu/tsaconf/938/>.

<sup>2</sup> William Healey Dall and George Gibbs, “Tribes of the Extreme Northwest by W.H. Dall/Tribes of Western Washington and Northwestern Oregon by Geo. Gibbs,” *Contributions to*

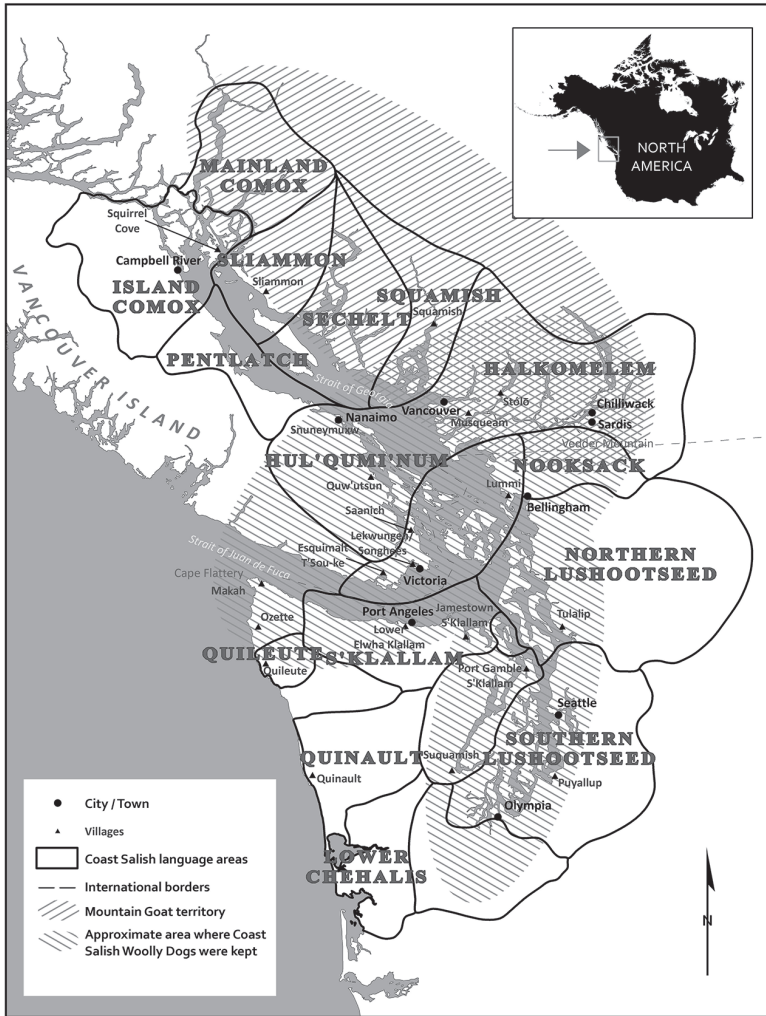


Figure 1. Map of Salish language areas, mountain goat territories, and Salish wool dog areas. Map by Carlos Gonzalez.

made into warm blankets and robes, many with colourful geometric

*North American Ethnology*, vol. 14847 (Washington: Government Printing Office, 1877), 176, 219-20; Paul Kane, *Wanderings of an Artist among the Indians of North America: From Canada to Vancouver Island through the Hudson's Bay Company's Territory and Back Again, 1839*, 210, available at <https://archive.org/stream/wanderingsanartookanegooq#page/n240/mode/2up/>; Charles Wilkes, *Narrative of the United States Exploring Expedition. During the Years 1838, 1839, 1840, 1841, 1842. By Charles Wilkes ... With Illustrations and Maps. In Five Volumes* (London: Whittaker, 1845), 288; H.G. Barnett, *The Coast Salish of British Columbia* (Eugene: University of Oregon, 1955), 119.

designs, others with plain white twill patterns and sometimes with a stripe or plaid woven in. George Gibbs, an ethnologist and geologist who worked in Washington Territory in the 1850s, poetically described the blankets as “garment[s] of mystical sublimity”:

The Indians of the Sound and the Straits of Fuca attained considerable skill in manufacturing a species of blanket from a mixture of the wool of the mountain-sheep and the hair of a particular kind of dog, though in this art they never equaled the more northern tribes, some of whose workmanship equaled the common kind of Mexican serape. [Captain] Vancouver describes the dogs as “resembling those of Pomerania, though, in general, somewhat larger.” Their usual color is white. The [mountain sheep] wool is obtained from the hunting tribes next to the Cascade Mountains, and is an article of trade. The two being mixed are twisted into yarns by rolling upon the thigh and the warp is formed by stretching these singly over a frame, tying the ends together. The wool is then passed through with a long wooden needle. The Klallam and Sound Indians do not make much use of colors in ornamenting their blankets, but those farther north introduce quite complicated figures of several colors. Another kind of robe, usually square and worn over the shoulders, is made by twisting in with the hair or wool the down of sea-birds, the whole being hand-woven in the same way as the last. This makes a very thick and warm stuff.<sup>3</sup>

What Gibbs described as the mountain sheep (not found on the coast) is actually the mountain goat (*Oreamnos americanus*), which is found on the mainland but not on Vancouver Island or the Olympic Peninsula, and was therefore an active trade item.<sup>4</sup> Mountain goat hair was the foremost fibre in making blankets.<sup>5</sup> When the annual late spring moulting took place, the moulted mountain goat fibres were collected from brush and lower tree branches or from the beds where the mountain goats lay.

In some cases, the goats were hunted and the fibres were pulled from the hide, as described by George Emmons, an ethnographer and US Navy lieutenant stationed in Alaska in the late 1800s:

<sup>3</sup> Dall and Gibbs, “Tribes of the Extreme Northwest/Tribes of Western Washington,” 219–20.

<sup>4</sup> Wayne Suttles, *Coast Salish and Western Washington Indians*, ed. David Agee Horr (New York: Garland, 1974), 1:244; Dall and Gibbs, “Tribes of the Extreme Northwest/Tribes of Western Washington,” 219–20.

<sup>5</sup> Wayne P. Suttles, Wilson Duff, and Diamond Jenness, *Katzie Ethnographic Notes* (Victoria: British Columbia Provincial Museum, 1955), 2–3; Edward Curtis, *The North American Indian* (Cambridge: Cambridge Press, 1913), 9:73, 91.

