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ASSOCIATION DES CARTOTHEQUES CANADIENNES

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COVER: [Henry Briggs] The North Part of America..., 1625. From Samuel Purchas, Hakluytus Posthumus, London, 1625.

Brigg's map, acquired by the National Map Collection in 1977, is significant in the way it depicts a probable North West Passage by minimizing the distance between Port Nelson and northern California. The map is also the first printed map in English to show California as an island.

The map has been reproduced in facsimile by the ACML and is available from the Association for $2.00.

EDITORIAL COMMENTS

The Twelfth Annual Conference of the ACML has come and gone. It was a well organized and educational event. Some of the spirit of former conferences was missing. Some of the familiar faces of former conferences were missing. A glance at the addresses of those attending will quickly reveal the imbalance in representation by regions. While there were forty-eight persons from the Vancouver-Victoria area and eleven from Ottawa-Hull, there were very few others from the other regions. Alberta was well represented in terms of membership due to proximity. But what would happen to attendance if, say, a Conference were held in Edmonton where there is not the population of Southern B.C. to draw upon. The editor would like to invite ACML to his home city, but it is a frontier location and we should know first who would come. Drop a line to your executive and let them know.

Joan Winearls has agreed to be the Review Editor and has been hard at work soliciting material for review and lining up reviewers. If you would like to be considered as a reviewer, please contact Joan at the Robarts Library, University of Toronto.

The Executive of ACML has decided to attempt to produce thematic issues. This is the first, containing the papers with an interest in mapping. Future issues will contain papers on automated cartography and micrographics in cartography. Guest editors will be invited to assemble the contents of certain thematic issues. Don't let that stand in the way of your articles, however. We still want to hear from the membership at large.

MAPS RELATING TO COOK'S THIRD VOYAGE

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The Pacific Basin is the largest single feature on the earth's surface and covers one-third of it, yet it was wholly unknown to early geographers. Although Ptolemy and others had computed the diameter of the earth, there was very little substantive knowledge about either the land or water areas; consequently, the earliest map makers were forced to use their imagination to fill the space available. From Marco Polo came knowledge that enabled cartographers to compute the size of Asia and from him, too, they learned that its eastern edge was washed by a great ocean. This, they assumed, was the same water that touched the western coast of Europe.

By the end of the fifteenth century substantive knowledge began to accumulate as mariners ventured farther and farther into the unknown. The Portuguese followed the coast of Africa and rounded its tip into the Indian Ocean so that the southern extremity of that continent was delineated. These voyages also opened the way east enabling the Portuguese to reach India and south-east Asia to establish a water route for the spice trade. Columbus opened a western route even though he did not reach the area he had sailed toward and eventually it was determined that a new and unknown land blocked the western route for the spice fleet.

With the recognition of the Americas as a new land mass, geographers were forced to modify their theories about the land and water areas of the world. At first, America was thought to be nothing more than a narrow peninsula of Asia as shown on some maps such as the Forlani world map of 1562. This notion was abandoned in favor of the earlier theory of a narrow waterway separating America from Asia as had been suggested by representations of the Arctic showing four large land masses separated by "in-going seas", such as depicted on the Behaim globe of 1492 and on the world map by Ruysch in the Rome Ptolemy of 1507 and 1508. The Italian map maker Zaltieri named this waterway the Strait of Anian and correctly shows America as a separate land mass on his map of 1566.

In succeeding decades the Pacific Ocean was penetrated by numerous European mariners sailing both the eastern and western routes. Ships of the English, Dutch, Portuguese, and Spanish fleets ventured into the Pacific but none succeeded in producing any clearly definable perception of the vast Pacific Basin. In most cases, these early ventures were ill-equipped with instruments or the skills needed to chart the waters they sailed, with the result that knowledge accumulated slowly and discoveries were often duplicated and misinterpreted. Some, like the Spanish, maintained secrecy about their discoveries even though they established routes across the Pacific and settlements at various places along its shores.

II

By the middle of the eighteenth century, far more had been discovered than was generally known, as no one was able to consolidate and clarify all the discoveries that had been made. This was due in part to the element of secrecy, but principally to the lack of precision in locating and identifying those places discovered. Although latitude could be measured with considerable accuracy, longitude was infinitely more difficult to determine. Most shipmasters were skilled in computing longitude by the best methods available, but the methods in general use were sadly wanting in the kind of precision required to accurately chart an island speck in the vast reaches of the Pacific. This resulted in newly discovered land areas being plotted by one master, only to be rediscovered and plotted differently by another master.

Thus, many of the distortions, misplacements, or confusions that we disparage on early printed maps are not the result of incompetence or indifference among navigators or cartographers, so much as they are due to inadequate instruments and techniques for determining location. The earlier navigators used celestial observations and calculations that were dubious at best so that each chart resulting from a voyage into the Pacific differed from all others significantly. The cartographers of Europe were in no position to alter the observations of the voyagers and had to choose among numerous alternatives or ignore inconsistencies.

