Teaching the Whole Body:
Apprenticeships in Gwich'in Canoe Building

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Abstract

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Academic inquiry has long privileged abstract knowledge by creating cognitive schemas of understanding that are primarily transmitted through language. Given that we understand the world through all of our sensory modes and bodily participation, apprenticeships offer a unique opportunity to study the multiple ways in which we acquire knowledge. This thesis considers how embodied knowledge is co-constructed between master and apprentice in the context of a long-term research creation field study with skilled craftsmen learning to build birch bark canoes. In repudiating the separation of mind and body, and the categorical tidiness of dialectical models that address the interactions between people, objects and the environment, it is herein argued that knowledge emerges in a field of total corporal experience that is embodied through skilled practices. Apprenticeships in canoe building reveal that while dialogue is an important instructional tool, kinaesthetic interactions with materials situated in landscapes are also profound actors in ways of knowing.

Acknowledgements

Many contributors made possible this academic journey and masters in anthropology. The Social Sciences and Humanities Research Council in Ottawa, Ontario provided funding, which helped to cover much of the expenses related to fieldwork. Mr. Don Gardner of Canmore, Alberta shared his considerable knowledge throughout my apprenticeship with him. I received support and guidance in the thesis and university course work from Dr. Mark Watson and Dr. David Howes. I also wish to thank the professors who I have had the pleasure of learning from and who have remained influential to my thoughts and work; Dr. Sally Cole, Dr. André Costopoulos, Dr. Homa Hoodfar, Dr. Christine Jourdan, Dr. Colin Scott, and Dr. Matthew Walls. Thank you for being a part of this project.

I would like to extend my sincere gratitude to everyone who shared their time, stories, personal experiences, and knowledge, as well as the people who graciously agreed to entertain my oft-outlandish requests to harvest materials on lands and in places that did not belong to me. Without exception everyone generously gave his or her permission, support, and consent. Thank you for seeing the value in this research: Mr. Jeremy Ward, curator Canadian Canoe Museum, Mr. Rick Nash, canoe builder, Mr. David Gidmark, canoe builder and author, Mr. Jean-Maurice Matchewan, former customary chief of Kitiganik/Rapid Lake, Mr. Albert Pokodgish elder and canoe builder in Kitiganik/Rapid Lake, M. André Côté, directeur Territoires et Ressources et M. Éric Canapé, conseiller, Conseil des Innus de Pessamit, M. Philippe Rock, elder in Pessamit, M. Pierre Clouâtre, chef Ministère des Forêts, de la Faune et des Parcs Quebec Manicouagan-Outardes, M. Marc Savard, chercheur ingénieur forestier, Prof. Cornelia Krause Université de Quebec a Chicoutimi, M. Gilles Renaud, directeur de centre École forestière de La Tuque, Mr. Peter Nitschke and Ms. Joyce Close, Bancroft Minden Forest Company, M. Laurent Brulé et M. René Dufour of St. Didace, Quebec and Mr. Russell Hart, for allowing me to repurpose his storage shed and backyard into a canoe building workshop. Special thanks to Mlle. Sandra Audet for her unwavering support and for her assistance in the field to help find and harvest bark.

Table of Contents

List of Figures

Chapter I: Introduction

1.1 – Research Question

It is through the investigation of my main research question, "how does an apprentice use somatic modes of learning to learn from the master?" that I will argue for a greater consideration of the body in the approach to teaching cultural anthropology at university. This thesis complements a research creation project that is explored by engaging in participative fieldwork as an apprentice learning to build a Gwich'in birch bark canoe. Research creation furthers the development of knowledge through scholarly investigation in a combination of media, which includes skilled performances and creative works. My research is supported by the perspective that all theoretical knowledge, even the most abstract, begins as a bodily practice.[1] However, the process through which embodied knowledge is co-constructed remains an under-explored topic in both the anthropology of learning and in the educational theory that guides the development of curriculum. I hypothesize that the construction of Gwich'in canoes involves a high degree of embodied knowledge that can only be developed through learning processes that involve thinking through the body in environmentally situated practices.

My objectives were to use the apprenticeship model of instruction as a unique opportunity to study the multiple ways in which learning occurs. This research uncovers the cognitive relations between observation and action by using my own body as a site of experimentation and documenting the experiential ways craftspeople supplement the use of language to communicate knowledge and teach skills.[2] Apprenticeships respect diverse ways of learning by giving a chance to succeed to students who also learn by doing things with their hands. Moreover, they provide rich whole body experiences that mobilize all the senses, to include; touch,

[1] Shusterman, R. (2012). *Thinking through the body: Essays in somaesthetics.* Cambridge, UK: Cambridge University Press.
[2] Jackson, M. (1989). *Paths Towards a Clearing: Radical Empiricism and Ethnographic Inquiry.* Bloomington and Indianapolis: Indiana University Press, 4.

smell, and taste, which are essential for understanding and 'making sense' of the world we live in. The goal is to highlight the value of craft and skilled practice so as to recognize these forms of complex knowledge as intelligent expressions of achievement on par with those already espoused in academia and anthropology, such as, oration, debate, and writing.

1.2 Thesis Structure

The thesis is structured around an apprenticeship in canoe building. This first chapter, beyond providing the research question, the thrust of which leads to contributions in research creation and sensory studies, also includes an explanation of the circumstances leading up to my own apprenticeship with Don Gardner as well as his biography. In chapter 2 the Dene canoe as a subject matter and investigative impetus is used to unravel a segment in oral history and historical records. In the retelling of various cultural narratives a glimpse of supplemental markers may be garnered to recover parts of the embodied learning involved in the building of canoes. Chapter 3 examines the multi-disciplinary research methods that arose out of the apprenticeship. The importance of tactile appreciation is exemplified through surveying, illustration, and building models. Furthermore, the apprenticeship in canoe building puts research into action through the mobilization of intergenerational learning opportunities. Chapters 4 and 5 contain the main ethnographic findings of the fieldwork involving the canoe-building project. These chapters respectively deal with the gathering of materials and the construction sequence of canoe building. In the concluding chapter the relevant theoretical frameworks on apprenticeships, embodied knowledge, and sensory studies, which inform the academic premise for the inclusion of skilled bodily practices at university, will be discussion in relation to the findings of this research.

1.3 The Apprenticeship with Don Gardner

On the 22nd of May 2003, I left Ottawa hitchhiking heading northwest and embarked on a journey that would eventually bring me to Alaska. I wanted to learn how to build an *ikyak,* which is a type of kayak made by the Unangan people who inhabit the Aleutian Islands. Along my way, I stopped at museums that had collections of kayaks, including the Museum of Civilization in Gatineau, Quebec and the Canadian Canoe Museum in Peterborough, Ontario. By the 5th of June after having paid a visit to the Arctic Institute of North America and the Glenbow Museum in Calgary, Don Gardner's name had come up in conversation from several independent sources as someone I should meet. Not wanting to overlook numerous signs pointing me in the same direction, I called him and we arranged to meet the following week on the 11th of June. He picked me up in front of a Co-op grocery store near a LRT station on the north side of Calgary. He said: "I'll be the guy in a blue van." To which I replied: "I'll be the guy with brown pants and a green nap-sac." When I un-shouldered my pack and climbed in, I sized up his appearance. As I noticed the layers of dust on the dashboard and the toothbrush in the cup holder, I got the feeling I was in good company. We drove to his workshop on the outskirts of town. I was 25 years old, over-confident, and knew too little about kayaks to even realize how little I knew.

Don's workshop had a woodstove, carving tools, bits of animal parts, hides, and bones spilling out of boxes on shelves along the back wall and in the middle of the floor was a beautiful Aleutian kayak destined for a client in Alaska. Broken radios and small counter-top appliances hung from trees behind the shop strew about like the high waterline spoils from the aftermath of a flood. On his workbench were scale drawings of artefacts, photos, and books that gave a glimpse into the research that went into this craft. I thought to myself I would love to do this kind of work and I wouldn't even have to go all the way to Alaska to learn how to build kayaks it was all happening right here in Calgary. In a couple of weeks Don and his friend Darrel Nasogaluak from Tuktoyaktuk, Northwest Territories would be demonstrating how

to build an Inuvialuit kayak as part of an exhibition at the Glenbow Museum. Perhaps I could watch from the sidelines, take some photographs, some notes and come away with detailed knowledge of the building process. Don advised, "There will always be more boats, best to stick to your plan and head up to Alaska." He gave me a little piece of paper with his phone number and mailing address and said to call collect if I ran into trouble or needed help. I kept on heading west to Vancouver Island, then took the ferry from Port Hardy to Prince Rupert and kept hitchhiking until on the 19th of July 2003, I crossed over the border into Alaska. Don and I would meet again later that summer in Homer, a small fishing village out on the tip of the Kenai Peninsula, where he and his wife Joan would deliver the Aleut kayak to an exhibit at the newly built cultural heritage center. As our friendship developed, we have gotten to know each other quite well.

Don was born in Calgary in 1946. His parents Laura and J.S. "Smitty" Gardner enjoyed the outdoors and would bring their children hiking and wilderness camping in the neighbouring Rocky Mountains. When he was young he built rafts that would carry him fishing out to the middle of the lake. Throughout his adolescent years, he continued making things out of sticks and experimented with hunting equipment and bows and arrows. He began university in geology and managed to get hired as an apprentice guide for a mining company doing fieldwork in Greenland for four summers. He worked alongside Inuit hunters who would leave their kayaks and harpoons to rest while they also took on a bit of wage labour to guide the geologists into remote sites that were hard to access. In Greenland he met Eigil Knuth, a renowned Danish explorer and archaeologist who was researching the paleoeskimo muskox hunters that lived around Independence Fjord. Upon returning to Calgary, he switched programs and in due course earned a degree in archaeology.

While in Calgary, Don would take off to the Rocky Mountains every chance he could get. By the young age of 19, he had completed the traverse from Moraine Lake to Lake Louise in 6 days, climbing 22 summits, each over 10,000 feet, along the way. Increasingly, he was drawn to winter alpinism, Nordic skiing, and arctic exploration.

In 1967, he and three friends were the first to cross The Great Divide on skis, which gave rise to a boom in backcountry skiing in the Canadian Rockies.[3] He crossed Ellesmere Island hauling sledges over 500kms from Eureka to Alert, again setting another first for skiing. Later, he would ski over 900kms from the Prairies to the Pacific Coast to get a sense what it felt like in his bones to travel great distances. He also joined the Canadian National Ski Team.[4] Don has consulted and designed world-cup and recreational ski trails for clients including, the 1988 Calgary Winter Olympics, Peter Lougheed Provincial Park, and the Canmore Nordic Center.

In the 1970s Don worked on the Thule Archaeology Conservation Project.[5] With the encouragement of several Inuit elders, he would carve caribou antler and muskox horn and make them into sinew-backed bows.[6] Examples of his engagement with communities include: The Kitikmeot Heritage Society in Cambridge Bay where he facilitated bow-making workshops; the Tłı̨chǫ Dene in Behchokǫ̀ where he participated in a Dogrib canoe building project;[7] and the Inuvialuit in Kitigaryuit where he assisted with an archaeological inventory and mapping project documenting the surface remains of driftwood kayaks, umiaks, and sled frames so that the whaling site could be recognized as a National Historic Site.[8] From the mid-1960s to the 1980s there was never a year that went by without frequent and sustained trips to the Arctic. Don has conducted extensive research of collections in museums and has amassed a lifetime's worth of drawings and notes of artefacts.

[3]Klassen, M. (2011) The Great Divide Ski Traverse, 270-283. [In] C. Scott & M. Klassen, *Summits & icefields 1: Alpine ski tours in the Canadian Rockies.* Victoria, B.C.: Rocky Mountain Books.
[4] [See:] Scott, C. (2000) *Pushing the limits: The story of Canadian mountaineering.* Calgary: Rocky Mountain Books., 174-179. [&] Scott, C. (2005) *Powder pioneers: Ski stories from the Canadian Rockies and Columbia Mountains.* Calgary: Rocky Mountain Books., 173.
[5] [See:] Gardner, D. (1976) Archaeological Site Record, LeDG-1, Ptarmigan Fiord, Cumberland Sound, Baffin Island, NU. Department of Culture, Language, Elders and Youth, Igloolik.
Gardner, D. (1979) 1976 Site Survey of Cumberland Sound and the Clyde Area. [In] Archaeological Whale Bone: A Northern Resource. First Report of the Thule Archaeology Conservation Project, Allen P. McCartney, ed., University of Arkansas Anthropological Papers No. 1, Fayetteville, AR., 365-386.
[6] [See:] Crawford, Glen (1983) *New People Old Ways.* [Featuring Don Gardner] Canmore: Alberta: Glen Crawford Production Services.
[7] Andrews, T. & Zoe, J. (1998) The Dogrib Birchbark Canoe Project. *Arctic, 51:*1.
[8] Hart, E. & Inuvialuit Social Development Program. (1997) *Kitigaaryuit archaeological inventory and mapping project, 1996: Field report.* Inuvik, N.W.T.: Inuvialuit Social Development Program. [&] Inuvialuit Communications Society. (2000) 02 Suaangan Kitigaaryuit / Gordon Aknavlak living trapping in the area. Inuvik: N.W.T. (12:00 min -22:15min)

Through his company "Oldways" he produces replicas of tools, hunting equipment, canoes, and kayaks, which serve as talking pieces among youth and elders in workshops, or exhibits in museums and cultural heritage interpretation centers.[9] Don has mentored a number of students in archaeology and has been an influential contributor to the ongoing research at the University of Calgary in areas that concern practical skills, knowledge, land, and movement.[10] He remains active in archaeology and in his commitment to helping people learn about the past. Although Don is now retired, he continues to make the things he has always dreamt about and together with his wife Joan they climb and ski the mountains that surround their home in Canmore, Alberta.

Over the years Don would invite me to help out on various projects. It is my experience working with Don on a Gwich'in canoe in Canmore from May to October 2008 that informs much of the ethnographic research contained in this thesis. As I began my master's degree in 2012, I wanted to bring the apprenticeship learning model full-circle and apply what I had learned over the years with Don into a practical skills based research project at university. This thesis provided me with an opportunity to assemble, synthesize, and attempt to reconstruct a canoe for the first time on my own. While the canoe type remains the same as that taught to me by Don in Western Canada, the materials I harvested come from closer afield to my present residence in Eastern Canada. Consequently, the bark has been sourced from forests

[9] [For examples of reproduction work see:] http://dongardner.blogspot.ca

[10] [See:] Dawson, P., Levy, R., Gardner, D., & Walls, M. (2007) Simulating the behavior of light inside Arctic dwellings: Implications for assessing the role of vision in task performance. *World Archaeology, 39*(1), 17-35.

Lemoine, G. (1985) Experimental use wear analysis of bone tools. Unpublished Master Thesis, Department of Archaeology, University of Calgary.

Lemoine, G. (1991) Experimental analysis of the manufacture and use of bone and antler tools among the Mackenzie Inuit. Unpublished Ph.D. dissertation, Department of Archaeology, University of Calgary.

Schledermann, P. (1996) Voices in Stone: A personal journey into the Arctic past. No. 5 Calgary: Arctic Institute of North America, University of Calgary.

Walls, M. *Caribou Inuit Traders of the Kivalliq Nunavut, Canada.* British Archaeological Reports Limited, 2009.

Walls, M. (2016) Frozen Landscapes, Dynamic Skills: An Ethnoarchaeological study of Inuit kayaking enskillment and the perception of the environment in Greenland. Ph.D. dissertation, Department of Archaeology, University of Toronto.

in Algonquin territories along the Quebec/Ontario borders, rather than from the Yukon in Gwich'in territory, and the spruce has been sourced from Innu territories along the north shores of the Saint-Laurence River. My partner Sandra Audet assisted me on many bark-finding journeys and it was a true pleasure being able to share in the excitement and cooperative experience of harvesting bark together. Don also remained available throughout the whole project as a mentor and friend. I now realize that in my apprenticeship with him, he always made everything seem so easy, especially since he already has an intimate connection with the land and local knowledge of where to find the appropriate materials. A pivotal stage in the development of this ongoing research learning about how to build canoes is the departure from working beside Don as his apprentice to actually trying to figure out and do things on my own; though his teachings and his voice continue to guide me and never feel far away.

Chapter II: Gwich'in Canoes: A Narrative History

2.1 – Introduction

The Gwich'in canoe is part of a larger family of Athabascan canoes types that exhibits remarkable continuity in form with neighbouring canoes over an expansive territory. Yet the Gwich'in canoe, being a local variant, also has distinctive features, which become apparent through a comparative study. Typically, most Athabascan canoes have a characteristic flat-bottom shape and boxy or flared V-angle sides. Broadly speaking, they also exhibit exposed stem pieces, inner and outer gunwales that are often split from a single piece of wood and left attached at the ends to form little stem blocks, a rigid floor rack (though not always), a covered fore-deck (sometimes aft as well) and constructed from a main sheet of bark and deep side panels that can be sewn up from multiple pieces of bark if need be. These features distinguish this canoe type from other canoes in the rest of the continent, although it is sometimes referred to as a kayak-form canoe because of its resemblance to flat-bottom arctic kayaks.[11]

The canoe is of central importance to the lives and livelihood of the Dene. In this next section, a segment on the oral history and primary-source observations of Dene canoes is given. These are presented not so much as historical facts but rather as a retelling of various cultural narratives, where the stories about canoes provide an invaluable lens through which to look and listen in an attempt to better understand the relationship between people, materials, and land. Although the history is wrought with politics and embedded in a process of colonial state making, that is not the focus of this thesis.[12] Instead a segment on the history of these watercraft is necessarily presented here because it offers an oblique glimpse into communities of practice with a host of associative canoe related skills. A re-reading of historical data can not only help to garner a sense of the utility the canoe in the

[11] Adney, T. & Chapelle, H. 1964. *The Bark Canoes and Skin Boats of North America.* Washington D.C.: Smithsonian Institute, 158-168.
[12] Stoler, A. L. (2002) Colonial Archives and the Arts of Governance. *Archival Science. 2*:1 87.

lives of the people it serves and the conditions and distances travelled, but also prove materially useful to the present day builder. To be clear, the embodied knowledge proposed in this thesis is still in the making and in the physicality of practice, as will be elucidated upon in the coming chapters. However, the historical records can be reconciled with the knowledge gained through skilled practice by using them as static markers along a "taskscape,"- a term coined by Ingold to describe a field of practice within the temporality of landscape where the activities of practitioners come into focus.[13] Each depiction in the historical record can act as a navigable waypoint or a collapsed node that represents a pattern of activity carried out on the land by a skilled agent embedded in the sociality of communal life.[14]

2.2 – Canoes in Oral History

Dene oral history tells of a close interdependence between people and caribou and the use of the canoe in tracking and hunting caribou. The Weledeh Yellowknives, a related Dene group, describe through their own oral history the utility of canoes as follows:

> In warmer months, they followed summer trails by canoe to hunt caribou and muskox. Most Weledeh Yellowknives families used the barrens all winter, which occurs there from mid-October until April (and sometimes May). Much of the non-winter activity would consist of preparing for winter in treeline camps and hunting for caribou around the large lakes from late summer to the first snowfall. From late summer to early fall each year, hunters took their hand-made birchbark (and later, canvas) canoes up the Weledeh and several other rivers, their dogs running along shore. Making camps below the treeline, hunters gathered firewood and made toboggans, snowshoes, and tentpoles. Leaving caches of meat for the families who could stay in these camps, the hunters headed farther north to caribou migrating south through the lakes- Courageous, Mackay, Lac de Gras, Lac du Sauvage, and the Coppermine River. Caribou provided the families with new clothing, toboggans, tipi, floor mats, meat and fat vital for winter survival. The rest of the winter was spent travelling through the barrens hunting and trapping. Some hunters left camp first, making a trail of meat caches for others to follow. After the people were engaged in the fur trade, trappers would make occasional trips to the posts at Reliance and Resolution.

[13] Ingold, T. (2000) *The perception of the environment: Essays on livelihood, dwelling and skill.* London: Routledge, 194.
[14] *ibid,* 195.