Preparatory to plucking, the skin is kept wet on the under side and rolled up for several days, in order to loosen the hold of the fleece. Then the woman, seated on the ground, takes the skin in her lap, wool side uppermost, and, with the thumb and fingers of both hands, pushes the fleece from her, the moistening process having loosened the roots.<sup>6</sup>

In addition to the mountain goat, a particular breed of dog, known as the Salish wool dog, or the woolly dog, was raised by the Coast Salish for its warm, downy wool.<sup>7</sup> Kept isolated from the village dogs – which were a separate type – to protect the genetic wool line, the dogs were highly valued, especially in areas where mountain goat wool was not readily available. According to Myron Eells, a missionary, scholar, and collector who lived with the Twana/Skokomish in southwestern Puget Sound for thirty years starting in the 1870s, the dogs were the property of women: “A woman’s wealth was often estimated by the number of such dogs she owned.”<sup>8</sup> The dogs were shorn once a year and the wool used to make yarn for blankets.<sup>9</sup>

In the early 1900s, a Snuneymuxw elder from Nanaimo recounted an exchange of the two fibres:

At certain times canoes would arrive at Nanaimo of Sliammon Indians from Squirrel Cove, Cortez [*sic*] Island. They brought bales of mountain goat’s [*sic*] hair in trade for native dog’s [*sic*] hair. The Sliammon Indians had procured the hair from the mainland ... as the mountain goat is not native to Vancouver Island. In the business of

<sup>6</sup> George T. Emmons, *The Chilkat Blanket. Memoirs of the American Museum of Natural History* (New York: American Museum of Natural History, 1907), 3:334. Although Emmons was describing the Tlingit process of stripping the fibre from the hide from northern British Columbia and southern Alaska, the process was likely the same.

<sup>7</sup> F. W. Howay, “The Dog’s Hair Blankets of the Coast Salish,” *Washington Historical Quarterly* 9 (April 1918): 83–92; Susan J. Crockford, *Osteometry of Makah and Coast Salish Dogs* (Burnaby: Archaeology Press, Simon Fraser University, 1997); Susan J. Crockford, “Native Dog Types in North America before Arrival of European Dogs,” in *Proceedings of the World Small Animal Veterinary Congress*, Mexico City, 2005, available at <http://www.vin.com/proceedings/Proceedings.plx?CID=WSAVA2005&PID=11071&O=Generic>.

<sup>8</sup> George Pierre Castile, ed., Myron Eells, *The Indians of Puget Sound: The Notebooks of Myron Eells* (Seattle: University of Washington Press, 1985), 122.

<sup>9</sup> Numerous articles discuss the Coast Salish wool dog and mountain goat fibre in blankets. Useful reviews and summaries of Salish dog wool research include Howay, “Dog’s Hair Blankets,” 83–92; Rick Schulting, “The Hair of the Dog: The Identification of a Coast Salish Dog-Hair Blanket from Yale, British Columbia,” *Canadian Journal of Archaeology* 18 (1994), 57–76; Caroline Solazzo, Susan Heald; Mary W. Ballard; David A. Ashford; Paula DePriest; Robert J. Koestler; Matthew J. Collins “Proteomics and Coast Salish Blankets: A Tale of Shaggy Dogs?” *Antiquity* 85, 330 (2011): 1418.32; Paula Gustafson, *Salish Weaving* (Vancouver: Douglas and McIntyre, 1980), 69–71.

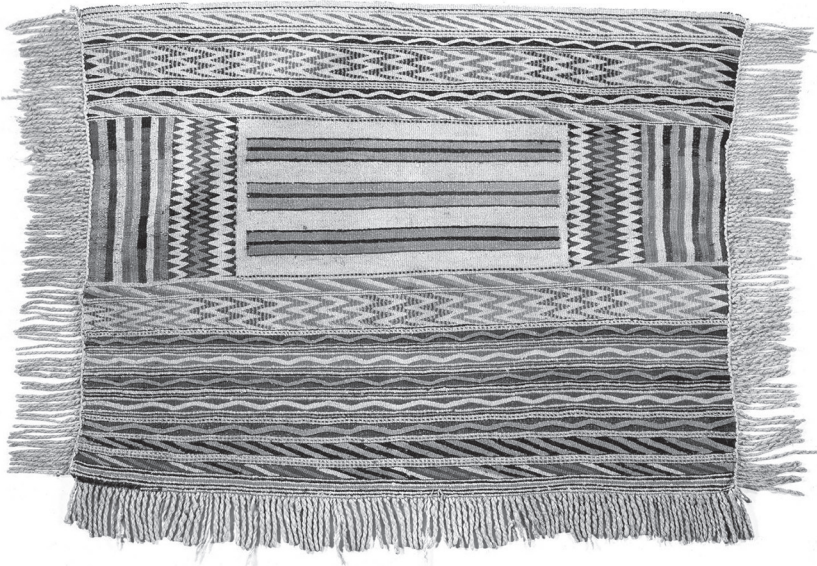


Figure 2. Dog/mountain goat classic style blanket, collected between 1838 and 1842 by the Wilkes Expedition (Peale Catalogue no. 312). National Museum of Natural History, Smithsonian Institution, catalogue no. E002124.

exchange, the bales of hair would be laid side by side, the hair patted down by hand, adding more of this kind or that of hair, until all were satisfied that the bales were even, then agreement was reached.<sup>10</sup>

It was these fibres into which this white clay was commonly beaten. But what was this clay? Where did it come from? Why was it used?

We have a few, often differing, accounts of why this dried white clay was pounded into the dog or mountain goat fibres. One of the earliest written records is from Paul Kane, a Canadian artist who toured the Hudson's Bay Company's districts in 1846-47. In 1847, Kane visited the Coast Salish areas of Puget Sound in what was then the northern part of Oregon Territory (now the state of Washington) as well as the southern Gulf Islands and Fort Victoria in what is now British Columbia. While at Fort Victoria, he noted a "white earth" being beaten into the fibre: "They have a peculiar breed of small dogs with long hair of a brownish black and a clear white. These dogs are bred for clothing purposes. The

<sup>10</sup> Barraclough, Ed. "Dogs That Were Indigenous to the Pacific Northwest Coast." *BC Historical News* 2, no. 3 (1969). Available at [http://www.library.ubc.ca/archives/pdfs/bchf/bchn\\_1969\\_05.pdf](http://www.library.ubc.ca/archives/pdfs/bchf/bchn_1969_05.pdf).



hair is cut off with a knife and mixed with goosedown and a little white earth with a view of curing the feathers. This is then beaten together with sticks and twisted into threads.”<sup>11</sup>

Twenty years later, the American Indian agent James G. Swan, writing about the “Cape Flattery Indians” (Makah) of northwest Washington State, observed what he called “white pipe clay” being used for a different purpose:

The hair blankets are made from the covering of a species of dog of a yellowish-white color, which, after having been sheared off, is packed away with dry pulverized pipe clay, for the purpose of extracting the oil or grease. When a sufficient quantity has been obtained, and has remained long enough in the pipe clay, it is carefully picked over by hand, and beaten with a stick to knock out the dirt. It is then twisted on strong threads, and finally woven into a thick, strong, and heavy blanket. The pipe clay is procured at Kwilleyute [Quileute].<sup>12</sup>

While Kane suggests the white clay was used to cure the feathers, and Swan suggests it was used to extract the oil from wool, both agree that it was used in preparing the fibres for the spinning process. Kane was very specific in saying that the clay was to “cure the feathers,” and one wonders whether he was told this or whether he perhaps misunderstood what he was told. In any case, the degree of detail suggests that he was faithfully reporting the correct usage.<sup>13</sup>

In 1890, twenty years after Swan, anthropologist Franz Boas, in writing of the Songhees (Lekwungen) Salish group on southern Vancouver Island, described in detail the preparation of wool, but he made no mention of feathers:

The hair which is to be spun is first prepared with pipe-clay (st’a’uok’). A ball, about the size of a fist, of this clay is burnt in a fire made of willow wood; thus it becomes a fine, white powder, which is mixed with the wool or hair. The mixture is spread over a mat, sprinkled with water, and for several hours thoroughly beaten with a sabre-like

<sup>11</sup> Kane, *Wanderings of an Artist*, 210.

<sup>12</sup> James G. Swan, *The Indians of Cape Flattery* (Washington: Smithsonian Institute, 1870), 44. Kwilleyute is now known as Quileute and is located on the west coast of the Olympic Peninsula in Washington State.

<sup>13</sup> Kane scholar Ian MacLaren, when asked about Kane’s phrase “cure the feathers,” replied that it did not appear in Kane’s field notes but was later added to his draft manuscript in someone else’s hand. MacLaren is not sure whether Kane dictated this addition or whether someone added it. Ian MacLaren, personal communication, 7 May 2015.

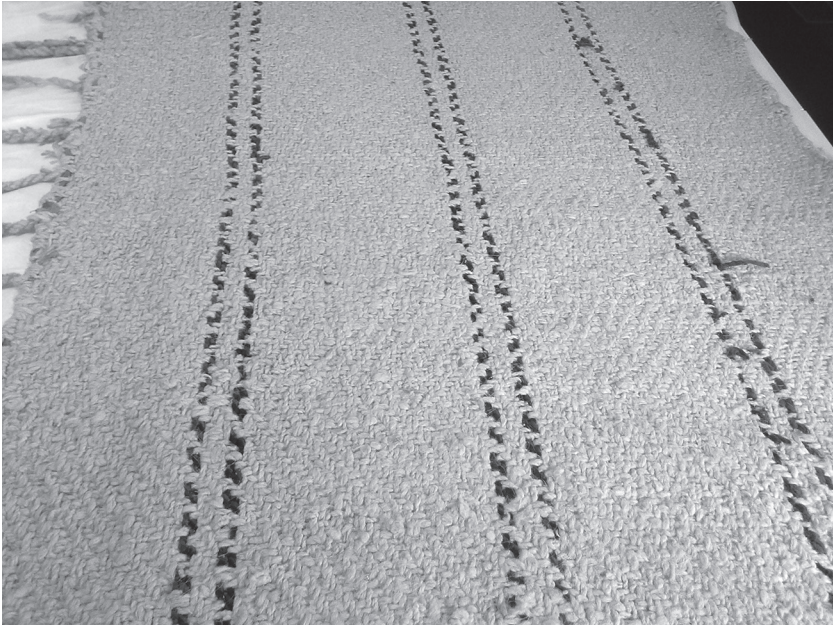


Figure 3. Mountain goat wool blanket collected in Nanaimo, Vancouver Island. Pitt Rivers Museum, Oxford, catalogue no. 1898.53.1. Photo by Mark Kaarremaa.

instrument until it is white and dry; thus the grease is removed from the hair.<sup>14</sup>

A related yet puzzling detail provided by Boas, but not mentioned elsewhere, is the use of white clay to clean not only the raw fibres before spinning them into yarn but also to clean the finished woven blanket: “Burnt pipe-clay is used for cleaning blankets. The clay is spread over the blanket, sprinkled with water, and then thoroughly beaten.”<sup>15</sup> This suggests that the clay had functions other than, or in addition to, removing the oil from the fibres: it was used for finished textiles and not just in the preparation of wool for spinning.

The manufacture of Salish blankets and the use of this curious clay extended to the Interior of what is now British Columbia. Simon Fraser, who explored the area from 1806 to 1808, recorded that the Salish Lillooet First Nation (Interior Salish, now the St’at’imc) made blankets

<sup>14</sup> Franz Boas, *Second Report on the Indians of British Columbia*, Report for the British Association for the Advancement of Science (London: John Murray, 1891), 566–67. Available <http://biodiversitylibrary.org/item/93461#page/713/mode/rup>.

<sup>15</sup> *Ibid.*, 567.

of mountain goat and dog wool.<sup>16</sup> James Teit, an anthropologist and photographer who worked with Franz Boas, quoted Boas's description of Songhees wool preparation and noted that the Lillooet people also used this white clay, or "pipe clay," in the preparation of fibre.<sup>17</sup> All these reports indicate a fairly wide geographic spread of Salish First Nations who used white clay, from the northwest tip of the Olympic Peninsula, Puget Sound, southern Vancouver Island, the Fraser River delta, and the middle Fraser River in the BC Interior.

A note is necessary regarding the use of "pipe clay" in Britain and Europe, where white clay was used in the mass production of clay pipes produced in metal (most often cast iron) moulds – hence the name "pipe clay." Clay produced a "purer" smoke from tobacco, with no additional smells emanating from, say, a heated wooden bowl. However, Europeans also had other uses for the clay, from whitening leather to removing unwanted substances from cloth. It is difficult to know whether these early European observers called First Nations white clay "pipe clay" simply because they were familiar with the term and this clay was similar or because it was indeed the same substance.

A clay-like substance for cleaning wool was known in Great Britain as a bleaching clay, or "fuller's earth." Textile workers would "full" freshly woven bolts of wool cloth to bind the fibres together, slightly shrinking the cloth and thereby making it "fuller," thicker, and more waterproof. They also added fuller's earth to remove any oils and dirt and to bleach the wool. The particular clay varied – hence the term "fuller's earth" – which covered calcium bentonite and montmorillonite clays of varying composition and colours, including white and off-white, red, brown, black, blue, and green. The key was the earth's ability to absorb grease.<sup>18</sup>

And, indeed, black earth was also encountered in Salish territories. In the 1930s, journalist and local historian Beryl Mildred Cryer interviewed First Nations people between Nanaimo and Cowichan Bay on Vancouver Island for her column on Native histories and mythologies for the *Victoria Colonist*. One of her interviewees was Ts'umsitun, a Puneluxutth'

<sup>16</sup> W. Kaye Lamb, ed., *The Letters and Journals of Simon Fraser, 1806-1808* (Toronto: Dundurn Press, 2007), 136.