III

With the invention of the chronometer in the middle of the eighteenth century it was possible to compute longitude with greater precision than ever before.[1] Thus, the true picture of the Pacific Basin did not emerge until after the chronometer became available. This was achieved by Captain James Cook on his three voyages into the Pacific. On his first voyage from 1768 to 1771 Cook discovered, circumnavigated, and accurately charted New Zealand and the east coast of Australia. His second voyage lasted from 1772 to 1775 and resulted in the rediscovery and accurate plotting of Tasmania which the Dutch had first discovered a century earlier. He also plotted the Friendly Islands, the Marquesas, the New Hebrides, and New Caledonia. The third, final, and fatal voyage by Cook, from 1776 to 1779, resulted in the discovery of Hawaii, the northwest coast of America and the survey of Bering Strait. At the conclusion of this voyage there remained little still to be discovered and the general configuration of the Pacific Basin with its five continents and thousands of islands became clarified for the first time. In the final analysis, this was Captain Cook's great achievement.

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1 Waters, D.W., "Navigation at the time of Cook's voyages and its influence on the opening of the Pacific."
In: Captain James Cook & His Times. Simon Fraser University, 1978. Vol. 11.

Cook was a surveyor and chart maker of considerable experience. He received his introduction to the science of chart making from John Simcoe, captain of HMS Pembroke in North American waters, under whom Cook served as master. He received detailed training in the techniques of surveying and chart drafting from Samuel Holland. Under the watchful eye of Simcoe, these two surveyed and charted the Gulf and River St. Lawrence. Later, Cook transferred to the Northumberland under Lord Colville and was sent to Newfoundland where he met, worked with, and learned the art of chart making from J.F.W. Des Barres who produced the great Atlantic Neptune from 1774 to 1781. Eventually, Cook was selected to survey the coasts and harbours of Newfoundland and produced a set of charts that were published in London from 1765 to 1768 and which remained in print for decades.[2]

Individually and collectively, these three men - Holland, Des Barres, and Cook - produced great charts of the east coast of North America which not only stand as monuments to their skill, but also set new standards for chart making that ultimately led to British domination of the chart trade.

Cook's success in the Pacific Basin was due to his accomplished skill as a navigator, surveyor, and chart maker but also to the availability of newer and more accurate scientific techniques and instruments which none of his predecessors had enjoyed. From the work of Murdoch Mackenzie, Cook learned about triangulation for surveying; from Holland he got instruction in the use of the plane table for plotting; and from Des Barres he learned about survey control and chart drafting. As well, Cook had the latest in navigational aids including the chronometer then under development. Cook participated in field testing this new instrument and used it to compute longitude so that the charts resulting from his voyages into the Pacific were more accurate than any done previously, thereby resolving many perplexing questions about the relationships among the land areas in the Pacific Basin.

While each of Cook's voyages made significant contributions to knowledge about the Pacific, our interest here lies with his contributions to the geography and cartography of the North Pacific Ocean - particularly the northwest coast of America. In this region his discoveries were less spectacular, perhaps, but certainly no less significant than those accomplished on his two voyages into the South Pacific. In summary, we can identify two very major contributions to the cartography of the North Pacific:

1. The delineation of the northwest coast of America in its relation to the rest of the continent and to Asia.
2. His survey and charting of Bering Strait that finally settled the question of the Strait of Anian.

Prior to Cook's third voyage, cartographers had no certain knowledge about the breadth of the North American continent or the delineation of the

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2 Ritchie, C.S., "Captain Cook's influence in hydrographic surveying." Ibid.

western shore north of the limits of Spanish exploration and settlement. In the absence of fact, they relied on theories based largely on speculation fed by creative imaginations. For some, the continent had a great westerly bulge, while others depicted the west coast as a line moving sharply eastward that connected the limits of Spanish explorations to Hudson Bay which was known by the English. Those less imaginative or more cautious, such as Delisle did not depict a west coast beyond the Spanish possessions. One curious map - the 1651 Farrer map of Virginia - showed the breadth of the continent to be "... 10 dayes march with 50 foote and 30 horsemen ... ."[3]

Enroute to the North Pacific, Cook reached the North American coast at Cape Blanco which was within the limits of Spanish exploration. Continuing northward, the fickle winds and currents kept the ships off shore as much as on, so they did not touch land again until arrival at Nootka. Thus, Cook missed the Columbia River and the Strait of Juan de Fuca. From Nootka, Cook continued northward sighting land at intervals and making his observations to fix his position. From Cape Edgecombe to the Aleutians he remained in visual contact with the shore most of the time.

Although Captain Cook did not see and chart the entire west coast he did manage sufficient observations to enable him to plot the coast line north of Cape Blanco. His observations included the position of Cape Gregory, Cape Foulweather, Cape Flattery, Nootka, and Cape Edgecombe which enabled him to determine the general delineation of the western shore of the continent for the first time. It was not important at that moment that he did not manage to discover and chart the intricate and confusing indentations and islands that characterize the shore line. That was left to others - in particular Captain George Vancouver, who accomplished a detailed survey of the area two decades later.

The technical equipment available to Cook was so superior to any previously available that he was able to plot the line of the northwest coast accurately, so that, after 1784, cartographers had available for the first time the kind of substantive data that allowed them to compute and show the true dimensions of the North American continent. Thus, from the publication of Cook's survey in 1784 the true shape of North America was known and the need for imaginative cartography vanished.

Captain Cook's second major contribution resulting from his third voyage was the delineation of the Strait of Anian which we know as Bering's Strait. When Vitus Bering entered this strait on his first voyage in 1728, he followed the coast of Asia and was misled by its configuration into thinking he had sailed through the Strait of Anian, so that he turned back without completely exploring or charting his strait. As a result, doubt still remained about the extent of the strait and the precise relationship between Asia and America. Cook sailed through the strait and into

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3 Verner, Coolie, "The first maps of Virginia". Virginia Magazine, 58 (January 1950), 3 - 15.

the Arctic Ocean until he was stopped by pack ice. Both the American and Asian shores were explored and charted by Cook in 1778, and by his successor Captain Clerke in 1779. The chart of the strait published in the Journal ... in 1778, was the first precise delineation of the strait and thus an age-old controversy was finally settled. Zaltieri was proven to have had a valid theory some three centuries earlier.