> In fall, caribou have acquired fat and their coats are thick and rough, ready for winter. Because Dene, too, need fat for winter and the thick hair on caribou helps keep them warm in the frigid cold and winds on the barrens, caribou hunting in fall was vital to the people's survival. Elders insistently repeat that the caribou is the most important animal to the Dene, that the people cannot survive without caribou. The single most important staple in the people's diet besides water, caribou is most useful to Dene in fall time.
>
> (Weledeh Yellowknives Dene)[15]

Evidence in the Canadian Barrenlands dating back 8,000 years suggests that cultural differences among the Dene could very well be the result of individual groups of hunters following a particular caribou herds that maintain their respective seasonal migration routes. According to Gordon, "The long-term continual bond […] between different Dene cultural groups and individual caribou herds helps to explain ethnological differences between these cultures in northcentral Canada."[16] Archaeological data corroborates that many sites in the region are at water crossings on rivers, where hunters waited in their canoes to spear swimming caribou before they could reach the other side.[17] Many Dene place names are at the intersections of caribou ecology and harvesting practices.[18] The Dene Mapping Project of the 1970s and 1980s, (a Dene initiative to record their traditional territory and land-use on modern cartographic waypoints), gives an indication of the vast territories over which caribou are pursued.[19] However, the mapping project also highlights the paradox of representing the dynamic social relationships among Indigenous communities via cartographic maps, because it obscures a core moral ethos among Indigenous people whose livelihood maintain borderless kin network. [20] Notwithstanding the above implications that Indigenous territory is never fixed, the

[15] Weledeh Yellowknives Dene (1997) "Weledeh Yellowknives Dene: a history" Dettah: Yellowknives Dene First Nation Council: 12-13.
[16] Gordon, B. (2005) 8000 years of caribou and human seasonal migration in the Canadian Barrenlands. *Rangifer, 16*: 161.
[17] Gordon, B. (2003) *Rangifer* and man: An ancient relationship. *Rangifer, 14*: 20-21.
[18] Benson, K. & Gwich'in Social and Cultural Institute & Gwich'in Renewable Resources Board. (2015) Gwich'in knowledge of Bluenose West Caribou, 18.
[19] Nahanni, P. (1977) The Mapping Project. [In] *Dene Nation: the colony within. M. Watkins* (ed.) Toronto: University of Toronto Press, 21-27.
[20] Thom, B. (2009) The paradox of boundaries in Coast Salish territories. *Cultural Geographies, 16:* 179-205.

following two maps are presented as a reference to comparatively illustrate the extent to which watercraft are used in navigating the waterways over an expansive Gwich'in territory and the English names and locations used most often in historic documents to identify the various Dene groups. The Gwich'in, for example, while in pursuit of caribou from the Bluenose herd, Boreal Woodland herd, and the Porcupine herd, have hunting routes that extend as far as 750 kilometers into neighbouring K'ahsho Got'ine District (Hare Dene) as well as into regions where the Inuit live.[21]

Mapping Gwich'in Hunting Trails

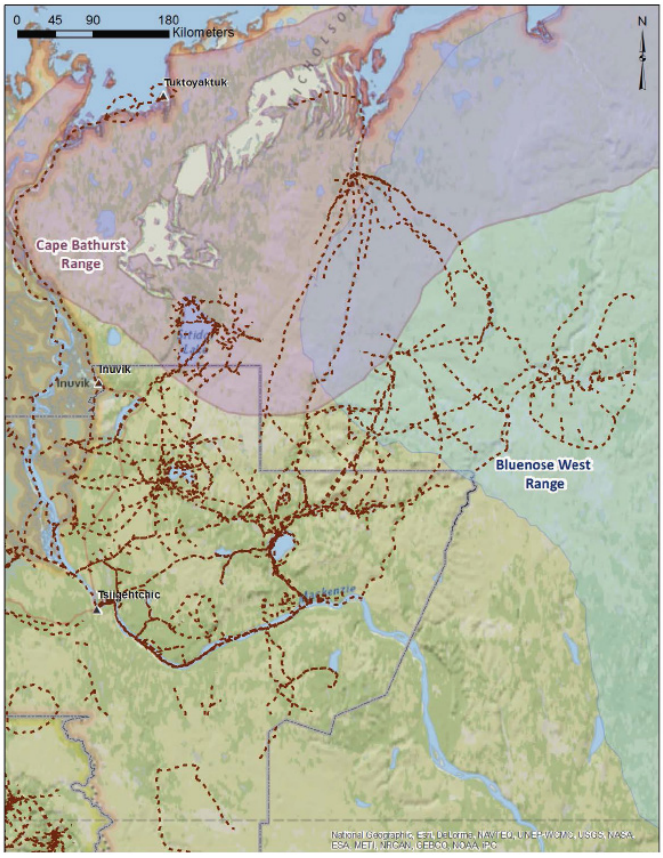

Fig. 2.1 Map of Gwich'in hunting routes. Reprinted from Benson, K. & Gwich'in Social and Cultural Institute & Gwich'in Renewable Resources Board. (2015)

[21] Benson, K. & Gwich'in Social and Cultural Institute & Gwich'in Renewable Resources Board. (2015)

Map of Dene Groups

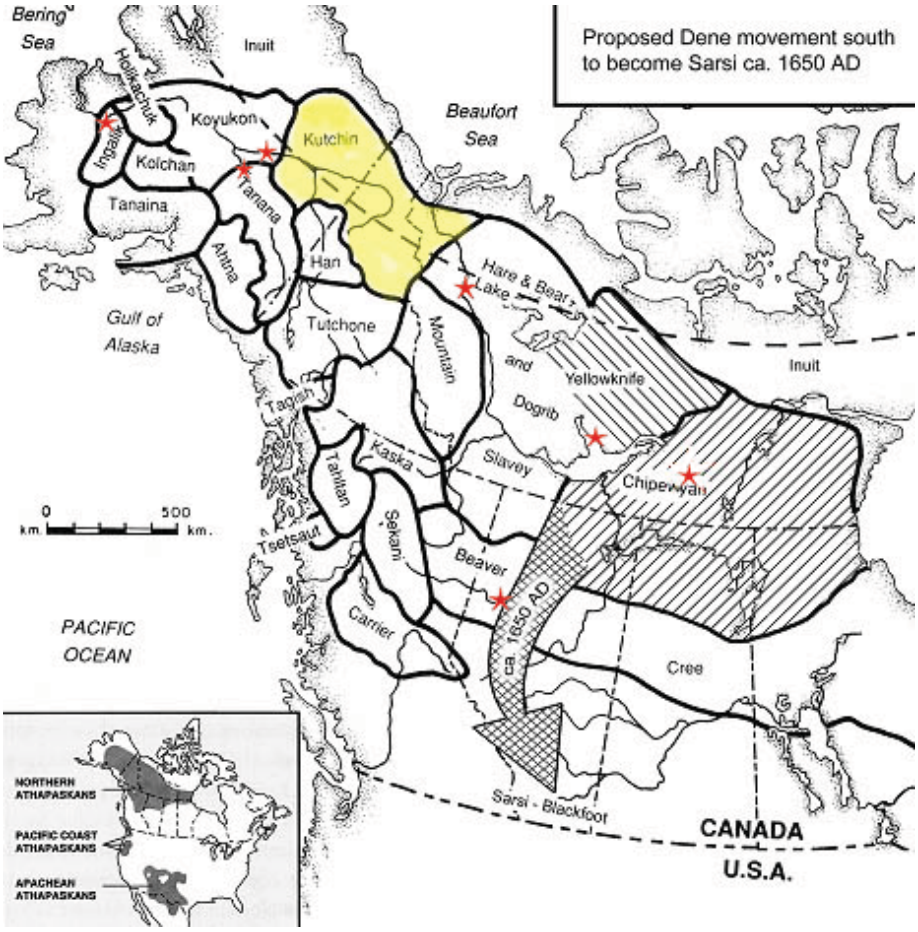

Fig. 2.2 Map of Dene groups. Adapted from Gordon, B. (2008) *Southern Athapaskan (Dene) Migration Patterns.* A presentation delivered to the Society for American Archaeology, Vancouver, Canada.[22]

[22] [Note:] This map is embellished with red stars indicating the locations of historic accounts of Dene canoes that are discussed later in this chapter.

2.3 Chipewyan Canoe Building at Lake Clowey

On the 7th of December 1770, Samuel Hearne and a party of Chipewyan led by Matonabbee set out from Fort Prince of Whales at the edge of the Hudson Bay on their way to reach the Arctic Ocean by summer. Hearne records his eye-witness account of the Dene building canoes at Lake Clowey, which he says has a small river on the west side that leads to Lake Athapuscow. He also provides a detailed survey and illustration of the construction sequence of what he calls a "Northern Indian canoe," both of which are reprinted here and on the following page.

> On our arrival at Clowey on the third of May [1771], we found that the Captain's brother, and those who were sent a-head with him from Theley-aza River, had only got there two days before us; and, on account of the weather, had not made the least progress in building the canoe, the plan of which they had taken with them. The same day we got to Clowey several other Indians joined us from different quarters, with intent to build their canoes at the same place. Some of those Indians had resided within four or five miles, to the South-East of Clowey, all Winter; and had procured a plentiful livelihood by snaring deer, in the manner which has been already described.
>
> Immediately after our arrival at Clowey, the Indians began to build their canoes, and embraced every convenient opportunity for that purpose: but as warm and dry weather only is fit for this business, which was by no means the case at present, it was the eighteenth of May before the canoes belonging to my party could be completed. On the nineteenth we agreed to proceed on our journey; but Matonabbee's canoe meeting with some damage, which took near a whole day to repair, we were detained till the twentieth.
>
> Those vessels, though made of the same materials with the canoes of the Southern Indians, differ from them both in shape and construction; they are also much smaller and lighter; and though very slight and simple in their construction, are nevertheless the best that could possibly be contrived for the use of those poor people, who are frequently obliged to carry them a hundred, and sometimes a hundred and fifty miles at a time, without having occasion to put them into the water. Indeed, the chief use of these canoes is to ferry over un-fordable rivers; though sometimes, and at a few places, it must be acknowledged, that they are of great service in killing deer, as they enable the Indians to cross rivers and the narrow parts of lakes; they are also useful in killing swans, geese, ducks, &c. in the moulting season.
>
> All the tools used by an Indian in building his canoe, as well as in making his snow-shoes, and every other kind of wood-work, consists of a hatchet, a knife, a file, and an awl; in the use of which they are so dextrous, that every thing they make is executed with a neatness not to be excelled by the most expert mechanic, assisted with every tool he could wish.
>
> In shape the Northern Indian canoe bears some resemblance to a weaver's shuttle; being flat-bottomed, with straight up-right sides, and sharp at each end; but the stern is by far the widest part, as there the baggage is generally laid, and occasionally a

second person, who always lies down at full length in the bottom of the canoe. In this manner they carry one another across rivers and the narrow parts of lakes in those little vessels, which seldom exceed twelve or thirteen feet in length, and are from twenty inches to two feet broad in the widest part. The head, or fore part, is unnecessarily long, and narrow; and is all covered over with birch-bark, which adds considerably to the weight, without contributing to the burthen of the vessel. In general, these Indians make use of the single paddle, though a few have double ones, like the Esquimaux: the latter, however, are seldom used, but by those who lie in wait to kill deer as they cross rivers and narrow lakes.

During our stay at Clowey we were joined by upward of two hundred Indians from different quarters, most of whom built canoes at this place; [...] [23]

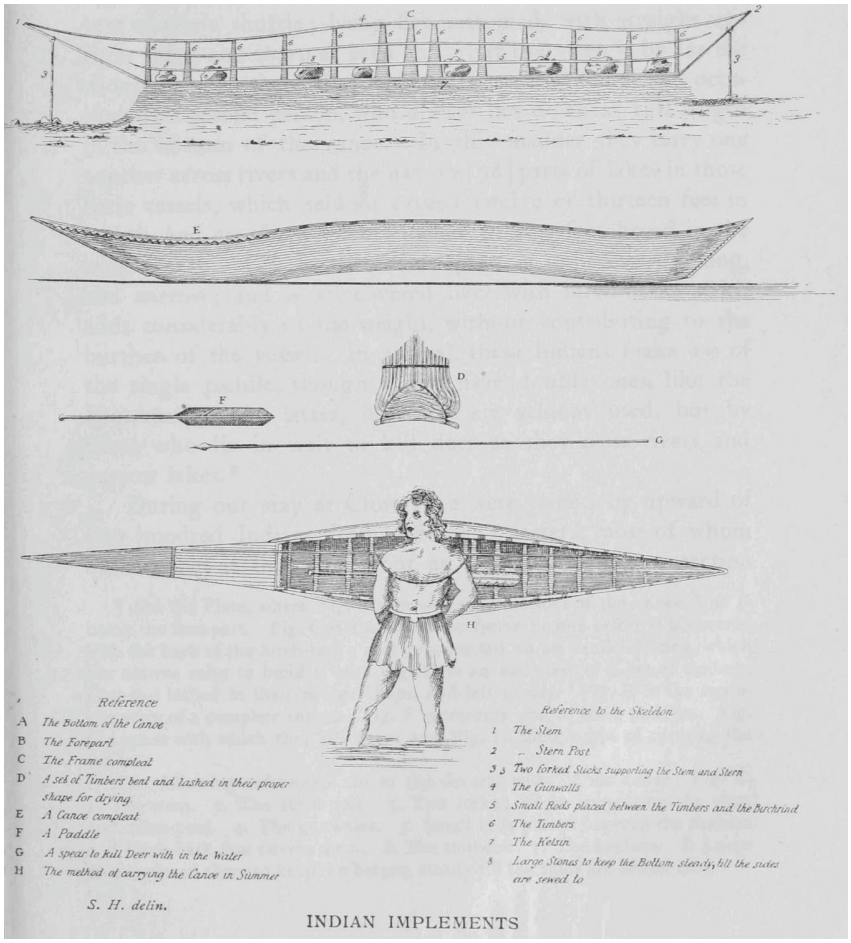

Fig. 2.3 Illustration of canoe building at Lake Clowey. Reprinted from Hearne, S. (1911) A Journey From Prince of Wales's Fort in Hudson's Bay to the Northern Ocean In the Years 1769, 1770, 1771, and 1772. Toronto: The Champlain Society.

[23] Hearne, S. (1795) *A journey from Prince of Whale's Fort in Hudson's Bay to the Northern Ocean. Undertaken by order of the Hudson's Bay Company for the Discovery of Copper Mines, a Northwest Passage, &c. In the Years 1769, 1770, 1771, 1772.* Facsimile reprint of the first edition. Edmonton, Alberta: M.G. Hurtig Ltd., 1971, 96-98.

The location of Lake Clowey has been the subject of speculation, but Fuller who has made this the object of his research, has located the lake to be at the same place as what is now called McArthur Lake about 250km north of Lake Athabaska and 200km East from the Western most tip of Great Slave Lake.[24] This puts Hearne and his company well within Chipewyan territory. On April 20th, 1771 ten days prior to their arrival at Lake Clowey, "Matonabbee sent one of his brothers, and some others, a-head, with birch-rind and wood-work for a canoe, and gave them orders to proceed to a small lake near the barren ground called Clowey."[25] This would indicate advanced knowledge and familiarity of the route, which his party and guide were travelling on, but it also reveals that canoe materials were procured and then transported overland for hundreds of miles if not more. There are instances where the burden of carrying a canoe over large distances outweighs the burden of making one anew, regardless of where the materials are secured. Since hunter-gatherer peoples are highly mobile, it is quite possible that Lake Clowey was a gathering place for canoe building attended by nearby Slave and Dogrib Dene. Although there is some overall consistency in canoe form and construction among all Dene people there are also some important regional differences and the Gwich'in are still a long way north and west from the Chipewyan, Slave, and Dogrib.

Conspicuously absent from Hearne's sketch is the floor rack, which one might expect to find in Dene flat-bottom canoes. Instead he lists a "keelson" in his "reference to the skeleton" on his illustration. There are 13 ribs and no indication of sheathing inside to protect the bark or of a framework that would have maintained the shape of the hard-chinned creases in the bark of a flat-bottom hull. Keelsons do exist in Inuit watercraft in both kayaks and umiaks but they are flanked on each side by a chine frame member that is pegged to the sides of the bow and stern post and runs the entire length of the bottom of the hull catching the corners of the ribs and thus preventing them from poking through the skin. This is not to say Hearne necessarily got it wrong. In support of this, Mason says: "No floor boards are used in

[24] Fuller, W.A. (1999) Samuel Hearne's Track: Some obscurities clarified. *Arctic, 52:* 3, 261.
[25] *op. cit. (1795)*, 91.

the small canoe, probably to reduce the weight."[26] Similarly, Osgood says: "The Slave canoe was said to be the same [as the "Hare Indian" canoes to the north], but had practically no lengthwise supporting boards,"[27] In Hearne's drawing there are two hull stringers mid way up the sides just below the gunwales, but this effectively does not do much to support the bark at the chines, perhaps they were positioned lower down. It is interesting to note, however, that the ribs are depicted especially wide and it is clear in the drawing that the width of the three ribs positioned under where one would expect the weight of a single paddler to be, are of much wider construction and more closely spaced than the rest. This may have been the solution to the tendency the ribs would have for poking through the bark, especially under pressure from the water pushing in on the sidewalls. There is also what seems like an exaggerated amount of reverse hog – the pre-stressed arch built into the bottom of the hull- however, as far as a historic description of canoe building is concerned, this one is particularly rich. It would not be a stretch to imagine the enthusiasm Hearne must have felt after traversing the barren lands on foot for 5 months to be in the company of so many canoe builders and this may explain the attention he gave to the flurry of associated activities.

2.4 A Beaver Canoe on the Peace River

In 1789, Alexander Mackenzie looked for a practical route over the Rocky Mountains to the Pacific Ocean, travelled right through Dene territory on the Slave River, Great Slave Lake, and the Mackenzie River and ended up at the Arctic Ocean. Later in 1793, in a second attempt he ascended the Peace River from Fort Chipewan and successfully reached the Pacific. Just prior to June 10th 1793, he inscribed the following passage about Dene canoe construction in his journal:

[26] Mason, J. A. (1946) *Notes on the Indians of the Great Slave Lake area.* New Haven: Yale University Press, 23.
[27] Osgood, C. (1933) *The Ethnography of the Great Bear Lake Indians*. Ottawa: F.A. Acland, 51.

> They have spruce bark in great plenty, with which they make their canoes, an operation that does not require any great portion of skill or ingenuity, and is managed in the following manner. - The bark is taken off the tree the whole length of the intended canoe, which is commonly about eighteen feet, and is sewed with watape at both ends; two laths are then laid, and fixed along the edge of the bark which forms the gunwale; in these are fixed the bars, and against them bear the ribs or timbers, that are cut to the length to which the bark can be stretched; and, to give additional strength, strips of wood are laid between them: to make the whole water-tight, gum is abundantly employed. These vessels carry from two to five people. Canoes of a similar construction were used by the Beaver Indians within these few years, but they now very generally employ those made of the bark of birch tree, which are by far more durable. Their paddles are about six feet long, and about one foot is occupied by the blade, which is in the shape of an heart.[28]

Mackenzie notes the use of spruce bark, which is often used in the quick construction of temporary watercraft. He also notes a switch to better canoes made of birch bark, but adds no further details of their construction. The Dene canoes would have been quite distinguishable from Mackenzie's own fur-trade style canoe fleet and on the 22nd of June 1793, he offers this: "At six in the morning we proceeded on our voyage, with two Indians, one of them in a small pointed canoe, made after the fashion of the Esquimaux, and the other in our own."[29] Historically, "Beaver Indians" was the name used by European traders to refer to a group of Dene called the *Dene-zaa*. It is possible the man in the distinctive canoe similar to an Inuit kayak was from the neighbouring *Deh Cho* (Slavey) in the region just to the north of Peace River.

2.5 A Copper Canoe at Lake Prosperous

On Aug 2nd 1820, Robert Hood, under the command of Lieutenant Sir. John Franklin was tasked "to make drawings of the land, of the natives, and of the various objects of natural history."[30] Looking for an inland water route through the Canadian

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[28] Mackenzie, Sir Alexander. (June 1793) *Voyages from Montreal on the River St. Laurence Through the Continent of North America to the Frozen and Pacific Oceans, in the years 1789 and 1793.* Philadelphia, 1802: 207.
[29] *ibid,* 238.
[30] Franklin, J. (1823) Narrative of a Journey to the Shores of The Polar Sea in the Years 1819, 20, 21 and 22. London: John Murray, Albermarle-Street, xiii.

Arctic to the North West Passage, they left Fort Providence at the mouth of the Mackenzie River and headed into Great Slave Lake with a fleet of three canoes, a total of 26 men, and a fourth canoe for an unspecified number of women.[31] The next day, their party met up with Akaitcho, a *T'satsąot'ınę* ("Copper Indian") chief, near the mouth of the Yellowknife River and were "soon surrounded by a fleet of seventeen Indian canoes" as they set off in their company up river.[32] After a short portage of a 5-foot cascade and a further 6 miles up river they entered Lake Prosperous. It is here that Hood made a sketch titled "Expedition Crossing Lake Prosperous" that appears as an engraving in Franklin's *Narrative of a Journey to the Shores of the Polar Sea.* Later in October, while staying at Fort Enterprise, he painted the scene in watercolour. Hood's artistic record leaves behind some remarkable artwork and this particular painting with a "Copper Indian" canoe in the foreground among a fleet of other boats including a voyageur canoe, is held in the National Archives of Canada.

Fig. 2.4 Painting of canoes at Lake Prosperous. Reprinted from W.H. Coverdale Collection of Canadiana, Acc. No. 1970-188-1273, Library and Archives Canada.

[31] *ibid,* 208-9.
[32] *ibid,* 210-11.

2.6 A Hare Canoe Near Fort Good Hope

In June 1825, Franklin would attempt a second overland journey to explore the areas between "the mouth of the Mackenzie and the Strait of Behring in the North Coast of America."[33] His instructions were to overwinter in the vicinity of Great Bear Lake and then push on at the earliest opportunity in the spring of 1826 and try to make it to Kotzebue's Inlet before the following winter sets in, or retreat back to Great Bear Lake, or pass the winter among the "Esquimeaux" if there was some certainty of reaching the Polar Sea the following season. [34] On the 9th of August, 1825 just a day shy of reaching Fort Good Hope on the Mackenzie River, Franklin offers the following passage about the "Hare Indian" canoe, which is just to the east of the Gwich'in:

> At one P.M. we saw a party of Indians encamped on the beach of a small stream, whom we invited to come off to us. They hesitated at first, being doubtful who we were, from our boat being different in shape from any they had seen, and carrying two sails; but after some time they launched their canoes, and brought us a good supply of fresh deer's meat. The sight of our boats seemed to delight them as much as the ammunition and tobacco which they received. These were Hare Indians, the tribe that follows next to the Dog-Ribs, in the line of country below Bear Lake; and, like them, they speak a dialect of the Chipewyan language. We admired the shape and appearance of their canoes, which were larger than those used by the Chipewyans, and had the fore part covered with bark, to fit them for the navigation of this broad river, where the waves are often high.[35]

Three days later, on the 12th of August, 1825, Franklin, while still on the Mackenzie River only this time in the company of the "Lower Loucheux" says: "Their canoes, too, are shaped like those of the Esquimeaux, and made of birch bark, which by some process is stripped from the gunwale perpendicularly downwards, for the purpose of ornament."[36] (The "Loucheux" was a name given to the Gwich'in by French traders who called them squinters or *loucheux,* because of the shape of their

[33] Franklin, J. *Narrative of a Second Expedition to the Shores of the Polar Sea, in the Years 1825, 1826, and 1827.* London: John Murray, Albemarle-Street, xxi.
[34] *ibid*, xxi-xxiii.
[35] *ibid*, 21.
[36] *ibid*, 28.

eyes.) At this time, Franklin would have likely been on the portion of the river that cuts through the territory of the *Nakotcho* Gwich'in.[37]

2.7 A Gwich'in Canoe on the Yukon River

The middle of the 19th century gave way to brief reports out of Gwich'in territory proper. In 1851 William Hardisty, a clerk for the Hudson's Bay Company, was sent to establish trade among "Indian" groups around the outpost of "Fort Yucon." He submitted a brief report titled *The Loucheux Indians* that was published by the Smithsonian Institution in 1866. The Gwich'in are also sometimes called Kutchin. Here is what Hardisty had to say about their canoes:

> In the summer the man uses a small light hunting canoe, requiring very little exertion to propel it through the water, while the poor woman is forced to struggle against the current in a large ill-made canoe, laden with all the baggage, straining every nerve to reach a particular place pointed out beforehand by her master as the intended camping ground.[38]

The next account comes from Hardisty's colleague, an officer named Strachan Jones, also stationed at "Fort Yucon." Jone's *The Kutchin Tribes* was published in the same Smithsonian report and offered a little more.