<sup>17</sup> James Alexander Teit, *The Lillooet Indians*. Memoirs of the American Museum of Natural History, vol. 4, pt. 5 (Leiden/New York: E.J. Brill/G.E. Stechert, 1906), 210-11. Although it is somewhat unclear as to which Fraser River tribe Teit is referring, in his introduction he identifies the names and locations of the tribes and villages and also indicates that "the Fraser River bands" refers to the Upper Lillooet. When referring to tribes along the mouth of the lower Fraser he uses phrases such as "the Fraser Delta tribes" or "the lower Fraser tribes."

<sup>18</sup> "Bentonite and Fuller's Earth" Minerals Zone, available at <http://www.mineralszone.com/minerals/bentonite.html>.



(Penelakut) man who lived in the village of Hwts'usi, south of Chemainus, who showed her a mountain goat blanket and described a certain black clay used in the preparation of the fibres:

“Now, first, to make these blankets, the Indians used to take the hair of the skin of mountain goats. Then they got a black mud. There is a place I know of,” he [Ts'umsitun] explained, “where in the old days the Indians used to dig this mud. I only know of this one place, and the Indians would come from all parts to get it. It is very, very black and sort of greasy when you rub it in your hands. Well, they made this mud into balls, then they made a little hole and in it they put a fire of alder. When the fire was red and very hot, no flames, they put sticks across the top of the hole, and between the sticks they put the mud balls, and kept turning them round and round to bake. As they baked, they got white until, when they were quite baked, they were as white as snow.

“After they were cold the Indians broke them up into small pieces, put them on a mat or blanket and mixed the goat hair with them. Now they took a long, strong stick, and for a long time – more than an hour – they beat the hair and the baked mud together; after that it was ready for the women to spin into white blankets.”<sup>19</sup>

So, while many reports describe a white clay, Ts'umsitun identifies a black clay that, once burned, turns white.

In 1875, the geologist and ethnographer George Mercer Dawson became the first to report that the white clay used in Coast Salish spinning and weaving was, in fact, diatomaceous earth. Writing of the First Nations living near Moody's Mill on Burrard Inlet, in what is now North Vancouver, he noted that he had “bought a goat wool blanket, with yarn &c. [etc.] & specimen of diatomaceous earth used in twisting the strand. Wool is said to be rolled into yarn on the bare knee with the hand & aid of this earth.”<sup>20</sup> Boas reiterated this in a footnote in his 1890 report: “Dr. George M. Dawson obtained a specimen of this material from Indians in Burrard Inlet in 1875 ... It proved to be diatomaceous earth, not true pipe-clay. The material used by the Lku'ngEn is found somewhere north-east of Victoria, the exact spot being unknown to

---

<sup>19</sup> Chris Arnett, ed., *Two Houses Half-Buried in Sand: Oral Traditions of the Hul'Qumi'Num' Coast Salish of Kuper Island and Vancouver Island* (Vancouver: Talonbooks, 2008), 148.

<sup>20</sup> Douglas Cole and Bradley Lockner, eds., *The Journals of George M. Dawson: British Columbia, 1875-1878* (Vancouver: UBC Press, 1989), 118. Dawson, who joined the Geological Survey of Canada and worked on the international boundary survey, spent two field seasons in British Columbia, from 1876 to 1877.

me.”<sup>21</sup> Even after Dawson and Boas, most written accounts continued to use the term “white clay” but without clarifying whether this clay was indeed diatomaceous earth or whether both substances were used.

Joanne Vanderburg, whose 1953 thesis focused on Salish weaving, extended the idea – first noted by Swan in 1870 – of the powdered white clay as an oil or grease extractor, suggesting it was a more general “cleaning agent,” although she also conceded that the main intention might have been to remove oil. However, she offered no reference. According to her account, the fine white powder was sprinkled over either the fibres or the whole mountain goat pelt, the latter being beaten with a wooden sword for a few hours before the fibres were removed.<sup>22</sup>

More recent reports suggest the white powder was used in the fibre to make the spinning easier. In the 1960s, Oliver Wells, a local historian and ethnologist, interviewed some of the Stó:lō elders in Chilliwack and Sardis. In a tape-recorded interview, Amy Cooper and August Jim described a white powder called *st’ewoqʷ*: “Sort of a clay,” said one of the women. “There’s some up on the Vedder Mountain. And they take that and burn it, and it turns white like powder, like as fine as talcum powder. And they use that right on the wool, the goat wool, because it’s so rough, and it makes it easier to spin.”<sup>23</sup> The dry, chalky clay might have made the fibres slippery, as talcum powder would, and therefore easier to spin. Or the sword-stick might have forced the clay to cut creases into the coarse guard hairs, making them more pliable and also easier to spin. Alternatively, both mechanisms might have been at work.

Another Stó:lō account has recently been published in the memoirs of Rena “Xwelíqwiya” Point Bolton, Order of British Columbia, a Xwélmexw (Stó:lō) weaver and matriarch who was taught the traditional craft skills by her mother and grandmother during the Depression. Xwelíqwiya describes, with a weaver’s knowledge of details, the mixing of a white clay with wool fibres:

The Steqó:ye Wolf side of my family specializes in types of weaving in wool: the Tii:t side of the family from upriver made fine, fine weavings of mountain goat wool mixed with dog hair ... The Wolf women of the family in Semá:th [Sumas] have specialized in a kind of twill weave called swox’wath. Swox’wath is not just the twill weave; it is also the way the fibre is prepared. Small feathers and feather down

<sup>21</sup> Boas, *Second Report on the Indians of British Columbia*, 567.

<sup>22</sup> Joanne Vanderburg, “Chilkat and Salish Weaving” (MA thesis, University of Washington, 1953), 50, 52.

<sup>23</sup> Oliver Wells, Ralph Maud, Brent Douglas Galloway, and Marie Weeden. *The Chilliwacks and Their Neighbors* (Vancouver: Talonbooks, 1987), 65.

are mixed with mountain goat wool and dog hair. This is all then mixed with fine white clay and a bit of water. Then it is spun out on a spindle whorl while it is still wet. The wool strands were sometimes strung out across the big house, or up to the smokehouse and back down. It took two women to do this. Then when the strands have dried, you would shake out the clay and have a beautiful feathery yarn. This was the work of the Semá:th Steqó:ye people.<sup>24</sup>

Bolton also noted that the clay assisted with the binding of the yarn and cut down on the oily lanolin of the goat wool.<sup>25</sup>

In other Coast Salish territories, the clay was also used as a colouring agent. Candace Wellman, a Washington historian, wrote that white clay was used to absorb oil and to whiten woolly dog fibres so they would be a closer colour match to the white mountain goat fibre when the two were blended.<sup>26</sup>

We are still left with the question: Was all the white “clay” actually diatomaceous earth? The latter is easily identified under a microscope, and certain museums identify balls of white clay in their collections microscopically as diatomaceous earth. These objects and their associated notes shed a bit more light on the use of this substance.