IV

The charts resulting from Cook's third voyage and published with the Journal ... in 1784 were made by Lieut. Henry Roberts who had accompanied Cook on the second voyage. Roberts was Master's Mate on the Resolution during the third voyage and assisted Cook in drafting the charts. After his return to London, Roberts spent his time from 1781 to 1784 in preparing the drafts for publication.

Of the thirteen charts published with the Journal ... only five relate to the northwest coast. The remaining eight charts concern islands in the Pacific such as Christmas Island and Hawaii along with the Van Diemen's Land and various ports and harbours. The most important chart in the Journal ... is that of the world which summarizes the achievements of the three voyages.

In regard to the making of this chart, Henry Roberts noted that:[4]

> Soon after our departure from England, I was instructed by Captain Cook to complete a map of the world as a general chart from the best materials he was in possession of for that purpose; and before his death this business was in a great measure accomplished: that is, the grand outline of the whole was arranged, leaving only those parts vacant or unfinished, which he expected to fall in with and explore. But on our return home, when the fruits or our voyage were ordered by the Lords Commissioners of the Admiralty to be published, the care of the general chart being consigned to me, I was directed to prepare it from the latest and best authorities; and also to introduce Captain Cook's three successive tracks, that all his discoveries, and the different routes he had taken might appear together; by the means to give a general idea of the whole.

In his search for the latest and best authorities, Roberts gained access to manuscript maps and confidential reports held by the Hudson's Bay Company. Among these were the maps made by Samuel Hearne showing his discoveries along the Coppermine River. Roberts used this in constructing his world map so that it was the first to show the Coppermine to the Arctic shore thus confirming the improbability of a Northwest Passage through Hudson Bay which had been a favourite theory at the time. This

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4 Ritchie, op cit.

appearance of the Coppermine River occurred some eleven years before Hearne's report was published but it appears not to have been noticed or else it was discounted by cartographers. Even Aaron Arrowsmith ignored it in preparing his great map of Canada for he added it to his plate after the publication of Hearne's report. In view of the obvious diligence of Lieut. Roberts we can assume that the world chart represents the pinnacle of knowledge at that moment.

The charts prepared for the Journal ... by Roberts were influenced by Dalrymple who interfered in their construction by imposing his own ideas so that Roberts made two versions of the chart of the North Pacific. The version that appeared in the Journal ... does not contain the Hearne material, while the one published separately by William Faden does. Both are properly Cook charts but the Faden chart is the more desirable of the two. Because of this difference, it is easy to determine which version was copied by those publishers who issued their copies of the North Pacific chart. In general, those publishing editions of the Journal ... copied the charts in it, while those issuing general geographies or collections of voyages tended to copy the Faden chart. Thus, if the Coppermine River appears on the North Pacific chart, the Faden version was copied but if it does not, then the Journal ... chart was the prototype.

A small chart of Norton Sound and Bering Strait reports the detailed survey of that area made by Cook and Clerke. It presents for the first time precise data on the relationship of Asia and America at that point. Without doubt this is probably the most important chart produced by the third voyage yet it was not, apparently, copied for use in other than reprintings of the Journal ... . This and other small charts and plans in the Journal ... depict areas surveyed in some detail and they were, of course, incorporated into the chart of the North Pacific which was, in turn, used in making the world chart. The North Pacific chart summarizes the lesser charts and places them in proper relationship to the North American continent and to Asia. The world chart shows the position of the North Pacific in its relationship to the rest of the known world.

V

The charts used to illustrate the Journal ... were copied extensively in reprints and translations but only the North Pacific chart appears to have been used extensively in other publications. As the Pacific basin was the last great unknown area of the world's oceans, interest in it was intense. During the eighteenth century, three significant maps of the Pacific were produced. The first of these was the product of imaginative cartography published in Paris in 1753 by Delisle and Buache. It created a controversy that lasted nearly a half-century and was instrumental in prompting the British Crown to launch Cook's third voyage.

The second map, by Müller, was published in 1754 and was the first map of the North Pacific based somewhat on explorations in the area. It reported

Russian discoveries in response to the Delisle map, in an effort to show the latter to be based on spurious geography. The third of these great maps was the Cook chart. Each of these three illustrate the evolution of knowledge from theory to fact. With the publication of the Cook chart, the modern era in Pacific cartography was launched and all subsequent work served to refine and elaborate the data presented by Cook.

The importance of Cook's third voyage cannot be underrated. Because of it, more knowledge about the Pacific was acquired in the two decades that followed than had been acquired in the two centuries that preceded it. As a scientific explorer and cartographer, Captain Cook had no equal. In addition to his own achievements, he also trained most of those who expanded on his discoveries in the following two decades.

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MAPS RELATING TO THE VANCOUVER EXPEDITION

W. Kaye Lamb
Vancouver, B.C.
(Former Dominion Archivist)

Any consideration of the maps relating to the Vancouver expedition must first take into account Vancouver's instructions, and the way in which he carried them out. It is often stated that the geographical objective that the Admiralty had in mind was simply to ascertain, once and for all, whether a passage of some kind linked the Atlantic and the Pacific. Certainly this was one prime objective, but the purpose of the British Government was broader than this. If there were a passage, well and good; if not, it was interested in means of communication overland, as a rather long quotation from Vancouver's instructions will show.