> The mode of killing the salmon requires very great skill in the management of the small canoe, as will be easily seen when I say that the canoe is flat-bottomed – about nine feet long and one broad and the sides nearly straight up and down like a wall. The fish makes the water foam when it is first hauled up; if it strikes the canoe it will knock a hole in it, if it goes under the canoe it will upset it; and as none of the Kutchin can swim, the consequences might be unpleasant.[39]

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[37] This reference by Franklin to the appearance of stripes on the bark of the Gwich'in canoes on the lower Mackenzie River, is significant because it provides yet another comparative marker. The Gwich'in canoe held in the collection at the Canadian Canoe Museum in Peterborough, among all the other canoes I've ever seen is the only one that has stripped markings on the bark as described above. [See photo of stripped bark: Appendix E]

[38] Hardisty, W. (1866) "The Loucheux Indians," [In] Annual Report of the Smithsonian Institution for 1866, 312.

[39] Jones, S. (1866) "The Kutchin Tribes," [In] Annual Report of the Smithsonian Institution for 1866, 323.

In 1886, Bancroft had this to say:

> In the manufacture of their boats the Kutchins of the Yukon use bark as a substitute for the seal-skins of the coast. They first make a light frame of willow or birch, from eight to sixteen feet in length. Then with fine spruce-fir roots they sew together strips of birch bark, cover the frame, and calk the seams with spruce gum. They are propelled by single paddles or poles.[40]

In June 1894, while travelling north of Great Bear Lake Russell remarked:

> I left the Slavey canoe in which I had come from Good Hope at McPherson, and continued in a small Loucheux birch canoe which had broadly flaring sides, so that it was not at all cranky. It was thirty-two inches in the beam, but it was roughly made and quite "slow." It was fourteen feet in length along the water line and fourteen inches in depth.[41]

2.8 Canoe Building in Stevens Village, Alaska

In 1911 and 1912, while Lawyer Rivenburg was a grade-school teacher in Stevens Village, Alaska, he took a series of photographs depicting some of the stages of the building sequence.[42] Stevens Village, located on the Yukon River, in neighbouring Koyukon territory is about 150km downstream from the confluence of the Porcupine River at Fort Yukon, which is home to the *Gwich'yaa* Gwich'in. Nowadays, Stevens Village is populated predominantly by Gwich'in, but in 1911 it would have likely been a mix as it was three brothers from the Koyukon region who founded it.[43] These photographs from the Alaska Digital Archives, offer a rare glimpse of the canoe in while it is being built and includes notes with accompanying descriptions.

Caption Fig. 2.5 Below "[T]he beginning of a birch bark canoe: the framework of straight grained white birch. The ribs are made from seasoned spruce roots, having the natural crook. The long sticks in this picture are not part of the canoe, but just a sort of cradle in which the canoe is shaped."

[40] Bancroft, H. (1886) *The Native Races: of the Pacific States.* San Francisco: A. L. Bancroft & Company, 130.
[41] Russell, F. (1898) *Explorations in the Far North.* Iowa City; University of Iowa, 138.
[42] Rivenburg, Lawyer and Cora Photograph Album. 1910-1914, Archives, University of Alaska Fairbanks.
[43] Campbell, K., Hewko, P. *et al.* (April 25, 2005) Yukon Flats Regional Government Feasibility Study, 28.

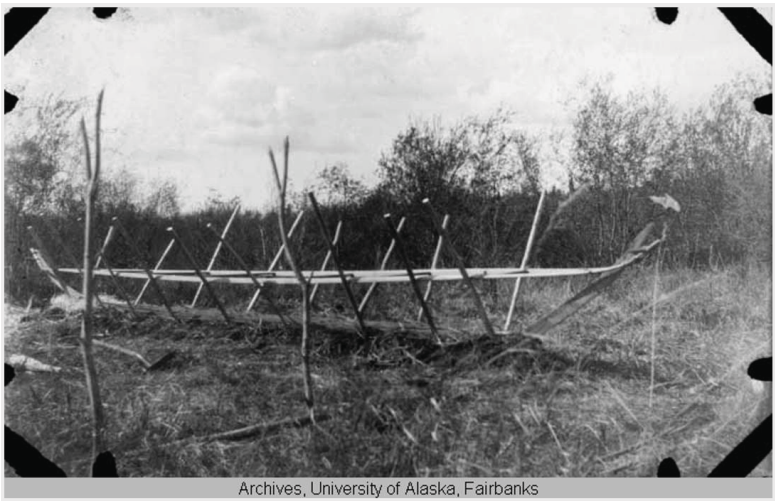

Fig. 2.5 Canoe framework. Reprinted with permission from Rivenburg, Lawyer and Cora Photograph Album. 1910-1914. # UAF-1994-70-105, Archives, University of Alaska Fairbanks.

Caption Fig. 2.6 "Next as shown below, the women sew the pieces of birch together, sewing over and over. For thread they use the small roots of the spruce which have been soaked in water a long time. These are split by using the teeth and hands into flat, half-round pieces which are flexible and tough. Using an awl to make holes, all seams are sewed; and pieces of bark are sewed over knot holes or any weak places in the bark."

Fig. 2.6 Women sewing the bark. Reprinted with permission from Rivenburg, Lawyer and Cora Photograph Album. 1910-1914. # UAF-1994-70-106, Archives, University of Alaska Fairbanks.

Caption Fig. 2.7 "Below is shown the next step. The large sheets of birch bark are pinned in position with wooden pins and the ribs are also placed."

Fig. 2.7 Bark pinned in position. Reprinted with permission from Rivenburg, Lawyer and Cora Photograph Album. 1910-1914. # UAF-1994-70-107, Archives, University of Alaska Fairbanks.

Caption Fig. 2.8 "Mrs. Albert, Mrs. Luke and Mrs. Jennie Pitka working on a canoe in a little dry slough just back of the village. Heavy wild hay grows in these sloughs sometimes as high as a man's head."

Fig. 2.8 Women working on a canoe. Reprinted with permission from Rivenburg, Lawyer and Cora Photograph Album. 1910-1914. # UAF-1994-70-112, Archives, University of Alaska Fairbanks.

2.9 Canoe Repair in Nenana, Alaska

Perhaps one of the most iconic (and frequently republished) photos of a flat-bottom Dene canoe is of a woman making some repairs to an upturned canoe at the river's edge. Nelson gives the caption: "An Athabaskan woman sewing a birch bark canoe at Nenana, ca. 1910." [44] Nenana is upstream on the Tenana River; a tributary of the Yukon River.

Fig. 2.9 Canoe repair at Nenana circ. 1910. Reprinted with permission from Albert Johnson Photograph Collection, 1905-1917. # UAF-1989-166-699-neg nitrate, Archives, University of Alaska Fairbanks.

2.10 A Canoe in Eagle, Alaska

There is a photograph of a canoe that resembles the Gwich'in canoe held in the collection at the Canadian Canoe Museum. This canoe may be a little (2-3") deeper, given how much of the paddler's hips disappear bellow the gunwale line and how much freeboard is above the water line. However, the two deck beams fore and

[44] Nelson, R. (1983) The Athabaskans: People of the Boreal Forest. Alaska Historical Commission Studies in History No. 27, Fairbanks: University of Alaska Museum, 26.

aft of the paddler are relatively the same length. This results in mid-section widths that are straight and boxy when compared to other Dene canoes that have fairly pronounced curved mid-sections. This photograph, if correctly labelled, was taken in Eagle, Alaska, which is predominantly a *Tr'on Dek Hwech'in* (Hän) community about 158 miles upriver from Circle, Alaska where the *Danzhit Hanlaih* Gwich'in live.

Fig. 2.10 Canoe in Eagle, Alaska. Reprinted from Clarence L. Andrews Photograph Collection, ca. 1892-1940. # ASL-P45-0625, Archives, Alaska State Library.

2.11 Canoes in the Anthropological Record

There are a number of early American anthropologists who conducted fieldwork among various Dene communities. The department of anthropology at Yale University figures prominently and was active in producing many ethnographic volumes on the; The Northern Athapaskan (1936), The Kaska (1949) The Kutchin (1936), The Slave (1946), The Tanaina (1937), The Tanana (1959), The Ingalik (1940, 1958, 1959), and The Han (1971), by ethnologists, such as John Honigmann, Alden Mason, Robert McKennan, and Cornelius Osgood. Most of these volumes contain some description of canoes under a section usually indexed and titled "Travel and Transportation." In 1936, Osgood published a two-page account of the

Crow River Kutchin canoe.[45] However, after spending two summers at Anvik, Alaska in 1934 and 1937, he publishes a 20-page account of the Ingalik canoe.[46] Without good reason to republish these at length, suffice to say that Osgood provides a first-hand account discussing some of the intricacies and finer details of their assembly that have previously not been provided elsewhere. There is also Edwin Tappan Adney's *The Bark Canoes and Skin Boats of North America* that was published posthumously in 1964 containing a lifetime's worth research (between 1887 and 1950) gathering knowledge about different canoe types and their construction.[47] In this book there is an entire chapter on kayak-form canoes that is useful to consult.

Fig 2.11 Canoe from Lower Yukon with rigid floor frame. Reprinted from Adney, T. & Chapelle, H. (1964) *The Bark Canoes and Skin Boats of North America.* Washington D.C.: Smithsonian Institute, 165.

In the second half of the twentieth century, Beryl Gillespie from the University of Iowa did her masters field research in Dettah, Rae, Fort Franklin and Fort Norman. June Helm, a professor, also from the University of Iowa carried out ten seasons of field research in Jean Marie River, Fort Good Hope, Deline, Fort Simpson, Lac la

[45] Osgood, C. (1936) *Contributions to the Ethnography of the Kutchin.* New Haven: Yale University Press, 61-62.
[46] Osgood, C. (1940) *Ingalik Material Culture,* New Haven: Yale University Press, 359-378.
[47] Adney, T. & Chapelle, H. (1964) *The Bark Canoes and Skin Boats of North America.* Washington D.C.: Smithsonian Institute, 164.

Martre, and Rae.[48] Nancy Oestriech Lurie, professor at the University of Wisconsin conducted research with June Helm among the Dogrib. Helm gives credit to Alden Mason for providing much of the archival photographs of Dogrib canoes in the Canadian Museum of Civilization's collections.[49] The following passage highlights the aesthetic value of root lashings on canoes and demonstrates the ability of a canoe-building revitalization project to generate lively debate.

> The anthropology division of the National Museums of Canada had arranged for the construction of a birchbark canoe in the aboriginal form, which had been supplanted by canvas canoes in the early 1920s. That successful "sale," followed by another the next year, stimulated an elderly widower to repair to an island near Rae, where he spent the summer alone, crafting yet another birchbark canoe. When it was finished, the canoe was brought to Rae, where it evoked a lively interest among the Dogribs. But the older men and women arrived at a collective judgment: "He should have had a woman do the sewing." Although "seaworthy," the canoe's stitching of spruce root that pieced the sections of birchbark together was uneven. Spruce-root stitching, on birchbark baskets or birchbark canoes, is women's work and should be executed handsomely.[50]

2.12 Conclusion

From the perspective of endeavouring to make a canoe, historical syntheses provide scant substitute. It would be completely misguided to think that cultural narratives and depictions of canoes could ever constitute the knowledge that belong among the people who develop skills by actually living and moving with the landscape.[51] The collateral value instead is in the ability to reference these surveys and archival photographs and use them as markers along a "taskscape" to tentatively inform our own actions. These markers reveal intersections between our actions in the present and those of previous canoe builders in the past, where a skilled agent may align their own work in a process of becoming aware and where the effectiveness of our own results may be loosely gauged along certain waypoints. The

[48] Andrews, T. (2004) June Helm (1924-2004). *Arctic, 57:* 2, 220-222.
[49] Helm, J. (1981) Dogrib folk history and the photographs of John Alden Mason: Indian occupation and status in the fur trade, 1900-1925. *Arctic Anthropology 18*: 2, 43-58.
[50] Helm, J. (2000) *The People of Denendeh: Ethnohistory of the Indians of Canada's Northwest Territories*. Montreal-Kingston: McGill-Queen's University Press, 336.
[51] Andrews, T. & Zoe, J. (1998) The Dogrib Birchbark Canoe Project. *Arctic, 51:*1, 75.

canoe is more than an artefact but is also a "taskscape," –a series of associated actions performed by people throughout time over a particular terrain. The way the spruce root is sewn, for example, acts as a marker towards which one can orient their own actions in the process of making. This is not to imply that trying to follow people who have built canoes in the past is done by simply deploying schematic knowledge from the historical record like a recipe. While I acknowledge that there are vast points of separation between a Dene canoe builder and myself, it is through the process of applying the technological praxis of canoe building in new contexts, where the shared production of knowledge occurs.

Chapter III – Research Methods

3.1 Introduction

The research methods that are employed in this project are those taught to me over the course of study both at the university and throughout my apprenticeship in canoe building with Don Gardner. The research bears a close resemblance to the methods developed in the field of archaeology, which by design simultaneously analyzes the material record as well as ethnographic and historical sources.[52] These methods are particularly well suited to the goals of this project, which, on the surface of things, is to present the data that informs the canoe building project; but also to dig a little deeper and to provide a contemporary re-reading of the ethnographic record in light of the particular experiences that Don and I have gained in our mutual experimentation of building Gwich'in canoes together. Learning in environmental contexts out on the land and in the workshop is also highly anthropological in the sense that the researcher is immersed in methods of instruction that fully resonate with Indigenous ways of transmitting knowledge by using our whole body while apprenticing under the tutelage of an elder. In turn this mobilizes techniques that are also a part of the greater social sciences tradition to gather field data through participant observation, interviewing, and an adherence to ethical guidelines.

Apprenticeships in canoe building involve a combination of work that is a derivative of primary and secondary sources. Other people's descriptions, illustrations, and photographs can provide good supporting material but cannot replace the first-hand research gained through the mobilization of all of one's senses in the actual handling of an object. Don, who is a trained archaeologist, would say to me that whenever feasible it is helpful to make a drawing of the tool, hunting equipment, paddle, boat or whatever it is that you wish to replicate. The process of

[52] Schuyler, R. (1988) Archaeological Remains, Documents, and Anthropology: A call for a New Culture History. *Historical Archaeology, 22*:1, 40.

drawing allows for an intimate study of the artefact, not only through visual inspection, but also by touching it, feeling the tool marks, getting a sense of its weight, and by engaging in discussions on the sidelines with the people who also make and use them. Over the course of surveying a canoe, which involves a methodological approach to measuring and then rendering this data into a scale drawing, there are many aspects that are revealed that are not perceptible by just looking. The hands-on manipulation of artefacts, especially in museum collections, has been increasingly discouraged due to competing interests and the mandate for conservation. However, it is through the sense of touch that the meaning of objects is constructed and we make sense of the world.[53] Surveying also results in a detailed technical drawing that will serve as a kind of open-ended reference, upon which revisions and notes can be added of the course of the building. The sensory experience of touching material artefacts in sequence with our other faculties facilitates, remembrance, discovery, narration, communication, and demonstration.[54] Surveying and making models is thus much more than the mere making of an architectural blueprint.

3.2 Surveys, Illustration, and Scale Models

In the case of Gwich'in canoes, there is just one surviving example, which makes it among the rarest canoe types in museum collections. To conduct a survey requires the permission of the museum staff where the particular artefact is held. Curator Jeremy Ward at the Canadian Canoe Museum in Peterborough, Ontario, recognizing the importance of such a study, was more than accommodating in allowing access to the Gwich'in canoe, which is on permanent exhibit. Harvey Golden

[53] Gadoua, M. (2014) Making sense through touch: Handling collections with Inuit elders at the McCord Museum. *Senses and Society, 9:*3, 323-4.
[54] *ibid.*

of Portland, Oregon taught me the method I use for surveying.[55] Generally, this involves measuring rates of change in heights -side view- and widths -top view- at stanchion intervals along the entire length of the boat (see Fig. 3.1 and Appendix A). It helps to be systematic and to set up a table or chart to record the measurements ahead of time and to be as efficient as possible when utilizing the museum's resources (see: Appendix B). In the stems where the shape of the canoe changes more dramatically it is advisable to take measurements more frequently perhaps every few inches, whereas, along the midsection it would suffice to do so every 6 or 12 inches. These measurements can then be used to plot and draw a reduced scale technical drawing of the dimensions of the boat.

Before the survey is complete it is important to gather as many details about the wooden frame on the inside of the canoe and to take as many notes as time and energy allow. In surveyor terms this is called scantlings measurements (see: Appendix C). Ribs may be thicker at the bottom of the canoe and thinner at the bend or sharpened to a point where they are inserted into the gunwales at the sides. The gunwales are often thicker in the middle of the boat and tapper towards the stems. It can be helpful to measure the lengths of longer frame members individually as much is lost in their curvature. For example, this particular canoe finishes at 5m 61cm long, (roughly 18.5 ft.) but the length of the wood needed to make the gunwales when measured along their curve is actually about 12cm longer.

Gwich'in canoe builders are exceptional at selecting wood with a particularly fine grain and then orienting this grain in a manner that achieves the kind of structural strength they desire. In this way they are able to craft boats that are remarkably light and strong. Don reminds me to take notice of the grain of the wood. Whether on a canoe, a paddle, a bow or any other equipment, this is a key piece of knowledge. The availability of suitable materials and selection of grain was far more important to Indigenous canoe builders than overall measurements or the following

[55] In 2004, Harvey invited me to participate in a survey of a Greenland Kayak at the Museum of Civilization in Gatineau Quebec. He graciously took the time to initiate me to my first lessons in surveying; a method that he learned and adapted from the late John Heath.

of an archetypal example. Canoes were often tailored to the needs of the person making it or the size of their own body. Taking note of the way the grain is oriented will affect the decisions made during the first steps in the procurement of materials.

There are three bark panels stitched together that make up the Gwich'in canoe at the Canadian Canoe Museum. The main sheet is from one tree and it appears that the two side panels are from another (see: Appendix D). I used a seamstress tape to measure the panels of bark and found that the trees, especially for the main sheet, would have had to be about 38-40 inches in circumference. The other two side panels may come from smaller trees about 22 inches around, although the bark is so evenly matched that I suspect it came from one sheet from a larger tree that was then split in half.

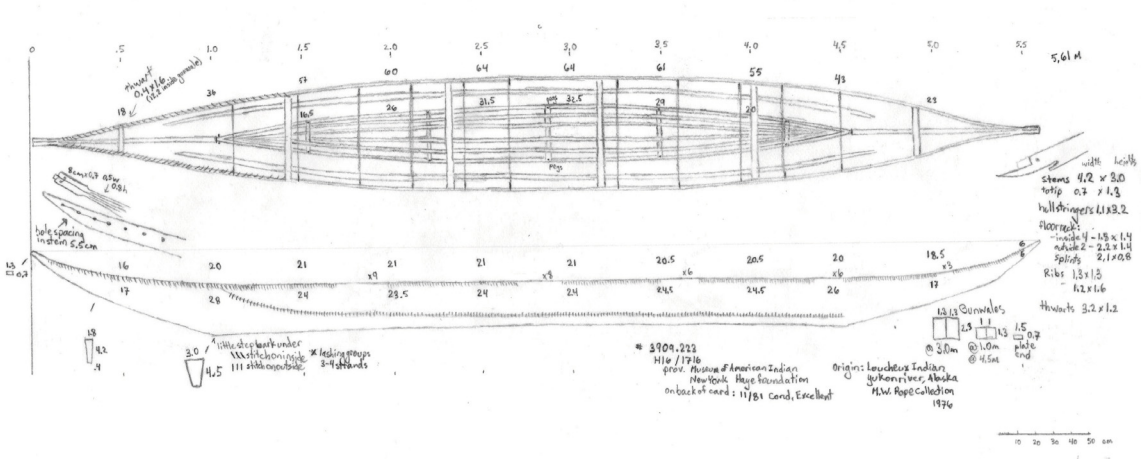

Fig. 3.1 Survey of Gwich'in canoe at the Canadian Canoe Museum in Peterborough, Ontario. Redrawn and adapted from Gardner, D. (unpublished).

Notes on the root lashings should be taken. What remains of the lashing today, I suspect, includes a few generations of repairs done by museum staff in conservation efforts. However, up around the stems the lashings are rather intact and look to be original and of imported rattan, not spruce root. Were Gwich'in canoe builders able to obtain rattan, and other trade items from as far away as trade ports like Canton in mainland China? The 21 blue and red glass beads, thought also to be

from China, sewn into the coils of rattan at the stern seem to lend weight to this possibility.[56] On this boat, the root lashings were once coiled around the gunwales in a non-continuous pattern punctuated by spaces and although they have mostly crumbled and fallen away, the pattern can still be discerned by the puncture holes in the bark left by the sewer's awl on the undersides of the gunwales. A good survey will note all these details as well as any tool marks, abrasions, knife scars, pegs, iron nails and whatever other surprises, which may be indicative of age and construction methods. Bring a camera, take lots of pictures, they will prove invaluable later when building miles away at home in the workshop.