Ancient traditional village sites provide clues to how the “clay” was stored with fibre prior to First Nations contact with Europeans. In the 1960s and 1970s, one of the most important archaeological sites in North America was excavated on the northwest coast of Washington. In about 1560 AD, a mudslide dramatically covered three large houses at Ozette village, a Makah First Nation site,<sup>27</sup> which is often called the Pompeii of North America because so much was preserved, unaltered and entombed, as though in a time capsule.

In archaeology, wood and textiles are preserved best in two types of sites: very dry areas (e.g., the high Andes) and very wet areas. In between these two extremes, most objects disintegrate. Ozette is a “wet site,” waterlogged and rare in the archaeological world. The wetness has prevented oxygen from reaching much of what was covered. Hence, wood, plants, fibre, and their products – tools, baskets, ropes, nets, and

<sup>24</sup> Rena Point Bolton and Richard Daly, *Xwelíqwiya: The Life Story of a Stó:lō Matriarch* (Edmonton: Athabasca University Press, 2013), 130.

<sup>25</sup> *Ibid.*, 192.

<sup>26</sup> Candace Wellman, “Skexe ‘Birch’: ‘Birch’ and Other Wool Dogs of the Coast Salish,” *Journal of the Whatcom County Historical Society* (October 2001): 4–14, 11.

<sup>27</sup> Although this was a Makah, not Coast Salish, First Nation village, the Makah live close to the Juan de Fuca and the Puget Sound Coast Salish nations, and we can expect some cultural overlap between Makah and Coast Salish traditions.

textiles – all objects most vulnerable to decay, were preserved. Most Northwest Coast archaeological sites are middens, where objects were either lost or discarded.<sup>28</sup> At Ozette, almost every object, whether in use at the time of the mudslide or in a storage container, was preserved in its place. Where an object was found, and its relationship to other objects, provides clues about how it was used.<sup>29</sup>

Among the exceptional finds at Ozette was a great rarity: a preserved woven blanket – the oldest extant blanket found on the Northwest Coast. Along with the blanket were thirteen looms, spindle shafts, whorls, fibre combs, and beaters for weaving, all evidence of textile making. In a large storage basket were several folded woven cedar bags, within one of which were hard, round lumps of white, yellow-white, black, and red pigment, one apiece. That different coloured lumps were found in the same basket indicates that they were most likely pigments used in painting. An associated flat bag contained fibrous material (too poorly preserved to identify positively) and yellow/white earth.<sup>30</sup> Archaeologist Dale Croes speculates that the fibrous material is dog wool stored with pipe clay, just as Swan describes.<sup>31</sup> Ozette is just north of Quillette, where, as Swan points out, the Cape Flattery people traded for the white pipe clay. That the earth found with the fibre is yellow/white leads one to ask whether this is the same material as the white clay: the yellow might result from the earth's contact with the fibre and the length of time they were buried. The different colours of earth might also result from contact with varying amounts of other organic materials. All surviving ethnographic and historical accounts mention a white clay (with the exception of two accounts of a black mud), with no mention of a yellow clay. It is possible that the yellow clay found at Ozette had not yet been burned, while the white clay had. That is to say, the yellowish clay may have been the same substance as the white pigment.

The Ozette site tells us a few things: that the practice of storing a whitish clay, which has now been identified as diatomaceous earth,<sup>32</sup> with

<sup>28</sup> See "Introduction," in Kathryn Bernick, ed., *Hidden Dimensions: The Cultural Significance of Wetland Archaeology* (Vancouver: UBC Press, 1998).

<sup>29</sup> Ken Ames, "The Place of Ozette in Northwest Coast Archaeology," in *Ozette Archaeological Project Research Reports*, vol. 3, *Ethnobotany and Wood Technology*, ed. David L. Whelchel, 9–24 (Seattle: WSU Department of Anthropology Reports of Research no. 68, National Park Service, Northwest Regional Office). See also Ruth Kirk and Richard D. Daugherty, *Archaeology in Washington* (Seattle: University of Washington Press, 2007).

<sup>30</sup> Dale R. Croes, "Basketry from the Ozette Village Archaeological Site: A Technological Functional, and Comparative Study" (PhD diss., Washington State University, 1977), 23.

<sup>31</sup> Swan, *Indians of Cape Flattery*, 44.

<sup>32</sup> Stored at the Makah Cultural and Research Center at Neah Bay, this white lump of clay is noted as diatomaceous earth (personal communication, 30 January 2015). The diatomaceous

fibre had been going on for at least five hundred years; that spinning yarn and weaving was already an advanced craft in ca. 1560 AD; and that, in keeping with nineteenth-century accounts, clay was stored in round lumps or balls.

Similar patterns applied on Vancouver Island. The Burke Museum in Seattle has samples of diatomaceous earth collected from Cowichan and the Pat Bay Reserve (Tseycum First Nation) in Saanich.<sup>33</sup> The Cowichan sample is a lump, while the Saanich samples are roundish balls and include a note that the material was used for whitening wool. The Royal British Columbia Museum (RBCM) also has a ball-shaped sample.<sup>34</sup> If collected while wet, the material would have been formed into such balls and baked to dry it for storage. When needed, it would have been broken apart and crumbled to be beaten into the wool by a wooden sword.

The Smithsonian Museum also has some Vancouver Island white clay identified as “diatomaceous earth” in its collection. Collected in 1935 from the Tsartlip First Nation Reserve in West Saanich, the Smithsonian recorded it as being used as a white pigment.<sup>35</sup> Like the Ozette pigments, it was pressed into a ball for storage.

Traces of such uses survive to the present. In the fall of 2014, I asked Gary Manson, a Snuneymuxw elder, whether he had heard of the white clay. He was not familiar with diatomaceous earth, but he did say that people in his community had historically used a white pigment for ceremonial purposes, although they subsequently had lost the knowledge of what it was, where to find it, and how to prepare it. His mother, Emily Manson, who had long since died, told him that the pigment was derived from a clay found near “the River,” but that was all Manson knew. Manson was not even sure which river she meant. He had discussed this with elders, who speculated that perhaps the pigment was derived from ground shells,<sup>36</sup> but other references from southern Vancouver Island suggest that it was diatomaceous earth.