His first objective was to be "The acquiring of accurate information with respect to the nature and extent of any water-communication which may tend, in any considerable degree, to facilitate an intercourse, for the purposes of commerce, between the north-west coast, and the country upon the opposite side of the continent, which are inhabited or occupied by His Majesty's subjects". With respect to this first object, "it would be of great importance if it should be found that, by means of any considerable inlets of the sea, or even of large rivers, communicating with the lakes in the interior of the continent, such an intercourse, as hath been already mentioned, could be established; it will therefore be necessary, for the purpose of ascertaining this point, that the survey should be so conducted, as not only to ascertain the general line of the sea coast, but also the direction and extent of all such considerable inlets, whether made by arms of the sea, or by the mouths of large rivers, as may be likely to lead to, or facilitate, such communication as is above described".

The survey of the coast was to extend from 30° to 60° north latitude, or from the northern part of Lower California to Cook Inlet, and a secondary objective was to be "the ascertaining, with as much precision as possible, the number, extent, and situation of any settlements which have been made within the limits above mentioned, by any European nation, and the time when such settlement was first made".

Tucked into another paragraph was a further instruction. Vancouver was expected to spend the first winter in the Sandwich Islands, and while there he was to employ himself "very diligently in the examination and further survey of the said islands". It was assumed that he would be spending a second winter there, in which event he was "to endeavour to complete any part which may be unfinished of your examination of those islands".

Vancouver duly completed the survey of the islands that Cook had begun, but this required only a few of the many months he spent in Hawaii. Vancouver anticipated this, and from the Cape of Good Hope - safely beyond the reach of contrary instructions - he informed the Admiralty, to quote his own words, that "on considering that Captain Cook's chart of the Sandwich Islands has left me but a small field to occupie two winters in their further examination" he had decided to examine "that extent of the coast of the S.W. side of New Holland [Australia]", ignorance of which he considered to be "a real blot in geography".[1] Having done this, he sailed on to Dusky Bay, at the southern tip of New Zealand, which he had visited with Cook, and where, as in Hawaii, he carried further a survey made by Cook. These investigations in Australia, New Zealand and Hawaii resulted in two of the ten charts in the folio atlas that accompanied the original quarto edition of Vancouver's Voyage of Discovery.

Vancouver had been at Nootka Sound with Cook in 1778, and he had with him all the maps of the Northwest Coast that the Admiralty could conveniently lay its hands on. He knew that, north of Cape Flattery, he would be surveying a broken coast, off which lay many islands, but he had as yet no inkling of the immense complexity of the task that lay ahead of him. That realization came when he and his officers explored the complicated waters of Puget Sound. His experience there resulted in two decisions. First, the only way in which he would be able to ascertain the existence and extent of any passages or inlets leading to the east was to follow meticulously the continental shore, no matter how convoluted it might be. Secondly, it had become obvious that ships even as large as the little Chatham, let alone the Discovery, could not themselves navigate and survey the countless channels and inlets that he was certain to encounter. Many of these inlets were so narrow and hemmed in by mountains that wind conditions were erratic; tides and currents were frequently strong; water depths, even close to land, were frequently so great that the ships could not anchor. On several occasions the only way that the ships could be moored was to tie them up to trees along the shore.

"I became thoroughly convinced", Vancouver wrote as the survey of Puget Sound was being completed, "that our boats alone could enable us to acquire

correct or satisfactory information respecting this broken country; and although the execution of such a service in open boats would necessarily be extremely laborious, and expose those so employed to numberless dangers and unpleasant situations, that might occasionally produce great fatigue, and protract their return to the ships; yet that mode was undoubtedly the most accurate, the most ready, and indeed the only one in our power to pursue for ascertaining the continental boundary".[2] This decision dictated the general strategy of the survey. The Chatham and Discovery would be moored in the best available cove or anchorage, and the ships' boats would then fan out and investigate in detail the nearby waters - always keeping in mind that their prime task was to trace the continental shore. Having completed the job, they would be taken on board and the ships would move to a new station. It is likely that Vancouver soon expected that the survey to 60° would require three summer seasons instead of the two the Admiralty envisaged: "The broken appearance of the region before us", he wrote, "and the difficulties we had already encountered in tracing its various shores, incontestably proved, that the object of our voyage could alone be accomplished by very slow degrees."[3]

It was indeed a tedious business. Inlet after inlet was followed, only to reveal that, from Vancouver's point of view, it led nowhere. "About our time of breakfast", he noted when approaching Walker Cove, in the Behm Canal, "we arrived at the south point of another of those arms, about half a mile wide, which had hitherto employed the major part of our time to so little purpose."[4] Puget, who was in charge of many of the boat expeditions, remarked in his log that as he neared Deception Passage its narrowness made it appear unimportant: "there was some Probability of its only being a large Cove but independent of these Suppositions we have hitherto Made it a Maxim to see the Termination of every Branch however Small it might appear."[5]

Inevitably there were some mistakes and omissions. Occasionally a sharp bend in an inlet was mistaken for its ending; one or two fairly large features were missed, notably Seymour Inlet. But the survey as a whole was an astonishing achievement, and proved conclusively that there was no passage within the limits explored in detail. One gains the impression that this was no surprise to Vancouver; it is obvious that he had no patience with the theories of armchair geographers or with the supposed discoveries of legendary explorers. Certainly he took an almost sadistic pleasure in having exploded the claims of both.