There are two surveys of this Gwich'in canoe that I am aware of. The first by Edwin Tappan Adney was done sometime in the first half of the twentieth century while the Museum of the American Indian in New York was in possession of this canoe.[57] Don Gardner did the next survey at the Canadian Canoe Museum in the last decade of the twentieth century, while he was effectuating repairs in order to stabilize some tears in the brittle bark. My own survey took place on two occasions in the summer of 2014. I focused mostly on observations and scantling measurements of particular frame members as well as some of the finer details. Though each of these surveys, including my own, are taken from the same object they are nevertheless different. For example, Adney's published survey depicts gores that are cut into the main sheet of the bark to relieve the buckle as it is folded to a point at either end, however, these gores just do not exist on the actual boat and this is one of a few construction feats that make this canoe so remarkable. It is quite possible a staff member at the Smithsonian did the inked version of the illustration and may not have read Adney's handwriting correctly. It is also inaccurately depicted as having continuous lashing along the entire length of the gunwales. These inconsistencies highlight the importance of performing updated surveys. Furthermore, a canoe is a living vessel made out of organic materials and as such it

[56] Finch, D & Gardner, D. (2002) Light Craft from the Great Northwest. [In] J. Jennings (Ed.), *The canoe: A living tradition.* Toronto: Firefly Books, 64-73.
[57] Adney, T. & Chapelle, H. 1964. *The Bark Canoes and Skin Boats of North America.* Washington D.C.: Smithsonian Institute, 164.

inevitably changes shape over time. Dated to around the 1860's, this canoe is not in the condition it would have been when it was younger. Each generation of survey captures the evolution in its movements as it is mostly in a state of decomposition, rather than preservation.

Another method employed by canoe builders is to make scale models. In the 20th century rudimentary canoe forms were sold as trinkets to tourists, but there exist many examples that showcase a fine level of detail and are faithful representations of the rich diversity of canoe types that exist in North America. There is also archaeological evidence of models canoes and kayaks made out of ivory, bone, antler, and wood that in some cases date back thousands of years and these are a testament to the continuity of a model making practice. Modeling after all is a timeless teaching and learning technique. Adney, regarded as "the foremost scholar of the North American bark canoe," documented hundreds of disappearing canoe types.[58] 121 (other sources put this number at 110) of his models are now at the Mariner's Museum in Virginia and at least 5 are in private curatorship after they were gifted to close friends in New Brunswick.[59] During the course of my apprenticeship with Don, I was encouraged to practice canoe building by making a ⅕th-scale model of the full size canoe. This endeavour took around 6 weeks. The root stitching on such a small scale is tedious work, but it was well worth it. Making models is an invaluable tool that is easily transportable to other locations and the lessons learned are often transferable to building larger canoes.

In the multidisciplinary methods that were taught to me on how to begin studying artefacts at museums, the importance of direct tactile appropriation through the handling of the objects, in the illustration of surveys, and the making of three dimensional models, exceeds visual or language-based learning and goes beyond learning by demonstration and imitation. One of the first things Don did when we went to the museum together was to offer me a piece of drawing paper, a

[58] Jennings, John (2004) *Bark Canoes the Art Obsession of Tappan Adney*. Richmond Hill: Ontario. Firefly Books, 11.
[59] Kent, T. (1997) *Birchbark Canoes of the Fur Trade.* Ossineke, Michigan: Silver Fox, 327.

pencil, and a callipers and without any instructions we each started drawing. He did not talk about the object or even direct my attention to notice the same features that his eyes were looking at. In the first few minutes, I may have looked over at Don to see what he was doing and to imitate what he was demonstrating to me, however, it wasn't long before the physical activity of doing, rather than watching him demonstrate, took over in a kind of autodidactic process. There is something very intuitive about the sequence of drawing and making of models that guides the hand and the body to complete these tasks in much the same sequence in which the actual artefact is constructed. Drawings are attended to in layers, where fine details are added over an initial outline of form. It is in these methods informed by the sense of touch that observation collides with process to yield moments of kinaesthetic learning and questions and conversations inevitably flow in due course. It is hard to have a meaningful conversation about something that we do not really know in our bodies what it feels like.

Fig. 3.2 Gwich'in canoe model

3.3 Research in Action

Researching canoes is by nature a very active process. One of the main features about conducting research in a way that deliberately involves the sensory exploration of materials and the environment, is that the knowledge gained by

mobilizing the tactile, olfactory, and gustatory senses helps situate knowledge among the bodily, as well as cognitive, faculties. I have chosen to include a script, which shows how these factors play out around the shop in conversation between the apprentice and the master and with research in action.

Project: Apprenticeships in Gwich'in Canoe Building
Location: Canmore Alberta
Recorded on: September 25, 2008
Master builder: Don Gardner
Apprentice: Jonathan Goldner
Title: *We'll never know until we try*

D: Hey Jonny ! have you read any of Osgood's stuff ?
J: Nope, who's that?
D: It's this guy who went up to Alaska and wrote about the canoes on the Yukon, I'll see if I can find a copy -I know I have a photocopy of it somewhere.
J: Ok

… Next day

D: <Don hands me some photocopied pages>
D: Hey I found it.
J: Nice ! thanks
J: <takes photocopied pages and goes outside shop to sit on the steps and read it>

… about 45 min. later

J: <Re-enters the shop>
J: Wow that's quite the description.
D: Yeah isn't that cool!
J: Lots of new stuff you don't read about too often in other write-ups of canoes
D: Yeah he really gives a good account of the "sliding bottom" floor rack. Some of it is a little unbelievable, unless these guys knew some magic.
J: What do you mean?
D: Well Osgood says the floor rack overlaps the stem pieces by about 6 inches on either end, I just can't see fitting a 13 foot floor rack into a 12 foot canoe bottom.
J: Yeah that sounds crazy, he did say it takes 3 people to wrestle it into place.
J: So what are you going to do?
D: Well I've over shot each end by about 2-3 inches and we'll see what happens We can always trim back a bit later if it won't fit.

… On the little canoe model

J: Hey Don, I tried to squeeze that floor rack into the sockets on the stem post and the thing just bowed out until all the floor rack splints popped from their mortises. I only overshot it by about ½ an inch but that was way too much on the little model and it definitely didn't push the canoe into the final shape it just kind of broke apart the floor.

D: Yeah on the Gwich'in canoe at the museum the splints are actually pegged into the mortises with metal nails. That probably would have kept them in place even under stress.

J: Maybe I'll use some glue and trim back a bit and see if that works.

… On the big canoe

J: Hey Don, how'd it go?

D: Went alright, in the end I got it to overlap by maybe an inch or two and I don't think my floor rockered out, there's still a hint of reverse hog.

J: Oh good!

D: It pushed the stems up a bit into final position but it also made them go out of alignment a bit too. Not too bad though.

J: Man that's a tricky little building technique. I wonder how they kept all these factors in check.

J: There's a photo in Adney's book that shows the floor rack ready to go into place and the stems are still temporarily pegged [see: Fig 2.11]. Do you think they might have pegged it so the stems could be re-aligned before the final sewing into place in case the floor pushes them off center?

D: I don't know. I guess we'll never know until we try.

… Some years later

J: Hey Don, remember that photocopy you had from Osgood about the canoes?

D: Yeah

J: What book was that from?

D: I'll have to check, but I think it was from the Ingalik Material Culture

J: Oh cus I'm about to order a few of Osgood's books and I'm looking for that write up it was so good.

D: I'll double check for you, but I'm pretty sure it was in *Ingalik Material Culture*, not in *The Ethnography of the Kutchin*.

3.4 Conclusion

The conversations that go into making canoes is partly informed by certain markers in the historical record, as evidenced by my discussion with Don about the rigid floor rack in Osgood's book, but is significantly more informed through the materiality of handling the actual object, which is not separate from the lives of the people who are trying to make it. This materially situated practice is fundamental to the way knowledge is co-constructed in the process of making.[60] In the drawing and making of models, the sense of touch in syncopation with visual observations gives rise to meaningful discussions that facilitate, as Gadoua explains, remembrance, discovery, narration, communication, and demonstration.[61] Together these methodological approaches constitute an appropriate way to beginning to learn about making canoes in apprenticeships. It is in the making of canoes that pedagogy reveals itself.

[60] Walls, M. (2015) [in press] Making as a didactic process: Situated cognition and the *chaîne opératoire*, *Quaternary International,* available at http://dx.doi.org/10.1016/jquaint.2015.03.005

[61] Gadoua, M. (2014) Making sense through touch: Handling collections with Inuit elders at the McCord Museum. *Senses and Society, 9,*3: 323-4.

Chapter IV – Materials: In the Footsteps of Masters

4.1 Introduction

Harvesting bark would have been part of the ongoing seasonal activities for the people who inhabit the boreal forest regions and this would have been an integral part of the local knowledge, similar to how one knows the location of a good lake to fish for trout or the quickest route to travel back home. Straight logs of wood for the canoe frame might have been spotted in a jam of driftwood while traveling the river. Finding canoe materials while wandering haphazardly about the woods is an activity only a novice or fool would embark on. A lineage of deep cultural history, a concert of coordinated activity, and the tuning of one's senses towards these ends, are generally required. Osgood, who wrote about Dene canoe building, says: "The time required to make a canoe can only be roughly estimated because of the number of variable factors. […] if one did not know from past experience where to find the materials, the undertaking might be extended indefinitely."[62] The process of finding materials on my own in Eastern Canada without Don's help is one of kinaesthetic experimentation and discovery. These attempts are part of a departure as apprentice to full-fledged canoe builder. As Don says: "It's always the first one that takes an extra-ordinate amount of time."[63] In this next section I will highlight the kinaesthesia that occurred while searching for bark and recount some of the best stories shared with me by more experienced builders.

When reading historic accounts of building birch bark canoes, most authors play up the extent to which individual expertise and the skill of the master craftsmen is the principle guiding force that makes the procurement of the materials and the coming together of a canoe possible. In my experience working with Don, skill level by itself can only assure a limited amount of success. Textual accounts of harvesting bark are attended to in scant detail as if it were a hurried appetizer prior to the main

[62] Osgood, C. 1940. *Ingalik Material Culture.* New Haven: Yale University Press, 367.
[63] Don Gardner, *personal communication*, July 22, 2015.

course of building. This can give the impression that in the old days canoe builders simply walked up to a suitable tree, as they have been doing all their lives and with a brief mention of harvest techniques, return home with bark in hand. Perhaps this may have been accurate in earlier times as there is some evidence to suggest that the birch have been drying out and changing in the last century. On another level, the ethnographic account is often slanted towards recounting what works and failures are often edited out. In the 1980's David Gidmark who worked with the Algonquin Anishinaabe people had this to say:

> In the previous two decades a builder from Maniwaki or Rapid Lake usually could go into the woods and come back with a suitable sheet of bark the same day. Within the last five or ten years though, this is becoming more difficult, and it might take several days to locate suitable bark. Large birches are still easy to find; large birch with healthy bark of quality are not. Their bark seems to be drier than before, and the eyes open up more easily.[64]

In Indigenous ways of teaching, elders are not only called upon for their knowledge about the land, but also for their role as listeners who act as earpiece to the younger generation as they talk about what they have learned and how they relate their own experiences to it.[65] My excursions in the woods got me thinking about this as well as Lave and Wenger's theory of situated learning and I began to understand how this could apply to my own predicament as a novice trying to gain knowledge and skills in the field.[66] Lave recognized that learning occurs in the context of an activity.[67] Similarly, the participatory co-construction of material artefacts fosters a process of intergenerational communication that requires the

[64] Gidmark, D. (1994). *Building a birchbark canoe: The Algonquin wâbanäki tcîman.* St. Catherines, Ont: Vanwell, 18.
[65] Simpson, L. (2014) Land as pedagogy: Nishnaabeg intelligence and rebellious transformation. *Decolonization: indigeneity, Education & Society 3:*3, 2.
[66] Lave, J. & Wenger, E. (1991) *Situated Learning: Legitimate peripheral participation.* Cambridge, UK: Cambridge University Press.
[67] Lave, J. (1988). *Cognition in Practice: Mind, mathematics and culture in everyday life.* Cambridge UK: Cambridge University Press.

apprentice to be immersed in activity and make use all their sensorimotor skills.[68] These teaching frameworks are in rather stark contrast to conventional methods of instruction that many students at university have become accustomed to. Howes states: "In the modern classroom, the ability to remain still for long periods of time solely looking and listening is a prerequisite for academic success."[69] Dewey, a long time proponent of educational reform, says teaching is actually inhibited by overly structured disciplinarian traditions within the academy.[70] In the search for materials for the canoe an alternative approach to teaching reveals itself. As Don pointed out, I was not likely going to find canoe bark on my way to the next lecture. Good canoe bark can only come from getting out on the land. This particular kind of training is probably closely aligned to the ways in which humans have evolved to learn by engaging in cooperative and productive behaviours immersed in their environments for millennia.[71]

4.2 Finding Bark

When looking for bark in the woods it becomes necessary to heighten one's awareness to the great deal of variation that exists in the characteristics of individual trees. My partner Sandra volunteered to help me go look for canoe bark. We set out into the regions to the north of the Ottawa River and we made our way towards Maniwaki, Quebec where a handful of reputable builders were active in the area as recently as 20 or 30 years ago.[72] We travelled to the far west side of the river past Golden Lake and Bonnechere Park. After a few days of searching, every single piece of bark we tested was dry, delaminated into paper layers, and was unsuitable for canoe building.

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[68] Walls, M. (2015) [in press] Making as a didactic process: Situated cognition and the *chaîne opératoire*, *Quaternary International,* available at http://dx.doi.org/10.1016/jquaint.2015.03.005

[70] Dewey, J. (1963) *Experience and Education.* New York: Collier Books.
[71] Hutchins, E. (1995). *Cognition in the wild.* Cambridge, MA: MIT Press.
[72] Gidmark, D. (1994). *Building a birchbark canoe: The Algonquin wâbanäki tcîman.* St. Catherines, Ont: Vanwell.

I remember the feeling of excitement that came with being in a forest that was predominantly birch for the first time. However, this feeling of enthusiasm was at times difficult to summon because it had to transcend the more immediate irritability of the intolerable summer heat and the constant harassment from the insects that inhabit the forest. To the east of Algonquin Park, the battery of air-born biting bugs was so thick that it was impossible to hear our own conscience thinking. The deerflies assault in orbit around the head in such quantity that what is actually surprising is how infrequently one of them ventures a landing. The psychological torment is by far more severe that their bite. The mosquitos are the least to worry about, as there exists tiny little flies that aim for the moisture on your eyeballs and drown in your tears as you implore your partner with urgency to remove the creature from your eyelids in order to abate the sting. Strangely these tiny flies were only attracted to movement and would completely disappear when we stopped walking.

On the fourth day something new happened. We stumbled upon two trees side by side that from a distance fit the profile of what a canoe birch might look like. They were large trees, about 40 inches in circumference. They had healthy white bark and the lower 20-25 feet of their trunks were clear of branches. They were relatively free of blemishes, storm damage, old branch scars, or excessive growth of fungus, mould, and their lenticels, which are the little horizontal membranes that the tree uses to breath through its bark, were short and shallow. They grew straight and tall. These basic profile requirements can be ascertained by a relatively quick visual inspection. If all looks good then a bark sample can be taken for further testing. Don showed me how to test bark by cutting a small rectangular test patch about 4x3-inches from above the snowline on the side of the tree where the roughest bark grows. I remember Don demonstrating this some time ago as he offered supplemental instructions. Cut into the bark like this on an angle, he said, as he held his knife showing me how much to lean it a fair ways off to the side. Bark does not cut well if you try to cut straight into it. Don peeled away a little test sample and began to roll it around in his hands, bending it to and fro. He pried at its edges with

his fingernail and looked to see if there was any delamination. When you have a good piece of bark in your hands you will know by how it feels and if it stands up to this kind manipulation.

I unsheathed my little sharp knife, and cut into the tree at an angle, just as he had shown me. I bent the piece of bark back and forth and tried to pry at it with my fingernail. Amazing, it didn't delaminate in the least. It felt almost elastic and the edges cut silky smooth like hard leather. When bent the other way the lenticels were shallow enough that they stayed intact and did not easily crack open. Bark that is brittle, dry, delaminating, cracking at the lenticels, too thick or too thin is not to be desired. We tucked the test samples from these two trees away, just as Don had shown me to do, and labelled them with the name of the nearest access road, "Old Hwy. 62." It is a preliminary visual inspection and then the sense of touch that informs the canoe builder whether the bark is suitable or not.

Before attempting our first harvest I wanted to make sure we had the permission we needed from the rightful landowners. I decided to head to the Canadian Canoe Museum for another visit and to have a talk with Jeremy, the curator of the museum, to find out if he could offer any local advice. Jeremy had this to say about harvesting bark in the area:

> *"When we were building this big fur trade canoe back in 2002, we needed a lot of bark. We called around to some of the logging companies in the area and they showed us a few cut lots that were slated for logging in the coming season. They told us we could go in and take whatever bark we wanted, as long as we left the tree and its lumber standing. I don't remember where it was exactly. To be honest we looked at so many cut lots, but after a few weeks we had harvested the bark with ladders from 8 trees in the area just north of Bancroft. Which was plenty enough for the big fur trade canoe we were building.*[73]

[73] Jeremy Ward, *personal communication,* July 25, 2014.

We attempted to go through the same channels for permission and the Ministry of Natural Resources informed us that we should ask the Bancroft Minden Logging Company, who has leased the cut rights to all the wood held on publically owned crown lands in the areas to the north of Bancroft. In turn the logging company suggested I buy a map, which shows all the parcels of land that belong to the crown and that we go to Sabine County just north of Maynooth, where they have typically had high percentage yields of white birch. We didn't come anywhere close to the results Jeremy related to me in his stories of bark harvests. After many days searching and several more trips to the area, I finally settled on cutting the tree we had seen on our fourth day next to Old Hwy. 62 since most of the other birch were in poor health and plagued by a kind of disease that covered the bark in rough grey scales, which made it thin, porous and useless for canoe purposes.

We prepared a clearing in the direction we wanted the tree to fall. A tree should be sent onto the side with the least obstructions and where the lay of the land is least likely to pinch the bark between the trunk and the ground. Once a tree falls there is no amount of muscle that would free a piece of bark caught under its weight and digging the earth out from beneath may only provide a limited remedy. It's important to keep in mind that any stems of brush or saplings that has been cut with an axe may be sharp enough to puncture a hole and do damage to the bark if the tree falls on top of these. Logs can be cut and stacked at the base to catch the fall and give it a few extra inches of clearance but this should not be relied upon for every time I've attempted this manoeuvre the violence that a mature tree falls when severed from its stump and the spring of energy that is sent back down towards the base as the canopy of branches catches its fall, has never resulted in coming close to catching a rest on any bed of logs that I've managed to drag into position.

Using an axe and a 3-foot bow saw I cut a wedge out of the tree on the same side as the direction of the prepared clearing and then made one more cut on the backside to release it and send it falling. Once the tree was on the ground I made a vertical incision in a straight line along its length and slowly began to pry up on the

edge of bark using the flat surface of my axe and knife. It was July 27th 2014, somewhat late in the season. The bark was a stuck to the tree and lacked the moisture that would usually make it easier to peel. We continued to pry on the bark pushing it slowly a few inches at a time. We worked carefully and evenly with our hands along its length. Sandra took care and repaired the tears that occurred at the edges of the bark. These tears almost always happen at a lenticel and if left unattended could run and carry forward many inches, if not all the way around, ruining a good sheet of bark. For this she used a small awl to punch little holes on either side of the tear and lace it over with a few stitches of waxed nylon to stop it from spreading.

Fig 4.1 – First bark harvest

The first bark harvest presented a couple caveats. Once the tree was on the ground, Sandra noticed tiny little shoots with precocious buds sprouting right out of the side of the trunk. These grew on the sunny side of the tree and were too far up to have been spotted from the ground while the tree was still standing, yet not far enough up the tree to be beyond the 16-18 foot sheet of clear bark we needed for the canoe. This might have been less of a problem had I made the vertical cut on the sunny side where these shoots were since they would have likely been trimmed off above the gunwales during the building, but I had already made the vertical cut on the rougher shady side of the tree. This sheet of otherwise clean bark now has about 10 or 12 little holes, remnants of where the shoots were sprouting, on what would become the bottom of the canoe hull. This bark was also about 3.5mm thick, which would be better suited for eastern canoes but not ideal for Dene canoes, which require thin bark about 1-1.5 millimetres. The harvest of this first piece of bark took about 3 hours from start to finish. Much patience was needed to slowly pry it from

the tree, on account of the sap drying out and it being stuck to the trunk. Undeterred, I wanted to go through all the motions and all the steps to get a feel for what the full experience of harvesting a sheet of bark is like. Don advised that it's good to find a less than ideal tree to practice on first as it would be rare if not near impossible to expect that the first attempt at harvesting a sheet of bark went perfect from start to finish to yield a usable piece. We flipped the bark over white side facing up towards the sky and gently rolled it up, beginning at its widest part at the base of the tree. There's a reason for this I remember Don telling me. "Roll it up white-side up and start at the base of the tree where it is widest that way when it wants to curl inward at the edges it will be supported."[74] Here we were in the forest with our first roll of bark and the voice of the master continuing to guide us. We were astonished that the skin of an entire birch tree can roll up as flexible as a yoga matt. Neither of us had ever done that before in our lives. I told Don about our exploits that day and about the little shoots that sprout from the side of the tree and he said "Oh yeah I guess we didn't talk about that. Look at everything you've learned today!"[75]

We made a few more trips to the area each lasting 3-4 days exploring large swaths of forest adjacent to the Algonquin Park, loosely delimited by a triangle formed by Barry's Bay to the northeast, Maynooth to the south, and Whitney to the northwest, which happened to encompass a huge and hugely disappointing lake called Bark Lake. We began to accept that we might not find a second suitable tree. This lake, situated along the upper Madawaska River, is actually the result of a dam owned by Ontario Hydro. The Madawaska, a tributary of the Ottawa River, used to be a fast flowing river with wild rapids, but over the last couple centuries it has been drastically changed and tamed. First by the logging industry, which began in the early 1800's, with the assistance of government funding to build slides, booms, and dams for sorting and triage camps before driving the logs further down to the Ottawa River to supply Upper Canada and the Royal Navy with timber. These dams made lakes out of land and in the case of Bark Lake put over 9000 acres under water

[74] Don Gardner, *personal communication,* September 05, 2008.
[75] Don Gardner, *personal communication,* July 27, 2014.

as deep as 280 feet. This mighty river and surrounding forests are integral to the livelihood of the Algonquin people. It now remains flooded to supply the burgeoning demand of the cottage industry in Renfrew Country with the amenity of electricity.