Pigments derived from diatomaceous earth are also recorded at Katzie, in Stó:lō territory on the lower Fraser River. Wayne Suttles, describing

---

earth is in the weaving display at the centre.

<sup>33</sup> See the Burke Museum database objects no. 1-10613 and no. 1-996, <http://collections.burkemuseum.org/ethnology/search.php?lc=nwc>.

<sup>34</sup> RBCM catalogue object no. 13560.

<sup>35</sup> Smithsonian Museum, National Museum of the American Indian, Ethnographic Collection, catalogue no. 18/6955. Saanich Peninsula is around 11 kilometres at its widest, hence the location of the West Saanich reserve cannot be far from where Boas records the Lekwungen mined their diatomaceous earth.

<sup>36</sup> Personal communication, Gary Manson, September 2014.



how a novice received a spirit at Katzie, recorded that diatomaceous earth was used both as face paint and for beating into the wool of the mountain goat:

In this way all three became new dancers. If their kinsfolk, on the other hand, wanted their initiation delayed, the priest painted on their faces white infusorial [diatomaceous] earth that women had gathered and baked to pound into their goat's wool when making blankets. The taint [sic] thus imparted to the earth loosened the bond that united the youths to their spirit guardians and weakened the spirit songs inside them; but unless they continued to whiten their faces each evening until the close of the dancing season, it was said, these songs might still grow within them and cause them to fall ill.<sup>37</sup>

Sticks or wooden swords also figure in this technology. Both Kane and Swan mention the beating of the wool (and goose down) and clay mixture with a stick.<sup>38</sup> An early film, taken by Harlan I. Smith in 1928, shows Mrs. George Johnnie of Musqueam demonstrating the process of using a wooden sword to beat dried white clay into mountain goat wool.

Many museums with Coast Salish collections have wool beaters, also known as swords, in their collections. The Canadian Museum of History (CMH) has a Cowichan wooden sword thought to have been collected by the American naval officer and ethnographer Lieutenant George T. Emmons in 1900. This sword was used in the preparation of mountain goat hides prior to the removal of the wool fibre for weaving. "The raw skin is filled with a burnt diatomaceous white earth and well beaten in the hair and wool to absorb the grease," states the catalogue record at the CMH.<sup>39</sup>

Another sword, also collected by Lieutenant Emmons, is held at the Pitt Rivers Museum in Oxford. The museum catalogue confirms that the white earth was beaten into the wool: "Sword of yew wood used for beating white burnt earth into the wool of the mountain sheep [goat] to clean it from the natural grease." As mentioned earlier, much mountain goat wool was collected in the wild from annual moulting. In all probability the beating of the wool with the sword-like tool and

<sup>37</sup> Wayne Suttles, Wilson Duff, and Diamond Jenness, *Katzie Ethnographic Notes: Memoir nos. 2-3* (Victoria: BC Provincial Museum, 1955), 45.

<sup>38</sup> Kane, *Wanderings of an Artist*, 248; Swan, *Indians of Cape Flattery*, 44.

<sup>39</sup> Canadian Museum of History, ethnographic collection, catalogue no. VII-G-369. The CMH catalogue states that this object, acquired from the collection of the Anglo-American architect and politician Lord Alfred Bossom, is believed to have been collected by Emmons. The catalogue entry was prepared from an original manuscript, probably made by Emmons, that cannot now be located (CMC, Nathalie Guénette, e-mail message to author, May 2013).



Figure 4. Mrs. George Johnnie of Musqueam sitting in front of a loom, demonstrating the use of a sword beater on mountain goat wool. She has spread the wool on a mat and is beating it with a wooden sword. Screen capture of the film documentary: *Coast Salish Indians of British Columbia*, by Harlan Ingersoll Smith, 1928, Canadian Museum of History, 16-0400-0008.



Figure 5. Sword for beating earth into wool. Pitt Rivers Museum, catalogue no. 1954.8.152. Photo by Mark Kaarremaa.

the use of the white, powdered clay were both integral to the preparation of wool-bearing hides.

We are still left with the question of what was used: White clay or diatomaceous earth? It helps to review some of the properties of the two. Clay comes in many colours and many compositions. The so-called bleaching clays of British Columbia are formed from volcanic ash, generally found far from the coast in the BC Interior, where it was

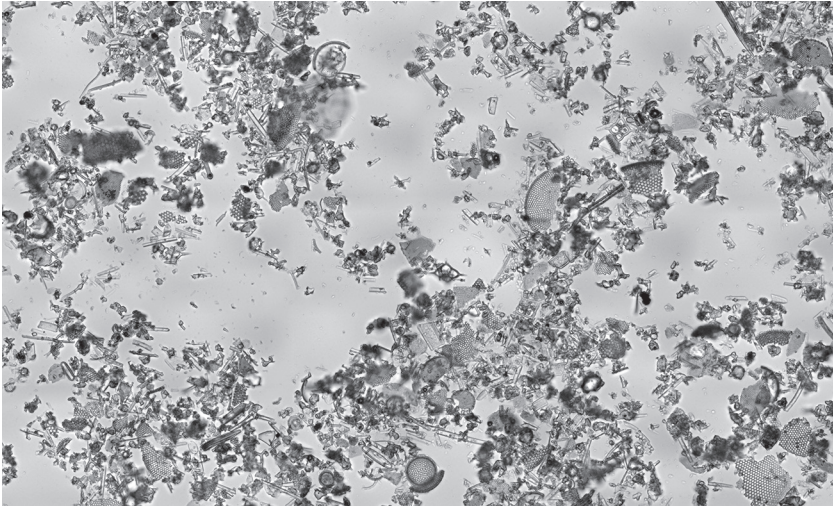


Figure 6. Powdered diatomaceous earth viewed under a light microscope. Photo by Richard Wheeler, Wikipedia.

blown by prevailing winds. Some marine clays are found in Coast Salish territories; however, while white or off-white when wet, they turn shades of salmon pink, red, or brown when fired.<sup>40</sup>

Diatomaceous earth is formed by the fossilized remains of diatoms – microscopic algae found in lakes and salt water.<sup>41</sup> When these die, their skeletons fall to the bottom of the lake or sea. Over hundreds of years, layers accumulate, forming a white to off-white rock that is easily crumbled when dry and that resembles clay when wet. Technically, diatomaceous earth is not a clay. This is because it is organic in origin, whereas clays derive from volcanic ash.