All this is germane to the present subject because throughout his survey, and the charts in which it resulted, chief emphasis was placed upon the continental shore. Indeed, this is all that Vancouver claimed to have determined with any exactitude. True, his explorations resulted in the discovery of many islands and other features, but this was incidental. He referred explicitly to this fact in June 1794, when he had just concluded the survey of Prince William Sound. This had been completed, he wrote, insofar as it "reflected the boundary of the continent; but the numerous islands, islets, rocks, and shoals, which are contained within this space, being considered as secondary objects, did not fall within the limits of our service for accurately ascertaining or delineating,

yet these have been noticed with every degree of circumspection, that circumstances, and the nature of our researches, would allow, without swerving from our principal object, viz. the survey of the shore of the continent."[6]

Much has been made of Vancouver's indifference to rivers, and in particular to his failure to discover the Columbia. He or his boat parties were at the mouths of the Fraser, Skeena, Nass and Stikine, but not one of the four appears on his charts. Yet the various logs of the voyage show that in each instance, the Columbia included, the existence of a river was either assumed or strongly suspected. For the reason for the failure to explore them we must turn again to Vancouver's instructions: "it seems desirable," they read, "that in order to avoid any unnecessary loss of time, you should not, and are therefore hereby required and directed not to pursue any inlet or river further than it shall appear to be navigable by vessels of such burden as might safely navigate the Pacific Ocean..." That Vancouver had passed on this directive to his subordinates, and that at least some of them obeyed it with reluctance, is shown by a remark by Puget, when he decided not to venture up the Skeena: "the Channel could not be termed Navigable therefore we had no Business to pursue [it] but," he added, "this would not have prevented its further Examination had it not absolutely been attended with very great Danger to the Boats."[7] What deterred Vancouver himself was the never-ending line of mountains that paralleled the coast, which he assumed, quite correctly, would place a limit, if not to the rivers themselves, at least to the possibility that they could be navigated by such a vessel as the Discovery. It is a pity that Broughton's exploration of the Columbia, made after Gray's discovery of the river, stopped just short of the chasms and rapids that would have proven Vancouver's assumption to be correct; and it is significant also that Broughton found river depths and conditions such that he left the Chatham, small as she was, within a few miles of the mouth of the river and proceeded upstream in the ship's boats.

Inevitably the survey had limitations and errors, and Vancouver showed no wish to conceal them. To cite an example: thick foggy weather had prevailed in August 1792 when the ships were examining inlets between Kingcome Inlet and Smith Sound - the area in which he had missed the entrance (an extremely narrow one, it must be added) to Seymour Inlet. In 1793 some re-examination was possible, but in his narrative Vancouver warned that "expecting the western extremities, that on this occasion were in some degree corrected" features were "likely to have been erroneously described, as well in respect of their positive, as relative positions ...". And adverting to the prime purpose of his survey, he quickly added: "As I would by all means wish to guard against too great reliance being placed on this particular part of our survey, I must beg leave to state, that I consider myself answerable only for the certainty of the connection of the continental shores between the stations before mentioned, those having been traced in such a manner, as to ascertain that fact beyond all possible dispute."[8] Archibald Menzies, the botanist and surgeon, though not involved professionally, had watched the progress of the survey throughout and had accompanied many of the boat expeditions. As it concluded, one error in surveying, which had been costly in lost time and needless labour, prompted him to make this comment in his journal: "These and other instances ought to teach us to speak with the utmost diffidence of our having all along traced the continental shore, notwithstanding that ever degree of precaution was in general

made use of, yet such was the expeditious nature of the service, performed often in obscure & inclement weather & such the difficulty of tracing all the windings of such an intricate labyrinth through a region so dreary & broken that it is impossible to pronounce such a laborious task as infallible."[9]

With this background, we come at last to the maps relating to the expedition, turning first to those in manuscript.

The routine followed in their preparation seems to be fairly clear. Virtually all the boat expeditions were commanded either by Joseph Whidbey, Master of the Discovery, or James Johnstone, Master of the Chatham. Both were highly competent and experienced surveyors who had been selected by Vancouver himself. Some of Johnstone's sketches, recording the exploration carried out by his boat parties, have survived and they are models of clarity. Whidbey's would have been on a par. These sketches were handed over to Joseph Baker, third lieutenant of the Discovery, who added their findings to a fair drawing sheet which he maintained on the Discovery. From these drawing sheets, in their finally revised and corrected form, the charts of the expedition's discoveries were drawn. Baker was a key figure throughout, and he was Vancouver's natural choice to prepare for the engravers the charts that were published in the atlas volume of the Voyage of Discovery.