Over the course of a couple weeks we had easily looked and walked amongst thousands of birch and had made test incisions into approximately 2 or 3 hundred trees. All of the mature trees were dry and brittle like parchment and with the exception of one or two, delaminated and were unhealthy covered in a grey scaly disease. This bark season would come to an end with a total of five harvest attempts. Each of these accompanied by important lessons in learning about how to find suitable bark. Feeling a little discouraged and disappointed, we will have to wait until next year to try again. To cheer me up Don offered his story of his first attempts at finding bark:

> *"I had this contract to build a section of the bow of a fur trade canoe for an exhibit. I didn't even know where to get bark and I had never built a canoe at that time. This was back like 40 years ago. So I began calling around to other builders and found a guy in Montana who put me onto another guy up in Edmonton. I only needed about 8 feet so I ended up driving up to Edmonton and just bought a short piece from the guy. A couple years later I got another contract to build a whole canoe and needed a bigger sheet of bark. So I called the same guy up again and I asked him if he would accept a payment for bark but rather than sell me a piece just show me where he gets it from so I can go out and get it myself. He agreed and I've been going to the same valley ever since. I've gotten all the bark I ever needed over the last 40 years out there.*[76]

The following season back on the trail for bark with Sandra, we decided to return to some forests in Lanaudière, Quebec where we had sampled some birch late the previous summer and had already approached M. Brulé, the landowner, for permission to harvest from his woodlot. There was one tree of particular interest, however, it presented a couple challenges that I thought could be overcome by attempting to harvest the bark with a ladder and leaving the tree standing. This tree

[76] Don Gardner, *personal communication,* July 22, 2015.

was located on a steep incline such that if we attempted to cut it down it would likely fall a ways down the hill to a precarious and damaging rest. This tree, also presented a significant branch scar midway up around the 10 feet mark, which would dictate the side of the tree that the vertical cut would need to be on to open up the bark. However, it had other qualities and did not delaminate, which made it at least in that regard a good candidate and worthy of further consideration. Eager to learn a new harvest technique, we proceeded to carry a 30-foot clanking aluminum extension ladder into the woods and followed some instructions that Don gave us:

> *"I like using a ladder because it won't kill the tree. Bring a few large nails, some long light rope and a couple of small C-clamps. Make the vertical cut just as you would if the tree were on the ground and open things up working your way up and down the tree a little at a time. When the bark remains attached by just a few inches on the backside, go up to the top and drive a large nail into the tree above the section you intend to harvest. Then attach a couple C-clamps to the top edge of the bark and tie the thin rope to these clamps. Loop the rope over the nail in the tree and secure this so that it can't fall. Then return down the tree to push what remains attached completely off until the bark is hanging free. Use the ropes as a pulley to rappel the harnessed bark gently to the ground. It helps if you have another person with you who can carry the bottom of the sheet away from the tree, while the other person controls the ropes. If all goes well it won't crash to the bottom of the tree and break into a useless mess.*[77]

The steep slope made working from a ladder difficult. The ladder needed to be constantly repositioned, extended and collapsed repeatedly so that our arms could reach up and down the tree to work the bark free. Swatting mosquitoes on the ladder is unnerving but not nearly as much as trying to drive a nail at the top of the tree while standing on the upper rungs of the ladder some 22 feet off the ground. One hand is required to steady the nail, the other to swing

Fig 4.2 – Bark harvest from ladder

[77] Don Gardner, *personal communication,* June 26, 2015.

the backside of the axe behind and over the top of your head and there is no hand available to hold on. In the end we were very please with our experience and this tree yielded a nice sheet of bark with no delamination and only a couple blemishes.

Fig 4.3 – Bark hanging on rope harness

I returned for many days to search these same hills and forests for more bark, since the Gwich'in canoe requires two pieces, but the only other tree of interest that I could find was in close proximity to a sugar shack on a neighbouring property. Sandra and I approached the owner and we explained the purpose of our request. M. Dufour was happy to allow us to harvest the bark from the tree on his property. Again we used the ladder method and this time it took a mere 2 hours from start to finish. It was nice to be able to leave the tree standing and alive, as harvesting bark does not usually kill the tree. This piece delaminates a little bit especially in the upper half where it feels a bit dry, but for the most part seems usable and is actually the requisite thinness for Gwich'in canoes around 1.5 millimeters.

I kept sharing photos and stories from the bush with Don and over the summer months we had many conversations by telephone about bark. Neither of us could figure out why almost every tree I was finding was dry and delaminated, compared to the much better yields Don was finding in the valley in Alberta. Don suggested I give Rick Nash a call and ask him. Rick lives near Algonquin Park and has a lot of experience building beautiful canoes. I explained to Rick that I was having trouble finding bark. Rick listened as I told him that I could walk an entire slope for miles and test every single birch I came across and they will all without exception delaminate. He asked "Was the soil sandy?" I had no idea, I hadn't even considered

soil conditions nor had I ever heard or read any report that correlates soil with bark quality. This is totally new, my ears tuned in and I listened to what he was about to tell me. Rick went on to say: "Oh yeah they will do that, you might get lucky but hillside birch are usually on sandy shallow soil with shallow roots where the sun can reach the trees and dry out the bark." Rick went on to explain:

> *"Go deep into the woods, like 2-3 miles, pack a lunch, leave early and come back by dark. You won't likely find any bark at the edges of roads or trails. Go deep try to get yourself to flat terrain when things start to get dark and clammy in low-lying gullies. When you can feel the bugs crawling all over the place coming alive and getting more intense, you're probably getting close to find some good birch. The ones I find around my place in Ontario don't really grow in a mixed hardwood forest like maples, ash or oak, they grow among the conifers like hemlock who block out the light so they have to reach for the light at the canopy. These birch will grow really fast, they have to struggle to reach for the light at the top, they will be healthy and when you cut them down you will see nice fat growth rings. They tend to have thick bark that doesn't delaminate. Now it's not easy sometimes it takes me a few days other times it can take me a week or a little more, but if you look for these dark clammy damp buggy, low-lying gullies when you get in there you'll almost get a feeling you like you are probably going to find some birch in there, it's like the kind of place where the only thing missing is a little fairy who dwells in these hard to reach thriving lush places.*[78]

Rick called back one morning about a week later to say he had a look on a map and thinks if I could make it up a couple hours north of Maniwaki to Rapid Lake or Lac Barriere that I'd probably be in as good a spot as any to look for bark. In his words: "One of the nicest pieces of bark I've ever seen on a canoe came out of the Gatineaus. The birch grow like roman columns on the north side of the (Ottawa) River." I left for Rapid Lake that same morning and just as the sun was setting I met Jean-Maurice Matchewan who gave me some tips on where the elders used to go look for bark. Mindful of wanting to ask the community for their consent I inquired: "If I find a tree, who should I ask for permission to harvest it?" He said "Oh if anyone asks just tell them you need some bark, they might think you are working for a

[78] Rick Nash, *personal communication,* July 23, 2015.

logging company since you're not from around here but just tell them you want bark for a canoe and you should be fine."[79] To which I replied, "Yeah I just need one or two trees not the whole forest." Later I found out that this man, who showed me a great level of hospitality, was also the former customary chief of Rapid Lake.

It was during one of the worst heat waves all summer. Walking in the woods was nearly impossible as temperatures mid-afternoon reached a scorching 39 degrees. Even the bugs knew better than to go out in the woods in this kind of heat. I would wake up at the break of dawn to go search for bark and cool off as frequently as possible in any and every lake that I came across. By the third day I thought my time would be better spent if I tracked down David Gidmark to speak with him in person and listen to his stories about collecting bark with some of the Algonquin canoe builders in the area. David was happy to reminisce about the years he spent building canoes with the elders at Rapid Lake and Lac Barriere. He said he didn't know exactly where to go for bark nowadays because things have changed so much but he shared a few stories:

> *"The best haul of bark I ever found was by canoe. I paddled about 3kms to the far end of Lac Coupal and around its shores we got 8 rolls that were good for canoes. [He reaches for one of his published books and shows me a photo of a canoe loaded with 3 large rolls of bark resting across the gunwales such that there was barely room for a paddler to get in.]*[80] *See! That was just one trip. [I ask him if I were to hike in to that same lake if he thought there was a even a small chance I might find bark around there still.] No we went back a few years later thinking there might be one left in there somewhere and one of the guys did manage to get a last piece, but that whole area is being ripped up and cut by loggers now. William (Commanda) and I once looked for bark for a whole week before finally finding a piece. It's not what it used to be.*[81]

I went to check out Lac Coupal anyway, just to see if I could get a feel for the lay of the land. David, sure was up to date on the activities of the logging companies.

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[79] Jean-Maurice Matchewan, *personal communication,* July 27, 2015.
[80] [see: color photo insert of Jim Jerome in a canoe with 3 rolls of bark] [In] Gidmark, D. (1997) *Birchbark Canoe: Living among the Algonquin.* Willowdale, Ontario: Firefly Books.
[81] David Gidmark, *personal communication,* July 29, 2015.

That lake is now attended by heavy machinery and the deforestation was disheartening. No longer could I walk in the shade among the trees, it was a huge mess of upturned roots, discarded and rejected wood, and sun-parched soil, which swallowed my entire leg into a cavity if I lost my footing scrambling over the spoils. A canoe isn't even required to access the far side of the lake anymore there is now a logging road bulldozed in.

When the heat subsided a bit, I finally found a tree with nice thin bark. It still had a hint of delamination but people are always improvising and making the best of materials that are in many instances less than ideal. I decided to harvest it and to try to make it work for the side panels of the canoe anyway. From start to finish it took me 1.5 hours. The bark popped right off the tree and there was still a surprising amount of sap and moisture beneath the rind considering how late in the season it was. With large crackling sounds that came from beneath the entire sheet and spread up and down the tree with each push of the hand, the bark came off so quickly and with such ease that it required virtually no effort at all. I had never heard that sound before when harvesting bark, maybe it's a sign of beginning to do something right.

Fig. 4.4 – Roll of bark

The following spring, I returned for a few days to the area around Rapid Lake just as the ice had disappeared from the lakes and the last bits of snow were melting in the darkest hollows of the forest. I wanted to have another look for bark deeper in the woods, as Rick suggested the previous summer. On this trip I found a patch of forest that was predominantly birch, where the trees grew straight and the bark looked healthy but they were widely spaced where the sun could penetrate among

other hardwoods and underbrush of alders and willow. I tested a few in here and as usual the bark delaminated. I decided to change my approach and instead of looking for a one in a million tree that grew just right - the proverbial needle-in-the-haystack, - I decided to look for the right environmental conditions first, as Rick had described, and then worry about locating a tree second. Adjacent to this patch of birch, the land dipped and gradually descended into a gulley filled mostly with spruce and hemlock. There were quite a few birch that bled into the margins of these shady conifers. Here I tested two birch only this time the bark was thick almost ¼ inch and although the layers could still be separated or pried apart with my fingernail, they were nevertheless more intact than the other trees above on the plateau. These two birch were rough and gnarly looking, nothing even close to being suitable for canoes, but the bark test revealed some potential. Perhaps there were others in here farther back. The conifer forest was cool and dark and every once in a while the contrast of a white birch would attract my attention. As I walked deeper in the woods I came across another tree and whacked the roughest side of it with my axe to get a peek at the bark. To my surprise the axe bounced off. I hit it again with a bit more force and it still resisted the blow. I pulled out my knife, held it on an angle and as I began to bury the tip of the blade into the bark, the knife almost squeaked as it was pinched tightly between what was evidently very thick dense bark. Bark this rigid is not actually good canoe bark, but it is on the opposite end of the spectrum than the delaminating paper bark that is readily found on virtually every other tree. This was very encouraging. I kept going further in the woods and as I got in a little over a kilometer, the ground had levelled off and gave way to soggy moss that squished beneath my feet. In here I came across a cluster of 5 or 6 large healthy birch growing among the conifers all within a radius of about 100meters. One of these birch was huge more than 4 feet around (that would yield 50 inches of bark from gunwale to gunwale on a finished canoe.) It grew really straight and looked great. The test revealed a buttery smooth pliable bark that didn't show any signs of delamination, but it was prone to cracking at the lenticels. I marked this tree, noted its location and kept going farther back and after about a half hour of walking I located another tree a few hundred meters away that had even more potential. I had

heard stories about good birch bark often growing in groups of three or four. I brought a small 5-foot panel of bark home from the lower section of one of the trees. The bark had a faint smoky smell like the interior air of a wood cabin that had been in disuse and closed up all summer. Finding these two trees meant that there will be more harvests and more canoes to build in the future. It felt great to finally begin to get a sense of knowing where and how good bark might be found.

4.3 Harvesting Wood

The framework for the Gwich'in canoe at the Canadian Canoe Museum is made entirely of spruce with a remarkable selection of straight-grained wood. There is almost no evidence of any knots from branches and the wood exhibits a fine millimetred grain that came from trees with annual growth rings as dense as 22-24 per centimeter. Most spruce trees in cold climates grow quite slowly but grain this fine without knots over these lengths would tend to indicate that the canoe builder must have been selecting wood that had properties strong enough to make all the members of the frame as light and slender as possible. Even the way the builder chose to orient the grain on each frame member -lying down or standing up- indicates an awareness of the different structural properties. In southern regions, the forests are a mix of resinous conifer trees, Hemlock, Pine, Spruce, Larch, and Tamarack. The climactic conditions are far too favourable and it is not uncommon to find 3-4 healthy annual growth rings per cm of wood, which are pulpy and light but lack strength. Each season's growth ring acts as a laminate layer alternating between fast stints of soft pulpwood in the summer season overlaid by a denser resinous layer from the winter. Seeking out similar environmental conditions on the east coast, as those found on the cold Alaska-Yukon border where Gwich'in canoes are made would require a trip out to the north shore of the St-Lawrence River around Baie-Comeau, Quebec at the edge of the Boreal Forest.

The forests around Baie-Comeau are predominantly spruce, both white and black but there are also a few hemlocks, pines, and the occasional cedar. On the edge of the St. Lawrence the land rises abruptly out of the water and the trees are offered very little sunlight as they are often steeped in the fog that rolls in off the tidal waters. The north sides of the trees are shaded most of the year. The shallow, dry moss that covers the rocky ground provides the trees with precious little to cling onto and a relatively poor nutrition. The iconic Black Spruce's silhouette is itself the result of their struggle to survive in an inhospitable habitat. Against all odds they extract a meagre living, which can only support a constrained crown of dark green growth atop of a bare trunk displaying dead branches. The fact that this species predominates the sub-arctic Boreal Forest is testament to their remarkable adaptation. However, finding clear spruce that has no branches at all for 19-20 feet, the length of the canoe gunwales, and has a tight milimetered grain is yet another challenge.

There are some sets of growing conditions that can yield the right kind of canoe wood. Sometimes two or three spruce trees will grow so close together in a cluster that they act as one, often sharing the same root system, competing for the same nutrients and fighting with each other to sprout branches under the same sunlight. In this case the insides of their trunks will sometimes grow relatively free of branches and yield wood that is clear of knots. It is these sorts of peculiarities that a canoe builder must be attentive for when searching for wood.

One of the main difficulties, even when a seemingly suitable tree is located, is twist. Most trees have a tendency to grow in a spiral fashion. This is in fact more the norm than the exception. It is thought to be the result of the wind acting upon the branches at the tree's crown predominantly from one direction, which leads the tree to grow in a spiral. One just has to look at farmer's cedar fence posts with all the dryness checks and cracks, or telephone poles in the city, for an illustration of this phenomenon. The dryness cracks always follow the twisty-ness in which the tree grew. This is significant because the wood for a canoe is hand split and follows the

grain to preserve the integrity of the internal threads of its fibres. I fussed for a couple afternoons, dodging raindrops and blackflies, practicing splitting a less than ideal twisty tree before learning this vital preliminary lesson. Finding clear wood long enough for canoe gunwales out on the east coast where trees are scrawny and full of knots is a really tall order.

On the sixth day, after finding nothing but twisted growth trees, I made my way towards Pessamit on the east side of Baie-Comeau. While I was in the village walking on the beach I noticed some wigwam poles. They were from small trees no bigger around than the size of my water bottle but what caught my attention was the visible dryness cracks were perfectly straight up and down without any evidence of spiralling. I wondered if maybe there were some trees around here that grow straight. I headed back out of town, down another dirt road and came upon an entire stretch of forest clinging to some shallow eroding sand dunes where the trees had trouble growing branches on the north side. As I explored these woods I became convinced that this feels like the right kind of forest where good straight spruce may be found.

The trees were small, maybe 30 feet tall, 8-10" diameter and not much older than 75 years but after doing a couple tests it looked like most trees were spiralling one way and occasionally one spiralled back the other way. In my entire time thus far on the North Shore of Quebec I had not observed any that spiralled clockwise. Every tree that I had tested before grew up from the ground with a counter-clockwise twist. Perhaps there is one or two among these thousands of trees where the balance of twisting forces was just right and caused the tree to grow straight. Testing for spiral growth involves peeling a small strip of bark with a pocket knife and prying up some of the fibres of wood with the point of the knife to see which way they run. If the fibres travel off, even slightly, to one side or the other then the whole tree will exhibit some degree of twist. I decided to approach the Innu community and ask if they would give me permission to harvest a few trees on their land.

I spoke with André Côté, the director of territory and resources, who was amenable to the idea, but said he would have to get back to me in a few days with a definitive answer once he checks with the elected representatives on the Innu Council. In the meanwhile, I followed up with a letter outlining the nature of the research project; – that the canoe building is part of an apprenticeship and masters degree research thesis, and the reasons for wanting to harvest some spruce on their land, - narrowly, because the spruce on their land fit the criteria for the kind of wood canoes require, but also more broadly, because I am interested in learning how to know about building canoes and to be able to share this knowledge and be a part of the continuation of these skills. I also let them know that I was entirely open to discussing and finding ways for any prospective harvest to be done respectfully and in such a way that the community may also benefit. A few days later I received a reply from André Côté and M. Éric Canapé, one of the councillors, saying that they are granting my request to harvest three spruce trees on their land with two conditions attached. The first, that before any potential spruce is harvested, I let them know in advance the location, and second, that we discuss together ways in which the community, specifically the youth at the primary school, *Nussim* and the secondary school, *Uashkaikan,* may also benefit and share in the knowledge gained from finding out how to harvest materials for building canoes.

Fig 4.5 –Trio of clear spruce

It didn't take long to locate a few trees that appeared to have great potential. One tree in particular, grew in a cluster of three. The insides were clear of branches for about the first 20 feet. A test under the bark on one of them revealed wood fibres that pointed straight towards the top. Curiously the two beside it were slightly twisted. I returned to the territory and resource management office to let André

know that I had located some trees that I would like to harvest. He asked Sébastien Picard, a member of his staff, to accompany me back to the forest so I could show him where exactly these trees were. The trees of interest were all within a 5-minute walk of each other and Sébastien gave me the go-ahead and returned to the office.

I cut down the spruce with my bow saw and was delighted to see very dense annual growth rings. I limbed the remaining branches, which only grew on the sunny south side of the tree and made another cut with the saw at the top of the tree a few feet beyond the length I needed for the gunwales. With my axe I began to peel two strips of bark opposite each other about an inch wide along the entire length of the tree to serve as a guideline and window where if all goes well I could watch the splitting as it occurs ahead of the leading edge of my wedge.

I remember the first time Don showed me how to split wood by hand. It was a pivotal moment in my life because it felt particularly liberating to know that these skills would enable me to find the right kinds of wood for canoes and to be free from sourcing kiln-dried, mill-sawed wood from lumberyards. On a cool rainy fall day in October, Don and I, both stood on the shores of Katchemak Bay on the Kenai Peninsula in Alaska. He brought with him a little canvas bag, an axe and an old bow saw, the blade sheathed in a bit of canvas and duct tape. In the bag was a small collection of plastic wedges. The kind of wedges used by loggers to pound into the backsides of their cuts and leverage the tree if ever it pinches their chainsaw blade. I watched Don in a matter of a few whacks with his axe pry a piece of wood from a spruce log that he said will serve nicely for a bow stave. Don said here you try now. It was my first time, but he watched without saying a word, even though I must have been doing it all wrong.

> I borrowed his axe and pouch with 3 wedges in it. He said he'd be able to continue working on the bow with his hatchet. I attempted to split the next third of the log looking at one side that was semi-clear of knots. 3 hours later I managed to split it but it sure wasn't what I'd call easy. My ribs hurt. I buried the yellow wedge past the point of retrieving it and when I tried to use the blue wedge to rescue it, this one got stuck too. I laughed and said to Don looks like I'm committed to splitting this now so I could return his wedges. He said if I can't do it to just leave it and he'd help retrieve them tomorrow.