Diatom skeletons, invisible to the unaided human eye, are hollow, which makes diatomaceous earth suitable for use in filters, such as those used in swimming pools. They are also safe for filtering drinking water and foodstuffs, such as honey or syrup. While diatomaceous earth will allow liquids to flow through the empty skeletons, clay, on the other hand, will absorb any liquids, including grease.<sup>42</sup> Dry clay will swell

<sup>40</sup> J.M. Cummings and J.M. McCammon, *Clay and Shale Deposits of British Columbia* (Victoria: Ministry of Energy and Mines, 1952).

<sup>41</sup> BC Geological Survey, *Zeolite, Perlite, Fullers Earth, Diatomite, Kaolin*, information circular 1992-17, available at <http://www.empr.gov.bc.ca/Mining/Geoscience/PublicationsCatalogue/InformationCirculars/Pages/IC1992-17.aspx>.

<sup>42</sup> BC Geological Survey, *Zeolite, Perlite, Fullers Earth, Diatomite, Kaolin* (Victoria: BC Ministry of Energy and Mines, 1992); Ainsworth-Jenkins Holdings Inc. and Master Mineral Resource Services Ltd., *Market Study of Bentonite Products* (Victoria: BC Ministry of Energy and Mines,

while absorbing the lanolin oil and, in the process, remove the grease, but it will dry out the wool.

Once we understand what diatomaceous earth is and what it does, our “curious clay” begins to make more sense. High-grade diatomaceous earth, containing very fine particles, is harmless for humans to ingest; it now forms an ingredient of makeup and even toothpaste. It is, however, fatal for small insects. The microscopic diatom skeletons are sharp, piercing the exoskeletons of creatures such as fleas and thereby killing them. Available at gardening shops, diatomaceous earth in its dry form can be used to prevent infestations of insects and slugs.<sup>43</sup>

In *Working with Wool: A Coast Salish Legacy and the Cowichan Sweater*, Sylvia Olsen of the Saanich Tsartlip First Nation asserts that diatomaceous earth was added to fibres as a natural insecticide.<sup>44</sup> This may explain Swan’s observation on storing the dog wool: “which, after having been sheared off, is packed away with dry pulverized pipe clay, for the purpose of extracting the oil or grease. When a sufficient quantity has been obtained, and has remained long enough in the pipe clay it is carefully picked over by hand, and beaten with a stick to knock out the dirt.”<sup>45</sup> Swan’s reference to a length of time may refer to a method for dealing with potential parasites: it takes time to kill them, and the efficacy of any particular source of diatomaceous earth might depend on the makeup of the diatoms it contains.<sup>46</sup> This would also explain Kane’s statement that diatomaceous earth “cured” the goose down feathers.<sup>47</sup> It would have protected them from bird lice, fleas, mites, and, most important, clothing or wool moths. Last, this would also explain Boas’s statement “Burnt pipe-clay is used for cleaning blankets.”<sup>48</sup> A well used blanket may require additional diatomaceous earth from time to time. Access to an insecticide before the advent of chemical pest control methods, when fibres were gathered from feathers, wild mountain goats,

---

1994), available at <http://www.empr.gov.bc.ca/Mining/Geoscience/PublicationsCatalogue/OpenFiles/1994/Documents/OF1994-25.pdf>.

<sup>43</sup> Paul Fields, Sylvia Allen, Zlatko Korunic, Alan McLaughlin, and Tanya Stathers, “Standardized Testing for Diatomaceous Earth,” in *Proceedings of the Eighth International Working Conference of Stored-Product Protection*, York, UK, July 2002, available at <http://home.cc.umanitoba.ca/~fieldspg/fields/fields-de-test-2002.pdf>; Wikipedia, “Diatomaceous Earth,” available at [http://en.wikipedia.org/wiki/Diatomaceous\\_earth](http://en.wikipedia.org/wiki/Diatomaceous_earth).

<sup>44</sup> Sylvia Olsen, *Working with Wool: A Coast Salish Legacy and the Cowichan Sweater* (Winlaw: Sono Nis Press, 2010), 55–56.

<sup>45</sup> Swan, *Indians of Cape Flattery*, 44.

<sup>46</sup> Z. Korunic, “Diatomaceous Earths – Natural Insecticides,” *Pesticides and Phytomedicine* 28, 2 (2013): 77–95.

<sup>47</sup> Kane, *Wanderings of an Artist*, 248.

<sup>48</sup> Boas, *Second Report on the Indians of British Columbia*, 567.

and domestic dogs, offered many advantages, not the least of which was the ability to protect blankets from becoming moth-eaten.

Apart from Kwilleyute, diatomaceous earth is found in at least half a dozen other locations within Coast Salish territories. Canadian geological research records the earth at Gabriola Island, the area near Quamichan Lake in the Cowichan Valley, the Saanich Peninsula, Trout Lake in Vancouver, Burnaby Lake, and Cultus Lake.<sup>49</sup> Other small sites known to First Nations might well have gone unrecorded in government records.

Steve Earle, a geologist on Gabriola Island who has diatomaceous earth on his property across the road from an old diatomaceous surface mine, volunteered to provide me with some so that I could test it for colour and suitability as a pigment.<sup>50</sup> It is clear from the written and oral accounts that the historical material was a white clay or a white powder derived from the clay; but Earle's dried lumps were a disappointing yellowish colour. When they were crumbled and mixed with water, a dark brown mud resulted.

Boas's explanation that "this clay is burnt in a fire made of willow wood; until it becomes a fine, white powder," and Ts'umsitun's comment on baking a black clay until it was white, provided a clue for the next step.<sup>51</sup> I baked a dry lump of diatomaceous earth from the Gabriola deposit, and the organic materials that had created the yellow colouring (and the brown mud) were thereby burned away, leaving the lump white and lightweight.<sup>52</sup>

To test and compare the wool-cleaning properties of diatomaceous earth and clay, I asked Leola Witt, a weaver and spinner who runs a studio at Whippletree Junction in the Cowichan Valley, if she could sell me a dirty and greasy fleece for an experiment. She happily offered one and refused payment for it, which says something about the condition

<sup>49</sup> "MINFILE," *MINFILE Digital Data* (Victoria: Ministry of Energy and Mines, 2006): <http://minfile.gov.bc.ca/default.aspx?page=searchbasic&d=15015075329>. Data from this database showing reported clay and diatomaceous earth deposits have been input into a map available at <http://minfile.gov.bc.ca/default.aspx?page=searchbasic&d=15015075329>. For the Gabriola deposit, see Jenni Gehlbach, "Unearthing the Past: The Diatomaceous Earth Mine on Gabriola Island," *SHALE* 24 (June 2010): 11–30, available at <http://www.nickdoe.ca/pdfs/Webp277c.pdf>.