When Vancouver was unable to reach an agreement at Nootka with Quadra regarding the claims that had been put forward by John Meares, he decided to send his first lieutenant, Zachariah Mudge, to England to inform London of the negotiations and to ask for instructions. Mudge, bound for Europe by way of the Orient and the Cape of Good Hope, left Nootka at the end of September 1792 and arrived in London in May 1793. With him, Vancouver sent two charts showing the progress of his survey in its first season. These are obviously preliminary drafts, but they are interesting because they depict only what the expedition itself had seen. One extends from its landfall, about 110 miles north of San Francisco, to Cape Mudge and Bute Inlet. It traces the coast north to Cape Flattery in considerable detail, and shows the first mapping of Puget Sound. The second chart picks up the survey at Cape Mudge and extends it to Queen Charlotte Sound, Fitz Hugh Sound, and the end of the season's work at Point Menzies, in Burke Channel. These charts are now in the Colonial Office records in the Public Record Office. With them Vancouver sent two other items of considerable interest: a copy of Captain Gray's very crude chart of the entrance to the Columbia River, and the excellent drawing of the Spanish village at Nootka Sound, by midshipman Henry Humphrys, which, in a slightly revised version, was engraved for publication in the first volume of the Voyage of Discovery.

When Vancouver reached California, on his way to winter in Hawaii he decided to send Lieutenant Broughton, commander of the Chatham, to England, travelling overland through Mexico. With Broughton he sent a collection of nineteen charts and sketches. Ten of these related to his own explorations in 1791-92; the other nine were copies of Spanish charts, one given to Vancouver by Galiano, seven received from Quadra and one a composite sheet copied from charts received from Quadra. Nine of the ten of the expedition's own charts are now in the collections of the Hydrographic Department at Taunton, Somerset, but only one of the Spanish charts - that

received from Galiano, depicting the coast from latitude 48° 20' north to 49° 35' north, or roughly from Cape Flattery to Nootka Sound - can be identified there.

The expedition's charts, much more elaborately produced than the copies sent from Nootka, arrived in London in July 1793. Three of them are of prime interest in British Columbia. The charts Mudge carried were untitled; those sent with Broughton had been given the full treatment. The title of the largest of them reads as follows:

> A Chart of the Western Coast of N. America in which the Continental shore from the Latde. of 42° 30' N. and Longde. 230° 30' E. to the Latde. 52° 15' N. and Longde. 238° 03' E. has been finally traced and determined by His Majesty's Sloop DISCOVERY and Armed Tender CHATHAM under the Command of George Vancouver Esqr in the Summer of 1792. ... The parts of the Coast red, are copied from Spanish Charts constructed by the Officers under the order of Senres. Quadra and Malaspina. Prepared by Lieut^{t} Jos^{h} Baker, under the immediate inspection of Captn. Vancouver.

This is the first appearance of the credit to Baker that is repeated on nine of the sheets in the published folio atlas, and the sheets in the atlas that duplicate it are obviously derived from it - a fact that makes comparison of the two most interesting. It is also the first chart incorporating data derived from Spanish sources. Vancouver had been specifically instructed to co-operate with the Spaniards; "if", his instructions read, "you should fall in with any Spanish ships employed on any service similar to that which is hereby committed to you, you are to afford to the officer commanding such ships every possible degree of assistance and information, and to offer to him, that you, and he, should make to each other, reciprocally, a free and unreserved communication of all plans and charts of discoveries made by you and him in your respective voyages". This Vancouver proceeded to do; he gave copies of all his charts to the Spaniards and, as we have seen, he received copies of Spanish charts in return. But this co-operation was limited by two considerations. First, Vancouver quickly developed a deep distrust of Spanish charts; time and again he was to complain that they bore scant resemblance to the areas they professed to cover. Secondly, in view of his instructions, he felt that cooperation must have limits. When, in June 1792, he met Galiano and Valdes off Point Grey, the two little squadrons agreed to proceed together, and for a short time they did so. But difficulties soon developed. Valdes explored Toba Inlet, and when within a mile or so of its mouth on the return journey, he encountered a boat expedition commanded by Johnstone which was setting out to explore the inlet. Vancouver relates the sequel: "Senr. Valdes intimated that he considered any further investigation of that place totally unnecessary; but the officers not having on this occasion any directions of a discretionary nature, acted according to the orders they had formerly received for the execution of such service, and prosecuted its examination".[10] In a word, Vancouver was unwilling to

accept any survey of any part of the continental shore other than that carried out by himself or his officers.

Vancouver's careful acknowledgement that many segments of his charts, and in particular the engraved charts, were derived from Spanish sources can be interpreted in several ways. It was a courtesy, and one that was obviously deserved. But it also served to make it clear that he was unwilling to accept any responsibility for the parts of the charts that were not based on his own surveys, which, to labour the point, were concerned chiefly with the continental shore. There were some exceptions. He made a brief examination of the west coast of the Queen Charlotte Islands, and as he passed through Johnstone Strait he saw a considerable part of the northeast side of Vancouver Island. But by and large the limitation holds. And it is perhaps germane to note that he followed the Spanish charts in instances when he must have known that they were incomplete or inaccurate. Two instances will suffice, both close to Nootka Sound. To the north, the Chatham by mistake entered Nuchatlitz Inlet, under the impression that it was Esperanza Inlet, and had a terrifying experience in the narrows there, but no inlet is shown on the engraved chart. South of Nootka, Vancouver was certainly aware of the existence of Hesquiat Harbour, but it does not appear on his chart.

The other two charts of primary interest that Broughton carried to London were a companion chart to that just described, extending south from 43° to Monterey, and Broughton's own large-scale chart of the Columbia River. Neither makes any mention of Spanish sources, as they were based entirely on the expedition's own work. Along with them Vancouver sent sketches of Port Quadra (Port Discovery) and Gray's Harbour, which became the basis for insets on the engraved charts.