> He and his wife Joan went back to their van. The weather improved, stopped raining and got some amazing light shinny through dramatic grey clouds onto the mountainous slopes of the forested landscape within view across Katchemak Bay. By the time I returned Don's axe and wedges he asked about tent poles. I had seen some earlier and dragged three tall skinny poles not that straight though back to his van. He shared some tomato, and cheese, and bread with me. I walked back on a not so empty stomach.
>
> (Personal Journal: Oct. 3, 2003)

Don has a particular style where he will only for the briefest of moments demonstrate how to do something and then in a matter of minutes or seconds hand things over to the apprentice. I've watched him do this with other people around the workshop as well. He has complete confidence and trust in others to figure it out for themselves and he abandons any superficial concern in attempting to control the outcome. On occasion he will disappear for chunks of time wandering off while he leaves others to figure something out on their own. Sometimes he feigns fatigue and encourages the novice to go ahead and perform the task for him parting with words of encouragement, such as: "it's easy" "go ahead" and "don't worry if you break it." His teaching philosophy is such that he believes learning by first-hand experience is much more valuable than anything an old man could ever show or tell. Don will entertain questions and is entirely open to a good "chin-wag" as he likes to say, telling stories about the past that serve to reinforce whatever teaching moment is at hand, but I get the feeling that building stuff with Don is a pretext for social relations and it is in the spaces between the bonds among people and their interaction with their material environment that moments of learning really occur. In a sense the tools and the materials become an integral part of our bodies that help give broader context to emerging questions and concerns.

Back on Innu territory in Pessamit, more than ten years later, I am still practicing. I prepare the butt end of the log at the base of the tree to receive a plastic wedge. For this I use the back of my axe to hammer a hatchet into the end of the log, which begins a split for a few inches making it then possible to remove the hatchet and replace it by tapping in a plastic wedge. The sound of the wedge being driven into a fresh, cool, waterlogged tree produces a sound like music climbing in pitch

higher on the register – “toc-toc-tic-ping” - as it is driven deeper the pitch increases because it is being pinched tighter until finally giving way to a more sustained “crack” when the tree begin to be bisected. The goal here is to split off the half of the tree that has branches and keep the clear half for canoe wood. The backside of the head of the axe is used as a sledge to tap the wedge down the length of the log. The head of the axe must be thinner than the wedge otherwise it will not be possible follow it in the split and deliver an impact. Our ears listens attentively to the sound of the wood splitting as the cracks are carried forward and the fibres are torn apart deep inside the log. The sense of hearing is adapted as a kind of diagnostic tool, which can alert to an immanent problem in advance of the first visual signs. One can actually hear a split veer off course, for example, or get caught up on an embedded knot before the eyes are able to see it. If the wedge or split travels off center it may be necessary to reset and sever a few grains or score a new line with the axe to get things back on track. In this case the split stayed perfectly on track and followed the grain of the wood for the entire length of the tree. This was indeed a very straight-grained spruce. Sometimes the tree delights and continues to emit a creaking and cracking sound long after a blow has been delivered as it continues to adjust to its new predicament. Once the tree is split in half, it is appropriate to consider quartering the clear half and reducing it down to thinner members.

Fig 4.6 – Splitting spruce with wedges

During the quartering of the clear half of this tree I split off course and broke it trying to steer the split back on track. I had watched Don do this by putting the piece of wood in the crook of a nearby tree and applying pressure on one side to bias the grains until they jump back on track. When I attempted to do the same, it did not go as planned and I learned that quarter-round pieces do not steer so well.

Frustrated but still managing to laugh I was reminded once again of Don saying: "Don't' worry if you break it." At any rate, gunwales must be evenly matched and come from the same tree. I made use of the rest of the wood by trimming it down to shorter lengths for the floor rack and roughed out some rib blanks. After 10 days on the North Shore of Quebec, it became clear that I did not have the energy that I would need to be able to get the all the wood for this canoe in one trip. I stashed the floor rack pieces and ribs in the forest where I could retrieve them later and vowed to return for the other trees next year at a time when working outdoors would involve less encounters with blackflies.

Fig 4.7 – Twin spruce clear inside

The following spring, the air was crisp and the last remnants of winter's snow clung to life in the darkest shadows of the terrain. I visited the work site from the previous summer to see what memories could be conjured up. I found new vegetation sprouting through the debitage of woodchips left from my axe and the young plants seemed to thrive and be well on their way to almost completely covering my traces. As I walked on the quiet carpet of moss the tranquility was suddenly interrupted by a pair of pheasants who were startled by my presence and whose instinct sent them up to the lower branches of a nearby spruce in a loud fluster that sounds a bit like the first pull on the cord of a cold chainsaw. Their wings probably flap around the same rate as the compression and exhaust cycle of a little two-stroke engine before it fires up. I paused to admire how their plumage mimics the pattern of spruce bark and how well they camouflage and remain still even when they perceive to be in immanent danger. It was near these two pheasants that I came upon a pair of spruce that grew within a centimeter each other. The tree to the south, with its inside to the shade of the north, seemed the better of the two for canoe gunwales.

I spent a few days splitting the remainder of the wood and then trimming it down in order to shed as much weight as possible to make it easier to transport. I worked long hours in total peace and was thankful that this time of year is perfect for working outdoors unmolested by blackflies. The air was fresh enough to cool the body and work comfortably in the month of May in a short sleeve shirt and the peculiar presence of a little person surprised me as he kept appearing just at the boundary of my peripheral vision.

Fig 4.8 – Split 19 foot gunwales

> Took a lunch break, ate raspberries and cretons on bread. And approached the tree slowly. Cutting it down. Taking my time to enjoy and not work too hard as this would probably be the last of the three trees I needed for the canoe. It began to split perfectly. I stumbled around the fallen tree rotating the log every so often so I could keep watch on both sides of the split. While doing so, a small dwarf man or little person scared me as he appeared over my shoulder and out of the corner of my eye. When I looked in his direction he was gone. He reappeared and startled me a couple more times and as I continued work on this tree I had an eerie feeling that someone was in these woods with me watching. I thought I was beginning to hallucinate. He kept a distance about 15 feet away and would stay only for the briefest of moments at the edge of the spruce trees where the jagged bark met the mossy green backdrop of the forest floor. Each time he would recede behind the tree just as mysteriously as he would appear. The last time I saw him he turned his back so I could clearly make out his blue trousers held up by suspenders and beige cotton shirt. This old man was about 3feet tall. I assume he meant no harm as he never spoke a word or made any other action beyond his momentary presence. Spooked, I continued to split the log and it split like magic! Amazing good find today, I think I'm close to finding all the straight pieces of wood I need for this canoe.
>
> (Personal Journal: May 10, 2015)

4.4 Digging Roots

White Spruce, Jackpine, Tamarack, and Black Spruce roots can all be used to lash and stitch a canoe. My preference is for black spruce. Some builders report that

white spruce is stronger, whereas others have told me white spruce is more brittle on a finished canoe. The best roots grow in moss-covered ground usually in a clearing or area where trees are spaced at a distance from their neighbour. Sometimes trees at the edges of bogs or embankments down to a river can give up some easy roots. It is not unheard of to dig roots upwards of 15-22 feet in length in the right soil conditions. Conifer roots branch out along the surface and tend to grow at shallow depths. They get tangled like busy highways or conduits that overpass, interconnect, and branch off in Y's. On the sides of each root grow little fine rootlets that tangle and branch off in as many ways. Pulling roots up in the same direction that they grow will minimize any tears and damage. Finding longer roots means less work when it comes time to stitch the canoe. If the trees grow tightly spaced or if the roots are tangled and only yield short lengths under 4-5 feet, they will require more effort to prepare. I look for roots about the size of my thumb or index finger because these make for the right gauge flat-capped lashings for canoes. When enough roots are gathered to make a coil, I bundle them into a wreath and soak them in a nearby stream or source of water. Roots should not be allowed to dry out. If they do it will be more difficult to remove the bark since they will need to be re-hydrated in hot water to debark and split them. Roots can be kept in soaking for many months until time among other tasks permits to prepare them.

Fig. 4.9 - Spruce root

Fig. 4.10 – Spruce root coils

4.5 Conclusion

A peculiar aspect in learning a skilled craft is that even during moments of rest and under the cover of inattention, there continues to generate positive outcomes. The learning that was once unfamiliar in the somatic interactions with the materials in the forest re-emerges the following spring into a practice that becomes internally known. Previously, the seemingly insurmountable challenge of finding materials and performing the requisite motions in a successful sequence is recalibrated into an embodied skill set that brings about new and surprising results.

Even in the absence of finding birch bark there is something compelling and motivating about exploring the same terrain where canoe builders had roamed before me. Actually being alive in the woods gives the sense that the knowledge of building canoes is also held in the natural record every bit as much as it is held in narrative and dialogue with elders. Unfortunately, we live in a world with a lot of environmental destruction and this marginalizes people who endeavour to learn with their bodies. Logging and hydro-electric operations monopolize the use of forests and have exclusive lease rights for the next hundred years on crown land that is supposedly held in the public's interest. The climate is also dryer and hotter than it was in the past. While apprenticeships involve multiple forms of learning that are cobbled together and shaped by various experiences that involve the physicality of practice; following the footsteps of master canoe builders is not entirely some romantic pursuit of an ideal pure existence with the state of nature. In the 21st century it inevitably includes making cellular telephone calls from the tops of hills to try to pick up a faint signal, flagging waypoints on a GPS, filling up yet another tank of gasoline in a Volvo station wagon that also serves as a place of rest, purchasing food that comes from far away, as well as asking for permission to harvest from private land owners, corporations, government agencies, and First Nations. These factors, along with the environmental degradation, create mediated worlds that are narrowing for Indigenous cultures and resurgences in approaches to teaching that rely on corporeal activity in environmentally situated practices. Increasingly,

learning is being diverted from the rich sensory experiences that come from the land with blackflies and trees, and the risk of injuries from physical labour as we are forced to learn under different sets of sensory conditions, such as in libraries, with computers and books, and the white noise of air-conditioning.

In apprenticing to build canoes there is also a reconfiguration of conventional relationships among people, animals, materials, and landscape that is capable of throwing other issues into sharp relief. Working with Don and being party to his wisdom has taught me that the materials also have agency and are themselves profound actors capable of shaping the formation of the person and our collective experience. This is not a mere conditioned response to scratch an itch on the surface of the skin after an insect bites or to push harder when the bark is stuck to the tree. It extends into a deeper connection with the environment through active engagement with the materiality of our surroundings. Ingold expressed this idea as: "Stable features of the world remain imperceptible unless you move in relation to them."[82] However, this goes beyond moving around to locate and perceive more features. In the forging of a relationship with the forest and its materials we also learn to have confidence in what we know through the body and the senses. Bark does not just grow on trees waiting for the canoe builder to transforms it into a canoe. The Boreal Spruce is not just living lumber until it is cut down. There is always resistance, a grain to follow, or a twist to throw you off. Learning about how to make canoes involves developing your senses and getting intimate with and finding out about the individual characteristics of the trees, the materials, and arguably the other living organisms that inhabit the woods, which are of great concern as well. Without the ecology of the forest, we cannot really know.

Don repeatedly deferred opportunities where he could have spoken or demonstrated how to do a particular task, but instead opted to turn the tools and the

[82] Ingold, T. (2000). *The perception of the environment: Essays on livelihood, dwelling and skill.* London: Routledge., 18. [Adapted from] Bateson, G. (1980) *Mind and Nature: a necessary unity.* London: Fontana/Collins., 120.

materials over to the apprentice and just watch, provide some encouragement, or disappear for a moment and go for a walk. Don understands that the kinaesthetic learning that occurs in apprenticeships involves cultivating a relationship with the forest, trusting our senses to inform our actions, and letting the materials shape us as much as we wish to shape them.

Chapter V – Notes on Building

5.1 Introduction

In the following section a descriptive overview of the construction sequence and the assembly will be given. For the most part specific measurements, unless otherwise required to draw attention to a critical design feature, have been abstained from mention. The surveyed dimensions of the canoe and the scantlings of may be consulted in the appendices in tandem with this chapter.

5.2 The Canoe Frame

The Gwich'in canoe frame is made entirely of spruce. The trees are hand split along their length with wedges until they are reduced to proportions that can be better managed and trimmed down to near final dimensions with an axe and crooked knife. Processing the green wood should be done as soon as possible since a half log or quarter log will develop cracks and dryness checks as the outer circumference shrinks at a greater rate if left to dry unattended. Soaking the wood in a lake or pond may extend the time the builder has to process it. The skeleton of the canoe consists of; a floor rack, bow and stern stem pieces, two hull stringers, two gunwales, six deck thwarts, and twelve ribs. The floor rack requires some assembly.

The floor rack is comprised of; 4 inner stringers, 2 slightly thicker outer chines, and 5 cross splints. It is roughly two-thirds the length of the canoe and its greatest width is slightly aft of center with the fore cutwater being a little narrower than the rear. The grain of the wood is oriented with the growth rings standing up, which provides the most rigidity to the floor beneath the weight of the paddler. The outer chines should be taken from the same tree and matched for curvature to achieve a nice symmetrical shape. The cross splints are mortised about half way into the two outer chines and pegged in place. The four inner stingers are split to receive each of the splints as they pass through.

The bow and stern stem pieces have a slight upturn in the last 8" and are carved from naturally curved pieces of wood that occur at the base of the tree where it grows into the roots. The grain of the stem pieces is oriented horizontally. The bottom ends of the stems are notched to receive the ends of floor rack. The Gwich'in canoe in the museum has a fine feature where a little lip is carved out to receive the edge of the main sheet of bark at both heels. The stern piece is about 1.5-2" shorter than the bow and its tip is positioned about the same amount higher. The upward curve in the stern may be ever so slightly more pronounced and they each have an almost imperceptible rocker with about ¼" - ½" along their length. Holes are bored on the top edge every 5.5 cm in order to receive the root lashing that will bind the bark cover to them.

Fig. 5.1 – Assembled floor rack

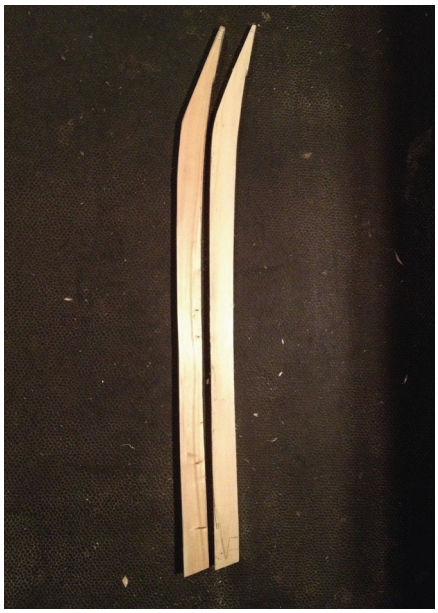

Fig. 5.2 – Stem pieces

Gunwales are made from two matching pieces of wood from the same tree with relatively the same flexibility. The grain of the growth rings on the gunwales is oriented in the vertical plane. The gunwales reach from the tip of the bow to the tip of the stern. They are tapered in height towards each end and split in half vertically so as to form an inner and outer gunwale. These are left attached at either extremity for the last 8 cm forming slightly trapezoidal end blocks. The split is

made carefully down the middle by first scoring with a knife and then by inserting a small wedge working it towards the ends and listening and looking for any signs of trouble. Great care is taken not to run out or split one half too thin. The last 20cm of the split is enlarged to 2 or 3mm so that the thickness of the bark as it is sandwiched between the gunwales does not pry and give undue stress on the end blocks.

Fig. 5.3 – Splitting the gunwales

The two hull stringers are D-shaped in cross section with the flat side lying against the bark. They serve to keep the ribs from poking through the bark and the integrity of the hull form as the water pushes inward against the frame. Their length is greater than the span of the 12 ribs. Ribs should be cut from live green wood, roughed out to near final dimension and kept soaking in water until such a time that the builder is ready to steam and bend them into shape. The grain of the ribs is horizontal to facilitate bending. There are six deck thwarts, also with a horizontal grain, that spread the canoe gunwales to the desired width. The thwarts are made flat on the bottom with rounded edges and are trimmed to a tapper at each end on top so they can be fitted into mortises that are shallowly notched about half way into the inner gunwale.

Fig. 5.4 Gunwale end blocks

5.3 The Building Frame

Some consideration should be given to the location the canoe is going to be built. Many steps require soaking pieces in water, such as ribs, bark, and roots, and other steps require a heat source for steam. Ideally any potential building site should have access to these amenities and also keep the canoe sheltered from the weather. Direct sunlight can curl the bark. Rain is also a problem. Canoes were built directly on the ground, where the soil can be levelled to form the desired building bed. In a workshop setting it is easier to build a building surface and work at waist height than it is to do so on the ground. A couple of sawhorses a sheet of 8'x4' pressboard cut in half lengthwise and two 16' pieces of 2x4 lumber should suffice. The bottom of the Gwich'in canoe has an almost flat but slight reverse hog shape to it. To achieve this shape the building frame table surface must also be gently arched with a rise of about 3 to 4 inches at the center. Previously, stakes were driven directly into the ground, however, when using a building frame, large holes may be bored in the top sheet to receive the stakes every couple of feet or alternately they can be screwed in place.

Fig. 5.5 Building frame with arched surface

5.4 Setting up the Bark

Bark may be harvested in advance, stored dry in rolls and submerged in water for a few days before attempting to unroll them. The Gwich'in canoe has a main sheet of bark, which goes from the tip of the bow to the heel of the stern, and two side panels, which go from the tip of the stern forward to approximately the heel of the bow. The bark is laid out in a pattern that resembles a swallowtail finger splice. This method of setting up bark for a flat bottom canoe alleviates the necessity of cutting gores and folding up sections of overlapping bark. The main sheet of bark is laid down first with the white exterior side up and then the floor rack is placed on top and weighted down with rocks or books or whatever other heavy items may be at hand. Aided by warm water, the bark can then be folded up around the edges of the bottom floor rack. Stakes are set up around the outside edges of the bottom floor at roughly the same angle to match the flared sides of the finished canoe. Temporary battens are used on the inside of the stakes to further support the bark. Most bark does not want to lay flat or conform to the hard chinned upturned edges of the bottom frame of the canoe. It requires a bit of fiddling. Thick bark around 3 mm proved to be uncooperative. The Gwich'in canoe uses thin bark measuring about 1mm and I had more success when I tried again with another roll that was of a similar gauge.

Fig 5.6 – Main sheet of bark

The bow and stern stem pieces are propped up in position with temporary stakes. It is important to remember when setting up the stems of the canoe that the space between the two notches that are carved into the ends of the stem pieces must be about 2-3 inches shorter than the overall length of the floor rack, which they are meant to receive. This means that the floor rack will lie on top of and slightly past the notches until after the canoe is sewn up and the floor is ready to be installed under pressure. It is in this way that the bottom of the canoe is pre-stressed and maintains its slight reverse hog shape.

Fig 5.7 – Side panel setup

The side panels comprise the bark that also makes up the tail section of the canoe. Again there is a bit of fiddling required to get this to work, but in general the panels need to be tucked a few inches under the floor rack and folded or creased at the chines in the same manner using some warm water as was used to fold the main sheet of bark. Even though the depth of the canoe in the middle is only about 9 ¾" - 10", the side panels should each be in the range of 18" to 20" wide in order to be tall enough to rise to the top of the end of the stern. Once the bark is set up, the excess above the longitudinal seam on the main sheet as well as bellow the bow and stern may be trimmed to profile.

Fig 5.8 – Tail section

The method I use to set up the bark differs slightly from the way the Gwich'in would have done it. The gunwales would have first been bound with rope to the tips of the stem pieces and then lifted onto the building frame, spread with temporary thwarts, tied to the stakes in the ground at the desired heights, and then the pieces of bark would have been laid in and set up. I prefer to use smaller inside stakes that catch the edge of the floor rack and pinch the side panels between temporary battens on the inside of the canoe. This method allows for the longitudinal seam bellow the waterline to be sewn and stabilized first before attempting to fit the gunwales.

Fig 5.9 – Debarking spruce roots

5.5 Preparing Roots and Stitching

Spruce roots are kept soaking in water until they are split and prepared into lashing material. The first step involves removing the bark to get at the nice bright root underneath. A simple root de-barking tools can be made from a stick about 1.5" in diameter and about 12" long that is split in half for about 8" leaving the two prongs attached at the end to form a handle. The root is then held between the edges of two-pronged tool, which is rubbed up and down to scrape the bark off. Next the root must be split in half down its entire length. Spruce roots have little rootlets growing out from the sides. The first split should be made along the same plane as the little side rootlets so that two clear caps of lashings are obtained without any trace of the little rootlets on the face of the lashing. The split is started with a knife beginning at the thick end of the root and then worked by hand pulling the two halves apart along their grain all the way to the end. If the split begins to veer off

center it is possible to steer it back on track by biasing the pressure applied to the thicker half until they become equal again. Since roots taper along their length, a second or third pass at splitting must be done to make their thickness more uniform. The aim is to remove more material from the thicker end of the root than from its tip. The Gwich'in canoe has roots that are dressed to about 3 - 3.5mm in width. Once they are prepared they can be wrapped in smaller coils and allowed to dry.

Fig 5.10 – Split spruce root coils

The coils of dressed roots are moistened in a pot of warm water to make them soft and pliable again. The longitudinal seem joining the panels together is stitched by punching a hole with an awl just above the overlap and then punching another hole about ¾" directly below. Beginning a stitch involves passing a couple inches root through the top hole and bending it over on the inside so that it can be secured under the next stitches. A set of two more parallel holes are punched and the leading end of the root is fed through the bottom hole and up to the next stitch diagonally such that on the inside of the canoe it bears a zigzag pattern and on the outside it shows a series of parallel stitches.