<sup>50</sup> Gabriola is five kilometres from the Snuneymuxw village. First recorded contact with the First Nations in this area was with a village located on Gabriola, within five kilometres from the site where geologist Earle collected the sample.

<sup>51</sup> Boas, *Second Report on the Indians of British Columbia*, 566; Arnett, *Two Houses Half-Buried in Sand*, 148.

<sup>52</sup> Given the local fire restrictions in force, the clay was put into a fireproof dish and a propane torch was used to burn the diatomaceous earth.



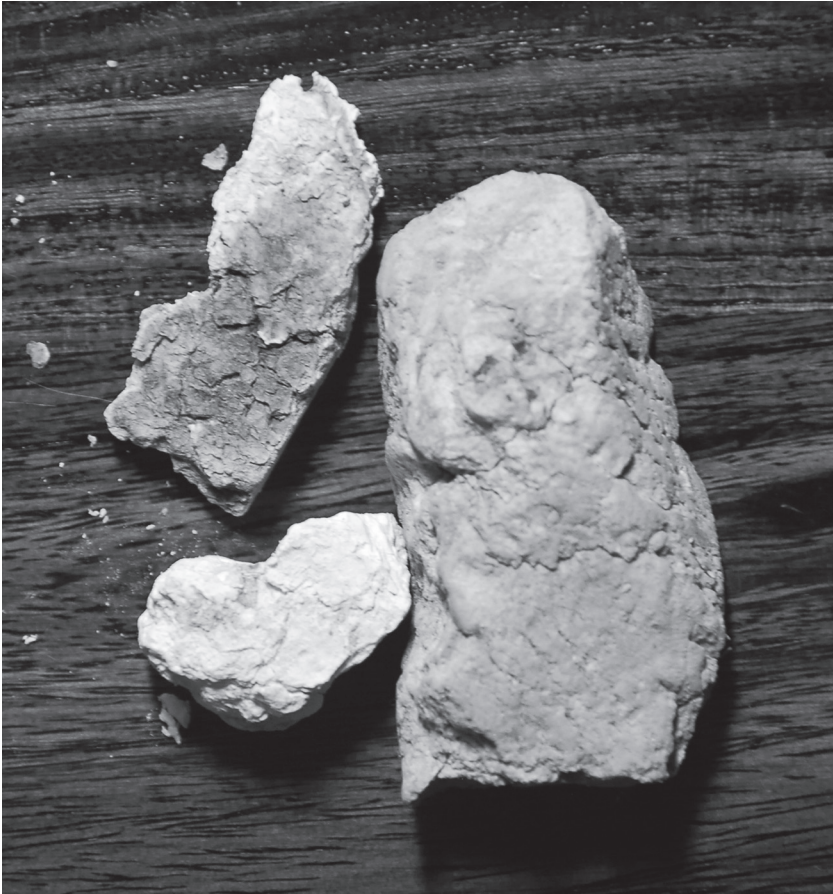


Figure 7. Diatomaceous earth. Right, as collected; bottom left, burned; and top left, partially burned. Photo by the author.

of the fleece. I removed some of the muddiest bits and split the fleece into sections of roughly five hundred grams each.

I pounded diatomaceous earth into one sample of the dirty and greasy sheep fleece. The diatomaceous earth did indeed whiten the fleece, but I was not sure whether this was due to the addition of a white colouring to the fleece or to the removal of the yellowish oils. The fleece did seem to absorb the beads of oily lanolin, which made it a lot less greasy without leaving it feeling too dry, and there was still a softness to it.

This made me reflect that, after beating the wool, and with time, the particles of diatomaceous earth would naturally have fallen out of Salish blankets, removing any grease trapped inside the hollow skeletons.

A certain amount of grease has its advantage in spinning: it allows the fibres to draft easier while spinning. Like the original Cowichan sweaters that contained lanolin grease, it made the garments waterproof as well as warm – ideal for the wet west coast.

I followed this up with a comparison test in which I subjected three samples (A, B, and C) of dirty and greasy sheep fleece to different cleaning methods. I left Sample A as raw, unclean, and untreated wool. I washed Sample B with hot water and dish detergent. I mixed Sample C with powdered grey clay: not being able to collect local clays from Coast Salish territory, I used a non-local commercial clay for Sample C.<sup>53</sup> I mixed Sample D with diatomaceous earth. However, I added only a small amount of diatomaceous earth as more would have produced a whiter fleece. I subjected the sample to very little pounding because the diatomaceous earth was already powdered. More pounding might have helped absorb more of the yellow lanolin. I then asked eight people (four women and four men) to answer five questions related to the cleanliness of each sample:

1. “Which sample feels the cleanest?” Five chose the washed Sample B, which made sense; however, when I removed Sample B and asked them to choose again, they chose evenly between the natural Sample A and the diatomaceous Sample D.
2. “Which sample is the dirtiest?” Sample C, the clay mixture, was unanimous.
3. “Which sample is the whitest?” The washed Sample B was the choice, but when I removed it, they chose evenly between the natural sample and the diatomaceous Sample D.
4. “Which sample smells the cleanest?” The eight subjects chose the washed Sample B followed by the diatomaceous Sample D.
5. “Which sample is the smelliest?” Five subjects agreed that the clay Sample C was the smelliest while three chose the unclean sample.

<sup>53</sup> George Mackie of North Saanich, scientist and potter, provided me with local clays that I later tested on more dirty fleece samples to see if there was any difference in feel, cleaning, or degreasing powers; however, my results seemed to be the same as with the commercial grey clay.

Taken together, apart from washing with hot water and dish detergent, diatomaceous earth provided the best choice for clean, white, somewhat deodorized fleece.

Clay found in the Coast Salish regions generally burns to a pink, red, or brown colour, while diatomaceous earth burns to a white. Diatomaceous earth has a reputation as a natural insecticide, a property not possessed by clay. These attributes, plus the results of the above experiment, strongly suggest that what early settlers and ethnographers called “pipe clay” was actually diatomaceous earth. Having said that, it is conceivable that local clays contain some percentage of diatomaceous earth, possibly enough to act as a natural insecticide. A good source of diatomaceous earth would have been ideal in the process of producing Coast Salish robes and blankets.

In summary, the curious clay, *st'ewoqw'* or *st'a'uok'*, while not pipe clay, did provide similar benefits and also acted as a natural and safe insecticide. We can safely speculate that diatomaceous earth brightened and whitened the wool; removed excess grease and oil; made the fibres easier to spin; killed fleas, mites, and dog lice in the fibre; and created a built-in insect barrier for the finished blanket. It was also applied beneficially to blankets that required cleaning or additional exposure to insecticide. The ability to do all this made diatomaceous earth a valuable ingredient in the Coast Salish spinning and weaving process.