Two of the other larger charts relate to Australia and New Zealand. One shows the southwest coast of Australia that Vancouver had traced, and an inset is a detailed sketch of his principal discovery there, King George Sound. Dusky Sound, in New Zealand, is the chief subject of the other chart, with insets of the two anchorages Vancouver's ships used there, Facile Harbour and Anchor Island Harbour. This latter seems now to exist only in a copy made in 1797, and the copy includes a third inset not mentioned by Vancouver, and probably added by the copyist - a small sketch of Pickersgill Harbour, after Cook. These charts were the sources from which the engraved sheet in the folio atlas was compiled. With them Vancouver sent sketches of the Snares (islets and reefs off the southern tip of New Zealand) and of Chatham Island, both of which also are included as insets in the atlas sheet.

One map Vancouver sent to London was not the work of his own ships. This was "A sketch of Hergest's Islands, discovered by the Daedalus Store Ship [commanded by Lieutenant Hergest] - Surveyed by Mr. Wm. Gooch, Astronomer". Hergest, a particular friend of Vancouver, had been murdered along with Gooch in the Sandwich Islands. The Hergest Islands were the northern group of the Marquesas, and, unknown to Hergest, had already been discovred and named by Joseph Ingraham, captain of the American trader Hope. The

chart was published in the second volume of the first edition of the Voyage of Discovery and appears as an inset on the smaller of the two engraved charts in the second edition.

The authorship of the various charts is an interesting question. Only Baker, who prepared most of the final versions, is mentioned on the engraved sheets, but many of the earlier versions are ascribed to others. No manuscript chart from Vancouver's own hand is known to me, but there are two items that may have been copied from originals by him. On the chart of Dusky Sound prepared in 1797 the sketch of Anchor Island Harbour is inscribed "Copy from Capt. Vancouver" - an ambiguous phrase, but almost certainly meaning that Vancouver had drawn the original. The second item relates to Vancouver's earlier service in the Royal Navy. While he was stationed in the West Indies, the commander-in-chief, Commodore Alan Gardner, ordered Vancouver and Whidbey to survey Port Royal and Kingston harbours, in Jamaica. An excellent chart resulted which Vancouver and Whidbey published themselves, as was quite customary at the time, in 1792. A copy of the engraving, and a manuscript version prepared by Baker, are included in the collections of the Hydrographic Department. How much of this chart was Vancouver's work we have no means of knowing.

The authors of the charts Vancouver sent home by Broughton are mostly indicated in the list he sent with them. Broughton himself contributed the sketches of the Snares and Chatham Island as well as the large chart of the Columbia River, and the 1797 copy indicates that it was he who updated Cook's chart of Dusky Sound and drew the sketch of Facile Harbour that appears as an inset. But his name does not appear on any of the engraved charts, and there is a suspicion that Vancouver took pains to keep even the invaluable Baker in his place. At Taunton there is an incomplete proof copy of the excellent chart of the Sandwich Islands that appears in the atlas. On this proof Baker's name is in larger capital letters than Vancouver's. In the final engraving this order of magnitude has been reversed.

At the end of the second season of surveying, 1793, Vancouver again forwarded to London, through Mexico, a letter of proceedings outlining his activities, and a chart recording the season's work. The letter, dated at San Diego on December 6, 1793, is in the Public Record Office, but the chart has disappeared. Unfortunately this is not the only gap in the documents relating to the voyage. Vancouver's original journals have all vanished, and so have the partial copies of them that he sent to the Admiralty in 1792 and 1793. These must have been in the possession of his brother, John Vancouver, when, after Vancouver's death, he completed the text of the Voyage of Discovery for the printer, but he evidently failed to return them to the Admiralty and what became of them is unknown. Perhaps I should add that the page of manuscript that George Godwin reproduced in his biography of Vancouver and described as "A page of the lost MS. of Vancouver's Voyage of Discovery preserved in the British Museum" is not by Vancouver, but is part of a narrative or journal by Peter Puget, who took command of the Chatham when Broughton left for England.

It will be recalled that Vancouver had been instructed to ascertain, if possible, "the number, extent, and situation" of any settlements within the limits of his survey. This applied equally to Russian posts in Alaska

and Spanish settlements in California, with the emphasis strongly on the latter. It would be wrong, however, to regard the voyage as a spying expedition, although after Quadra, Vancouver's friend, disappeared from the scene there is some evidence that the Spaniards came to regard it somewhat in that light. Only two of the engraved charts might have aroused suspicion: one inset is a rather rough sketch of San Francisco harbour, in so far as Vancouver saw it; the other depicts the harbour of San Diego in greater detail. Three of the published drawings would give some further information: Humphrys' drawing of Friendly Cove, to which I have referred, and the general views of Santa Barbara and Monterey. But that is all.

Considering conditions and equipment, the accuracy of Vancouver's locations is remarkably high. He left England without an astronomer, but by the time he had reached the Canaries he decided that it would be wise to ask London to add one to the expedition. In response, the Board of Longitude sent out William Gooch in the Daedalus, the store ship that was to meet Vancouver at Hawaii or Nootka. The Daedalus duly arrived, but unhappily Gooch did not; he had been murdered while ashore in the Sandwich Islands. Largely with Whidbey's help, Vancouver carried on. He had been provided with the best instruments available, including two chronometers, to which were added another three that had been sent out with Gooch. They were invaluable, but varied in accuracy, which is scarcely surprising considering the small, lively little ships in which they travelled. A portable observatory had been provided, and whenever time, a suitable site and clear skies were available it was erected on shore and a great number of astronomical observations were taken with a view to ascertaining any error that had developed in the chronometers. Invariably they were found to be fast by Greenwich mean time, and when the extent of the discrepancy that had developed since the last set of observations had been taken was ascertained, the locations on the chart were modified accordingly. Vancouver's latitudes are very near the correct mark; most of them are in error by only a few minutes. The longitudes are invariably too far to the east. The discrepancy is about a third of a degree in the Juan de Fuca - Puget Sound area, and increases gradually as he went north to about a full degree in Cook Inlet.