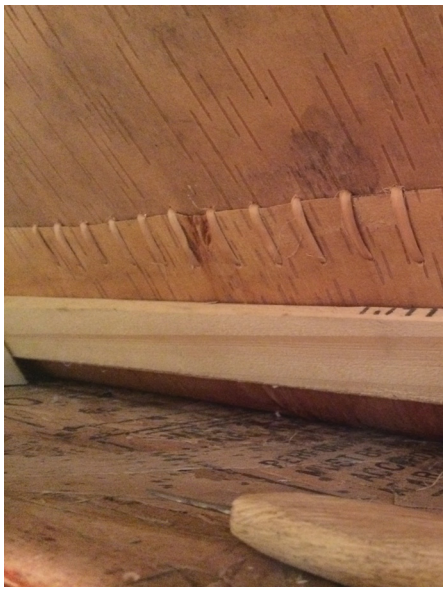

Fig. 5.11 - Sewing the panels

5.6 Installing the Gunwales

The split gunwales are put into position by slipping them over the top edge of the bark such that the bark is sandwiched between the inner and outer gunwales. Temporary thwarts are used to spread the gunwales to the same widths as the finished canoe. The gunwales are tied to the stakes at the heights that correspond to the desired depth of the canoe. The Gwich'in canoe is about 9 ¾" in the midsection where the paddler is seated, but the stern is deeper than the bow by about 1 ½ - 2". The gunwales are slowly brought to rise to the ends of the stems and are bound with some cord until they are sewn in place. Some steaming of the gunwales at the upturned ends may help this along. The excess bark that exceeds the length and height of the gunwales can be trimmed off with a knife.

Fig. 5.12 – Installing the gunwales

The gunwales are wrapped with roots using a coil stitch. Holes are punched with an awl just below the bottom edge of the gunwales and root lashings are passed through the hole, up over the top of the gunwale and back again through the next hole. When the piece of root is near its end, it is secured by passing it under the last coil or two, pulled tightly and trimmed off. Similarly, a new

Fig. 5.13 – Lashing the gunwales

lashing is started by leaving the first inch of root tucked under the inner gunwale, which is thereafter secured by the next few coil wraps. From the bow until the second thwart, the Gwich'in canoe has a coil stitch with turns about every inch. Between each of the remaining thwarts there are 5 sections on each gunwale pair with groups of lashings of about 3-4 turns that make for a patterned design. The remainder is done with continuous lashings.

5.7 Sewing the Stem Pieces

The Gwich'in would temporarily peg the bark to the stems and then sew them into place towards the final stages of assembly. The longest roots are saved to sew the stems. If roots of about 10-12 feet can be obtained it may be possible to sew the stems without having to add on a new piece. The stitch used is a double-thong in-out stitch, which is basically a long piece of root pulled half-way through the bottom hole of the stem piece and the two ends fed into the next hole in opposite directions, pulled tight and repeat until the stitching reaches last hole at the tip.

Fig. 5.14 – Sewing the stems

5.8 Pre-Stressing the Floor Rack

The floor rack is overbuilt by a couple of inches beyond the space intended to receive it. Pre-stressing the floor forces it into compression between the two stem pieces and stretches the bark of the canoe lengthwise so that the bottom is taut. It is a good idea to pour warm water inside the canoe before attempting to stretch the

bark. Ideally this stage is best attempted with a couple helpers. While one person lifts the floor in the middle, the helpers can press and guide the ends down into the notches in the stems. This allows the floor rack to become arched, which shorten it enough to then press the middle down slowly under pressure. This may need to be attempted a few times and gradually trim the floor back until it is about ¾ - 1 inch overbuilt so that it fits without breaking anything. The movement positioning the pre-stressed floor pushes the canoe into its final shape by raising the stems up an inch or two. As the bow and stern rise, the gunwales change shape slightly, where they were previously set flat and level on the building frame, they now gain a subtle but graceful sheer. This action also diminishes the reverse hog that was built into the bottom of the canoe to an almost imperceptible amount but should not induce it to become flat or have any rocker.

Fig. 5.15 – Fitting the floor

Fig. 5.16 – Stems rising into position

5.9 Thwarts and Ribs

Thwarts are installed into mortises that are carved about half way into the inner gunwale. Three slots are carved into the ends of each of the thwarts so that a sturdy root

lashing may affix them into place. The location of the fourth thwart, which acts as a backrest for the paddler who is seated on the floor, is critical as this determines the trim and center of gravity while on the water. On the Gwich'in canoe the fourth thwart is about 14 inches aft of half the length.

The first and last ribs are V-shape and are positioned at the ends of the floor rack so that it cannot dislodge from the notches in the stems. The two hull stringers are held in place a few inches up from the bilge by the pressure between the ribs and the bark. Ribs are steamed and bent with sharp turns at the chines. It is a challenge to achieve this bend without kinking or collapsing the grains in a rib made of softwood spruce. The ends of the ribs are sharpened to a point with a shoulder and forced into the underside of the gunwales. Ribs aft of center are canted slightly towards the back and ribs forward of center are canted slightly towards the front.

Fig. 5.17 – Thwarts and ribs

5.10 Gumming the Seams

When collecting resin from conifer trees it is best to seek out the hardened aged sap that is dry and resembles the brittleness of amber. Semi-hard resin may also be collected, but soft sap with the consistency of honey should be avoided. The resin is heated in a pot until it melts into thick syrup and begins to simmer. The raw sap requires straining in order to separate all the pieces of bark and impurities that are trapped in it. I found that a metal strainer works better than cloth or burlap for this task. Next, the resin should be reheated, applied to a test piece of bark and then

allowed to cool in order to observe how it behaves under stress, cold water temperature and sunlight. Pure resin should set up brittle and chip or crack when the test bark is being manipulated and bent back and forth. The degree of brittleness will determine the amount of animal fat that needs to be added to render it flexible and adherent. Some consideration should be given to the intended usage conditions. One of the challenges with canoe pitch is that the waterproof sealant has a narrow operating temperature. A sturdy pitch with very little animal fat is suitable for use in warm waters and summer days with moderate or direct sunlight, because it won't melt too badly. However, a pliable mixture with a bit more animal fat is appropriate for use in cold waters because it is less prone to cracking and chipping. A good mixture for one season is likely not for another. The sap is applied to the canoe seams with a stick while it is still warm. Frequently licking your thumb will allow you to press the sap into the awl holes and smooth it out to completely encase the stitches. For some reason hot sap sticks to everything except saliva.

5.10 Finished canoe

Fig 5.18- Finished canoe

Chapter VI – Discussion: Canoe Building as Pedagogy

6.1 Introduction

In building a Gwich'in canoe, this research creation project sought to answer how an apprentice uses somatic modes of learning to learn from the master. This study found that skills apprenticeships produce new complementary multimodal expressions of anthropological knowledge, which pluralize ethnography beyond purely interpretive textual accounts. Sensory studies provided an approach and framework that is particularly germane to examining the ways craftspeople use the body to supplement the use of language to communicate knowledge and teach skills.

At the core of this exercise, was the use of the body as a site of experimentation to uncover how learning occurs in the interactions between people, materials, and the environment. Kinaesthetic learning occurs in carrying out a physical activity, as documented for example; through the tactile appreciation of the Gwich'in canoe held in the museum, through the feel in your bones and muscles what its like to walk on the land, to endure the heat and interminable swarms of insects, to work with an axe and wedges, and to listen to the splitting of the spruce. This is how knowledge is made. While the production of a canoe as a material object can be the aim towards which the efficacy of the builder's skill may be evaluated, the emphasis, however, should not be on the end results, but rather on the process through which the body is brought to learn. Another canoe could always be made later, but it is the skills and knowledge that are co-created and shared that will remain within the body for a lifetime. Furthermore, not only do these kinds of rich somatic experiences provide a means of accessing and shaping the materials in the forest, but they also forge new pathways into other institutions of learning as well. Grounding the materials taught in school curriculums to a body of practice is not only mutually productive it also makes good sense.

The number of paths that an apprentice travels in the building of a canoe has made clear that teaching models at university have been constrained by placing an inordinate amount of emphasis on discipline, propositional thinking, literary achievement, and meta-theorizing. The role of the expert has also been over-stated. My preoccupation with building a Gwich'in canoe is a value statement of what I believe to be an appropriate strategy in an attempt to reclaim the experience of a post-secondary education from the grips of theoretical abstraction and dull sensorial learning environments. To be clear, close at heart in learning how to build birch bark canoes, by actually doing it, as opposed to just studying it, is also my own commitment and an expression of confidence in a future that includes the continuity and sharing of Gwich'in deep cultural knowledge. The following section aims to find a footing for the inclusion of apprenticeships and diverse ways of knowing that are heteroglossic and transcend Western disciplinary boundaries.

6.2 Sensory Studies

It is argued in this thesis that there is a detachment from the body and bodily ways of knowing in teaching at the post-secondary level. Given that the human sensorium is primordial in shaping our collective experiences, it is disconcerting that the ways in which people use touch, hearing, taste, smell, and sight are increasingly being mediated through environments that are principally controlled and shaped by human intervention. Learning is being diverted from the sensory experiences that come from the land towards a different set of sensory conditions that come with being hosted in institutions. These mediated worlds have a narrowing effect for people who rely on corporeal activity as a primary site in the transmission of knowledge. This affects not only our research, but also our worldview. Sensory studies is at once an appropriate methodological approach but also a framework with which to work towards recovering ways of teaching that encourage students to trust what they have learned and have come to know through their bodies while applying skills in practical contexts.

The marginalization of craftwork in Western culture is problematized by the privileging of the visual sense. When comparing the visual arts and fine arts to handcrafts, Howes states: 'Sight is opposed to touch as mind is to body and in the conventional Western hierarchy of the senses honour is heaped onto vision as the noblest sense and touch is relegated to the lowest most primitive rung of the sensorium.'[83] Shusterman concurs, in developing a theory about body consciousness, he says that in the West the body is often associated with what is negative, bestial and unholy.[84] His studies of somaesthetics, a term he uses to emphasize that the body is not just flesh but also 'an entity of sensuous being and a site of creative self-fashioning and self-realization;'[85] questions why in the West, teachings of body awareness are greatly discouraged.[86] According to Fabian "visualism," which is a term he uses to characterize this phenomenon, is to conceptualize knowledge as being principally a function of the sensory mode of sight and this has the effect of reducing the act of knowing to what is observable from a distance.[87] This detached perspective, alienates our conceptual realms from the sensations and everyday lived experiences that they are supposedly based in.[88] Embodied learning through apprenticeships points the way towards a revaluation of craft.

Literacy has profoundly changed our knowledge of the world. In McLuhan's opinion, print technology unconsciously alters our perspective due to literacy privileging vision over the other senses as a mode of input. The production of textual accounts also focuses too narrowly on conceptual thinking in the transmission of

[83] Howes, David. (2011) The Craft of the Senses. *Centre for Sensory Studies – Occasional Papers* Concorida University, 1.
[84] Shusterman, R. (2012). *Thinking through the body: Essays in somaesthetics.* Cambridge, UK: Cambridge University Press.
[85]Shusterman, R. Interview June 25, 2012 Cambridge UP Japan [Accessed from] http://www.youtube.com/user/CambridgeUPJapan?feature=watch
[86] Shusterman, R. (1999) Somaesthetics: A Disciplinary Proposal. *The Journal of Aesthetics and Art Criticism, 57*:3, 299-313.
[87]Fabian, J. (1983) *Time and the other: How anthropology makes its object.* New York: Columbia University Press. [In] Jackson, M. (1989) *Paths Toward a Clearing: Radical Empiricism and Ethnographic Inquiry.* Bloomington and Indianapolis: Indiana University Press, 6.
[88] ibid, 5-6.

ideas.[89] Furthermore, literacy may isolate the reader and writer from social contexts.[90] Jackson says that word-worlds predispose us to think of social experience in sequential lineal terms that are cut off from the stream of life.[91] Dewey refers to this as the "spectator theory of knowledge."[92] His explanation is simple. He says that people naturally seek security and stability from the harshness of life and their environment and in order to guard against the unpredictability of nature we do things such as; build houses and create routines, but also part of our survival strategy involves conceiving intellectual systems of a symbolic nature. Creating higher conceptual realms brings comfort since these can be controlled with greater certitude and consistency and in ways that allow us to withdraw from an inferior sensual realm where the practicality of life and all its uncertainty is found.[93] This narrow intellectual notion of knowledge allows us to retreat into our minds and find some respite without having to participate in the ongoing drama that belongs to everyday life.[94] While book learning is highly portable and can be economically advantageous, it is important to bear in mind that these gains also come at an expense. In effect literacy has played its part in the sensorially mediated worlds that exist in most modern institutional education settings.

The call for non-textual approaches to anthropology is not new. Michael Taussig wondered if "anthropology has sold itself short in conforming to the idea that its main vehicle of expression is an academic book or journal article."[95] The field of visual anthropology has done much of the groundwork in breaking trail on this

[89] Peters, M. (2004) Education and the philosophy of the body: bodies of knowledge and knowledges of the body. In L. Bresler (ed.) *Knowing Bodies, Moving Minds: Towards Embodied Teaching and Learning.* London Kluwer Academic, 13-28 [In] T. Marchand (2008) Muscles, Moral and Mind: Craft Apprenticeship and the Formation of Person, *British Journal of Educational Studies*, 56:3, 267.
[90] McLuhan, M. (1962) The Gutenberg Galaxy: The Making of Typographical Man. University of Toronto Press.
[91] Jackson (1989). *Paths Towards a Clearing: Radical Empiricism and Ethnographic Inquiry.* Bloomington and Indianapolis: Indiana University Press, 9.
[92] Dewey, J. (1929) *The quest for certainty: A study of the relation of knowledge and action.* New York: Minton, Balch. [In] Jackson (1989). *Paths Towards a Clearing: Radical Empiricism and Ethnographic Inquiry.* Bloomington and Indianapolis: Indiana University Press, 6.
[93] *ibid*, 15.
[94] *Ibid*, 15.
[95] Taussig, M. (2015) *Excelente Zona Social* [In] The Corn Wolf. Chicago: University of Chicago Press, 76.

matter by advocating for the inclusion of ethnographic film and audio-visual media.[96] Moving anthropology beyond textual accounts is not just the literary question it initially appears to be. Cox says that, "non-textual [works] […] have the capacity to offer anthropological insights of equivalent value to the standards set by the written text."[97] Proponents of non-textual media in anthropology are often mistaken for having a naïve or romantic antagonism towards language as if somehow alternative media can "obviate the obscurantism of specialised academic language."[98] The real argument for the inclusion of alternate media is not to be liberated from text but rather to encourage the production of diverse kinds of knowledge, which lead to new analyses.

The embodiment paradigm in anthropology gave rise to the attuning of researchers' own body and senses as a means towards ethnographic analysis.[99] Sensory studies are not merely a highly effective method of inquiry; it also is a framework that produces new expressions of knowledge that are performed as skilled practice. The craft of canoe building may be different that the crafting of a textual document but these two forms can be mutually productive and informative to the ethnographic project. Furthermore non-textual works in anthropology are not meant to replace textual accounts but rather to complement each other in a continued effort at finding new ways to remain critically engaged in both our writing and in our creative research pursuits that include richer sensorial approaches.

6.3 Embodied Knowledge

One of the guiding principles of embodied knowledge is that consciousness is

[96] Pink, S. (2007) *Doing Visual Ethnography: Images, media and representation in research.* London: Sage.
[97] Cox, R., Irving, A., & Wright, C. (2014) *Beyond Text* 'unpublished manuscript' Manchester: U.K., 9.
[98] *ibid*, 11.
[99] Howes D (2013) "The Expanding Field of Sensory Studies" (An Essay) Montreal: Center for Sensory Studies, 3.

also a matter of doing, not only of thinking.[100] When ways of knowing are pluralized to include embodied forms, the mind can then be considered a sentient organ among others and intellect can be reconceived as to emanate through praxis from the whole body. With embodied knowledge there is no *a priori* hierarchy of the mind over the body as they are both indivisibly responsible for actions of higher-order cognitive functioning. Embodied knowledge thus emerges in a field of total corporal experience rather than in purely cognitive spaces.

In contrast to ideational models, which place human cognition at the pinnacle of the knowledge making process, Lave and Wenger's influential theory on "situated learning" propose that learning is born out of the context of an activity through "participation in communities of practice [that] concerns the whole person acting in the world."[101] Ingold takes up the intersection of tools, skills, landscape, and mind, in what is also essentially dealing with the lived experience and embodied knowledge.[102] His approach, with a particular emphasis on the development of skills, is similar in that he believes 'knowledge emerges as a property of the total system of relations by the presence of an organism engaged in activity in its environment.'[103] In re-evaluating the nature vs. nurture dilemma, Ingold suggests that the process of enskilment, which is not entirely the product of learning or acquisition of culture but rather the result of humans training in a particular environment, is largely responsible for the ways decisions are made and the world around us is perceived.[104] From the position of a pragmatist philosopher, Shusterman calls for a "critical ameliorative study of the use of one's body in experience."[105] His perspective is that all theoretical knowledge, even the most abstract, begins as a bodily

[100] Merleau-Ponty, M. (1962) The *phenomenology of perception.* London: Routeledge & Kegan Paul, 124.
[101] Lave, J. & Wenger, E. (1991) *Situated Learning: Legitimate peripheral participation.* Cambridge, UK: Cambridge University Press, 49.
[102] Ingold, T. (2000). The *Perception of the Environment*: *Essays on livelihood, dwelling and skill.* London: Routledge, 173.
[103] Ingold, T. (2001) From the transmission of representations to the education of attention. [In] *The debated mind: evolutionary psychology versus ethnography* (ed.) H. Whitehouse, Oxford: Berg, 122.
[104] Ingold, T. (2000) *The Perception of the Environment: Essays on livelihood, dwelling and skill.* London: Routledge.
[105] Shusterman, R. Interview June 25, 2012 Cambridge UP Japan [Accessed from] http://www.youtube.com/user/CambridgeUPJapan?feature=watch

practice.[106] Jackson "remains sceptical of all efforts to reduce the diversity of experience to timeless categories and determinate theorems, that force life to be at the disposal of ideas."[107] He proposes that ethnography should be informed through a process of "radical empiricism," which re-emphasise lived experience as the basis for knowledge.[108]

There is no reason to limit knowledge to what is bound to the human corporal experience. It is not that far a departure for a skilled apprentice and scholar of embodied knowledge to arrive at a notion of knowledge that seriously reconsiders (and blurs) the boundaries between mind, body, and the material environment. Using a walking-stick analogy Bateson asks: "Is my mental system bounded at the handle of the stick? Is it bounded by my skin? Does it start halfway up the stick? Does it start at the tip of the stick?"[109] There is a whole system of pathways upon which knowledge flows and there is no good reason to cut off any investigation into the matter with tidily prescribed categories no matter how crucial an actor we may believe we are. Learning by doing, by being in a relationship with the land and by listening to the materials that are in our hands, reinforces the inseparability of knowledge from the physical and mental realms.[110]

In situated learning environments, cognitive and bodily spheres of knowing are never discrete, but rather are simultaneously complementary and mutually informative. It may seem elementary to a skilled craftsperson that the paradigm of embodied knowledge should become relevant in anthropology. However, with the erosion of bodily ways of knowing in modern institutions of learning, the specific corporeal experiences that craftspeople regularly engage in enable them to

[106] Shusterman, R. (2012). *Thinking through the body: Essays in somaesthetics.* Cambridge, UK: Cambridge University Press.
[107] Jackson, M. (1989). *Paths Towards a Clearing: Radical Empiricism and Ethnographic Inquiry.* Bloomington and Indianapolis: Indiana University Press, 1-18.
[108] *ibid.*, 2-5.
[109] Bateson, G. (1987) *Steps to an Ecology of Mind*. Northvale, N.J: Jason Aronson Inc., 466.
[110] Malafouris, L. (2004). "The Cognitive Basis of Material Engagement: Where Brain, Body and Culture Conflate." [In] E. Demarrais, C. Gosden, & C. Renfrew *(eds.) Rethinking Materiality: The Engagement of Mind with Material World.* Cambridge: McDonald Institute for Archaeological Research, 53-62.

contribute to scholarly debates and advancements on a theoretical level. What transpires from the perspective that the mind and body conflate and that there is intellect in bodily practice and sentiency in the brain is that achievements are developed through the use of the same faculties that are neither distinctly manual nor cognitive. For example, the skills that are learned by training in a particular environment to make sense of the grain in spruce and deliver a blow with the axe onto a wedge that has spiralled in a corkscrew split along the length of a twisted tree, are consummative of the skills required to make sense of the readings about bodily ways of knowing. The fact that literacy and different sensory conditions in the forest versus the university may set one apart from the other in no way diminishes the value of the training under each respective pedagogical paradigm.

6.4 Apprenticeships as Anthropology

In anthropology the consideration of other avenues of learning that include all of our sensory modes and bodily participation, are increasingly gaining traction and are in the process of becoming less marginalised. Anthropologist Trevor Marchand has advanced the theoretical premise and argument for a consideration of the inclusion of apprenticeships. Drawing upon Peters, who says 'the history of Western education has too narrowly focused on conceptual thinking;'[111] Marchand says the apprenticeship model of learning offers "an expanded notion of knowledge that exceeds propositional thinking and language and centrally includes the body and skilled performance."[112] Research on apprenticeship knowledge intersects with studies of somatic learning, cognitive sciences, phenomenology, practice theory and enskillment.[113] It is also often more broadly accompanied with salient critiques that

[111] Peters, M. (2004) Education and the philosophy of the body: bodies of knowledge and knowledges of the body. In L. Bresler (ed.) *Knowing Bodies, Moving Minds: Towards Embodied Teaching and Learning.* London: Kluwer Academic, 13-28 [In] T. Marchand (2008) 267.
[112] Marchand, T. (2008) Muscles, Moral and Mind: Craft Apprenticeship and the Formation of Person, *British Journal of Educational Studies*, 56:3, 245.
[113] [For somatic learning see:] Shusterman, R. (2012). *Thinking through the body: Essays in somaesthetics.* Cambridge, UK: Cambridge University Press.

attend to the unnecessary separation of mind and body that run deep in Western epistemological traditions. Among embodiment scholars, Merleau-Ponty is oft regarded as a pioneer. In his theory about the unity of consciousness and action, he states that all knowledge is embodied; or to put it another way, that all thinking or perception is born out of sensuous experience in the world.[114]

Marchand begins thinking about the application of apprenticeships in the social sciences as a potentially new learning model by asking two questions: "How do we know?" – which speaks to the practice of knowing and "How do we come to know?" –which speaks to the process of learning.[115] While these are both questions of epistemological consideration, his response is: Knowledge is born out of a 'dynamic process arising from the indissoluble relations between minds, bodies and the environment.' [116] Varying opinions begin to converge in the discussions surrounding the embodiment of knowledge. There are, however, no concrete or definitive answers to these profound questions and another plausible hypothesis is that, at least at the present time, "higher-order thought processes are very likely inexplicable."[117]

This study reveals that the boundaries between distinctly cognitive schemata of understanding and embodied knowledge become blurred the moment skills are put into practice. The webs of knowledge that flow become impossible to untangle in

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[For Cognitive sciences see:] Boyer, P. (1999) Human cognition and cultural evolution. [In] *Anthropology theory today* (ed.) H.L. Moore, Cambridge: Polity. 206-33.
[For phenomenology see:] Merleau-Ponty, M. (1962) *Phenomenology of Perception.* Translated by C. Smith. London: Routledge,
[For practice theory see:] Bernstein, N.A. (1967) *The co-ordination and regulation of movement.* Oxford: Pergamon.
[For enskillment see:] Ingold, T. (2000) Evolving skills. [In] *Alas poor Darwin: arguments against evolutionary psychology* (eds.) H. Rose & S. Rose. London: Jonathan Cape. 225-46.

[114] Merleau-Ponty, M. (1962) *Phenomenology of Perception.* Translated by C. Smith. London: Routledge, 229.

[115] Marchand, T. (2010) Making Knowledge: Explorations of the Indissoluble Relations Between Mind, Body and Environment. *The Journal of the Royal Anthropological Institute, 16,* 1.

[116] *ibid.* 2.

[117] Fodor, J. (1983) *The mind doesn't work that way: the scope and limits of computational psychology.* Cambridge, Mass: MIT Press. [In] T. Marchand (2010) Making Knowledge: Explorations of the Indissoluble Relations Between Mind, Body and Environment. *The Journal of the Royal Anthropological Institute, 16,* 5.

the complex interplay of ideas and habits of action. It is in this way that, as Marchand says: "embodied learning involves, multiple and highly complex forms of communication and, like propositional knowledge, skilled practice is a hard-earned cognitive achievement."[118]

According to Marchand, "apprenticeships and more specifically embodied learning, is being rediscovered (and in some instances 'recovered') as a prime site for connecting theories of knowing to practical doing."[119] For Marchand, immersion in apprenticeship learning environments not only teaches technical know-how, but also "almost every affirming principle of human life" including "social knowledge, worldviews and moral principles."[120] However, in the West the recognition of skilled bodily practices as an equally important intellectual achievement is fraught with centuries of marginalization. The challenge remains in how to implement apprenticeships and bring them on-board as part of the mainstream university curriculum.

6.5 Conclusion

In recognizing the limitations of the role of the expert or master in teaching, Don urged me to consider that the bark and the wood are profound actors that are not only mutually involved in the transformative process of becoming a canoe, but are also capable of shaping the formation of the canoe builder. This resonates well with Indigenous approaches to teaching that often cultivate a deeper connection between people and land and that are already attuned to bodily ways of knowing. Simpson's work in *Land as Pedagogy,* recommends considering a radical break from state education systems because by and large it reproduces inadequacies in

[118] Marchand, Trevor. (2008): Muscles, Moral and Mind: Craft Apprenticeship and the Formation of Person, British Journal of Educational Studies, 56:3, 266
[119] Marchand, T. (2008) Muscles, Moral and Mind: Craft Apprenticeship and the Formation of Person, *British Journal of Educational Studies*, 56:3, 246.
[120] *ibid*, 245-6.

intelligence that uphold colonialism by disconnecting people from the land, skills, and Indigenous epistemologies.[121] Perhaps there remains something to be salvaged in the universities if an overhaul made provisions for alternative teaching models that nurtured, instead of narrowed, the relationship with the forest and allowed for learning through the use of a diversified sensory repertoire.

There is an increasing concert of critique calling for the broadening of the scope of what counts as anthropological knowledge and for getting out from under the thralls of categorical tidiness that entrenches Western epistemology.[122][123][124][125][126] This suggestion arises partly out of the realization that abstract theory has become out of touch and disconnected with the realities of the people, places, and things it attempts to describe. There is however, no consensus on how to go about doing it. Apprenticing as a field method posses little problem to the pre-established order of things and thus it is tempting to simply utilise apprenticeships as a new paradigm for learning in practical contexts.[127] However, the potential that apprenticeships bring forth to the discipline should not be constrained to a complementary method of inquiry used alongside existing practices of participant observation, interviewing, and other research techniques. To anthropologize in writing about the complementary aspects of apprenticeships as a means towards ethnographic analysis would be to miss the point entirely as this risks subsuming the value of craftwork into the processes of hegemony that many critics are seeking to dismantle. The contentious issue here, especially in the highly structured disciplinary field of anthropology, is about the extent at which

[121] Simpson, L. B. (2014) Land as pedagogy: Nishnaabeg intelligence and rebellious transformation. *Decolonization: Indigeneity, Education & Society. 3:*3, 1-25.
[122] Giri, A.K. (1998) Transcending Disciplinary Boundaries: Creative experiments and the critiques of modernity. *Critique of Anthropology,* 18: 379-404.
[123] Hobart, M. (1993) *An Anthropological critique of development: The growth of ignorance.* London: Routledge.
[124] Jackson, M. (1989) *Paths Towards a Clearing: Radical Empiricism and Ethnographic Inquiry.* Bloomington and Indianapolis: Indiana University Press.
[125] Restrepo, E. & Escobar, A. (2005) Other Anthropologies and Anthropologies Otherwise: Steps to a World Anthropologies Framework. *Critique of Anthropology,* 25:2.
[126] Rorty, R. (1999) *Philosophy and social hope.* New York: Penguin Books.
[127] Coy, M. W. (ed.) (1989) *Apprenticeship: from theory to method and back again.* Albany, N.Y.: SUNY Press.

practitioners have been successful in getting other ways of knowing to circulate freely and on equal terms among the ways in which we currently know. If pluralizing knowledge is to become a priority, then realizing the full potential of apprenticeships entails properly considering them as a means of production for new outputs of our intellectual work that include skilled practices and crafts. To become effectual, craftwork must be considered equally with existing forms of oration, debate, and publication that are currently espoused in contemporary education.

The apprenticeship model of instruction, were it to see greater adoption in higher education, would present an attractive option for students who wish to develop practical skills and a solid personal formation, while remaining in school.[128] Apprenticeships are capable of transcending learning barriers that are present at university because they provide more opportunities for active learning experiences. In turn, the skills craftspeople learn remain with the communities that they are a part of and contribute to increasing social capital across broad cultural and contextual spectrums that span from the forests into other institutions of learning. While craftspeople are not yet resigning to operate entirely outside of an educational system that was ostensibly set up to exclude their work; craftspeople are seeking to create new performances, new media, new stories, and new analyses, that will serve to re-interpret the change we wish to be a part of going forward.

[128] De Broucker, P. & Canadian Policy Research Networks. (2005). *Without a paddle: What to do about Canada's young drop-outs.* Ottawa Canadian Policy Research Networks.

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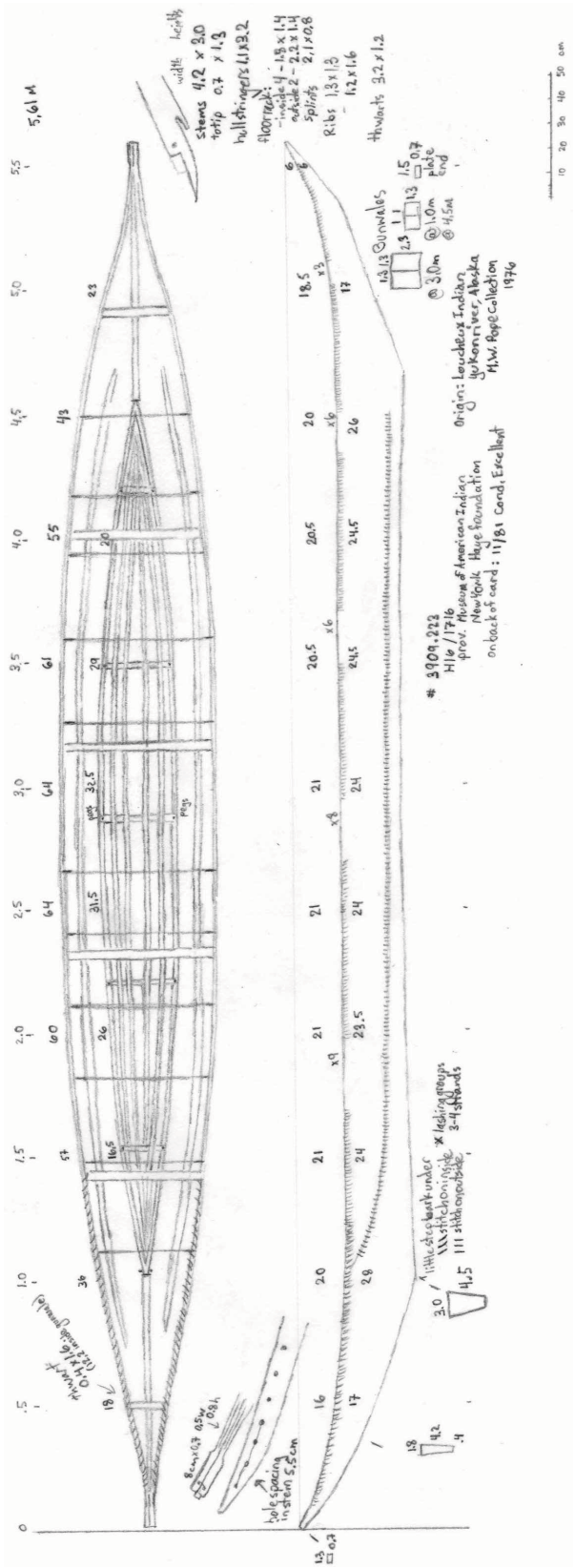
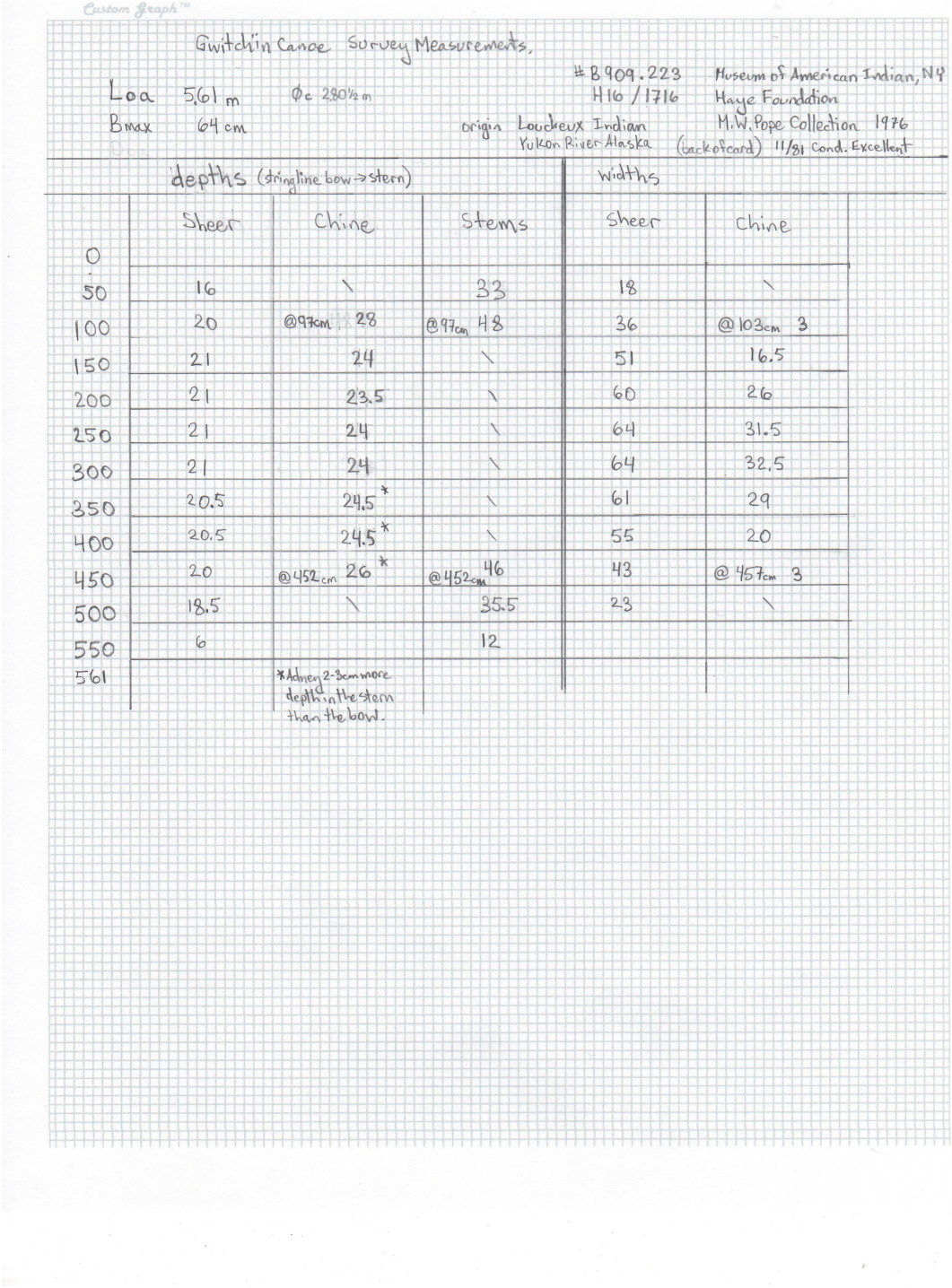
Appendix A: Survey of Gwich'in Canoe



Appendix B: Table of Measurements



Custom Graph™

Gwitchin Canoe Survey Measurements,

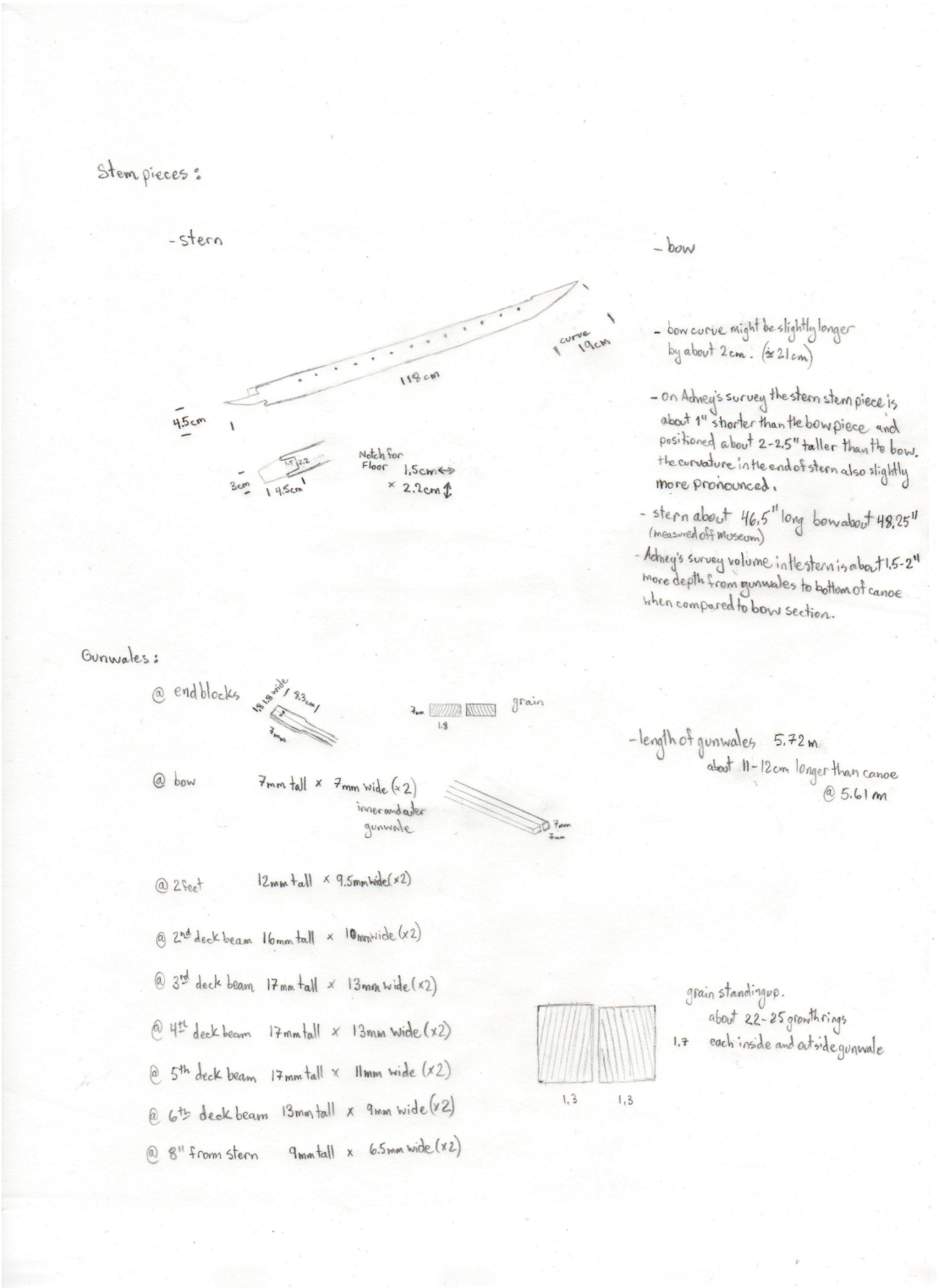
Loa 5.61 m Φc 280½ m
Bmax 64 cm

B 909.223
H16 / 1716
origin Louckeux Indian
Yukon River Alaska

Museum of American Indian, NY
Haye Foundation
M.W. Pope Collection 1976
(back of card) 11/81 Cond. Excellent

	depths (string line bow → stern)			widths	
	Sheer	Chine	Stems	Sheer	Chine
0					
50	16	\	33	18	\
100	20	@97cm 28	@97cm 48	36	@103cm 3
150	21	24	\	51	16.5
200	21	23.5	\	60	26
250	21	24	\	64	31.5
300	21	24	\	64	32.5
350	20.5	24.5*	\	61	29
400	20.5	24.5*	\	55	20
450	20	@452cm 26*	@452cm 46	43	@457cm 3
500	18.5	\	35.5	23	\
550	6		12		
561		*Adney 2-3cm more depth in the stern than the bow.			

Appendix C: Scantlings Measurements



- floor rack:

- 4 inside - 1.4 cm tall x 1.8 cm wide

- 2 outside chines 1.4 cm tall x 2.0 cm wide

- cross piece splints 6.5 mm tall x 2.1 cm wide
(longest 13" - 12", 12", 6.5", 7")

* All floor rack grain is standing up.

- wood for floor rack should be about 12' 2" long

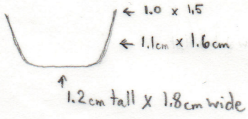
- hull stringers:

1.0 cm tall x 3.2 cm wide

about 13' 2" long

- flat side against bark, rounded edges and 'D' shape cap facing in the boat.
- grain also standing up.

- ribs



ribs are sharpened and forced into underside of gunwales

- longest rib about 36" ∪ x 12 ribs.
shorter ∪ V ribs about 26"

- deck beams

- 4th deck beam
1.2 cm tall x 3.1 wide

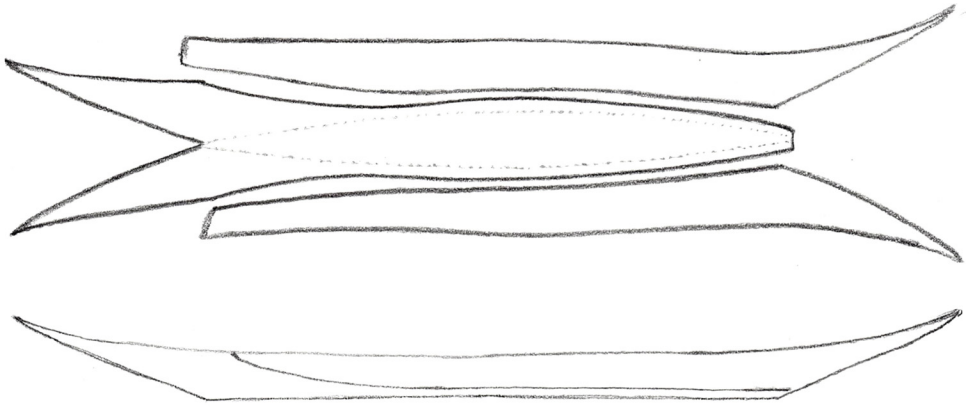
- 5th deck beam
1.3 cm tall x 3.0 wide

longest is about 24"

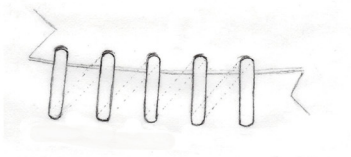
- 1st deck beam (tiny little thwart)
0.4 cm tall x 1.6 cm wide
about 12-13 cm long

- flat on bottom, top side has a hint of arch rounded soft edges,
- more rounded in center
- gets square towards the gunwale ends
a little more boxy cross section
- grain lying down horizontal.

Appendix D: Bark Panel Pattern



-Bark panels



panel stitch

Appendix E: Photographs of the Gwich'in Canoe