A word should be said about place names. A very high proportion of those bestowed by Vancouver have been retained, sometimes in modified or shortened forms. Thus, for example, Prince Frederick's Sound, Prince Ernest's Sound and Duke of Clarence's Strait, have become Frederick Sound, Ernest Sound and Clarence Strait, though Prince William Sound has been retained in its original form. When checking place names one must use the second edition of the Voyage of Discovery with some care. When editing it, for some reason John Vancouver decided to substitute the word "channel" in most instances when George Vancouver had used "canal". Thus, in the first edition, Vancouver records the naming of "Burke's Canal" and "Dean's Canal" and they so appear in the folio atlas. The second edition makes Vancouver state that he named them "Burke's Channel" and "Dean's Channel", the names, minus the apostrophe "s", by which they are now known. But the change was not always effective. In the second edition, Vancouver is made to state that "in honor of the noble family of Bentinck, I names Portland's Channel", but in the first edition he named it "Portland's Canal" and this name has prevailed.

Vancouver made a considerable effort to retain Spanish names when these were known to him and the features could be identified. In this respect the history of the name "Port Discovery" (recently renamed "Discovery Bay" by the Americans) is interesting. When Vancouver entered and named this inlet in 1792 he was unaware that it had been discovered by the Spaniards the previous year and had been named Port Quadra. Menzies comments on the problem this presented: "Captain Vancouver names it Port Discovery but we afterwards found that the Spaniards had named it Port Quadra the year before, and having then anchored in it, surely gives their name a prior right of continuing, to prevent that confusion of names which are but too common in new discovered countries". At one time it was evidently assumed that Port Quadra was the name to be adopted, for the inlet is so named on Baker's manuscript chart. But on the engraved chart in the folio atlas Port Discovery has displaced it.

For the most part Vancouver named features after royalty noblemen and noble houses, noted naval figures, naval colleagues, officers and sometimes men of his two ships, friends, and members of his own family. Towns in England, including King's Lynn, his birthplace, and features on the south coast of England, such as the Eddystone, were occasionally commemorated. Anniversaries were noted from time to time, and a few names were suggested by circumstances, such as Protection Island and Port Conclusion.

In closing, something should be said about the history of the charts in the folio atlas of 1798. It includes ten map sheets, one devoted to the southwest coast of Australia and Dusky Bay, and the expeditions discoveries in the South Seas, the Snares, Chatham Island and Rapa Island. A second sheet depicts the Sandwich (Hawaiian) Islands. Seven of the others are sectional charts of the west coast of North America from 30° north latitude to the head of Cook Inlet, which is well beyond 61°. The eighth chart is a composite of the seven, showing the enormous range of the survey on a single sheet. The seven sectional sheets were all prepared by Baker; the eighth was compiled from them, again "under the immediate inspection" of Vancouver, by Lieutenant Edward Roberts (who must not be confused with Captain Henry Roberts, who had been appointed to the command of the Discovery at the beginning of 1790, but was replaced by Vancouver after the Nootka Sound crisis had been resolved).

In the second edition, published in 1801, a note from the publisher states "that the copper-plates of the charts contained in the folio volume, which accompanied the first Edition, were all stolen, and may therefore be considered as irrecoverably lost". It continues: "The general chart [meaning the composite chart of the west coast of America], and that of the New Discoveries, &c. are re-engraved, and will, it is conceived, completely satisfy the majority of his Readers". The items to be re-engraved were well selected: the chart of the Sandwich Islands, much reduced in size but remarkably clear in spite of this, appears as an inset on the map of the North American coastline; a second and much smaller sheet is devoted to what were (or in the case of "Hergset's Islands" were thought to be) new discoveries in the South Seas.

No use seems ever to have been made of the stolen plates, and the theft seems to have been singularly pointless. About fifty years ago Henry Stevens Son & Stiles, the well-known London antiquarian booksellers, issued a complete facsimile of the folio atlas which has since become something of a collector's item. Finally, in 1967, Israel of Amsterdam and the De Capo Press of New York together published an excellent facsimile of the original 1798 quarto edition, including the charts in the folio atlas. There, for the moment, the story of Vancouver's maps ends.

(1) Vancouver to the Admiralty, August 9, 1791.
(2) May 25, 1792. Voyage of Discovery, 1798, vol. 1, p. 267.
(3) June 2, 1792. Ibid., vol. 1, p. 288..
(4) August 9, 1793. Ibid., vol. 2, p. 354.
(5) Peter Puget, log, June 8, 1792.
(6) June 15, 1794. Voyage of Discovery, vol. 3, p. 187.
(7) Puget, log, July 14, 1793.
(8) May 1793, Voyage of Discovery, vol. 3, p. 433.
(9) Archibald Menzies, journal, August 19, 1794.
(10) June 20, 1792. Voyage of Discovery, vol. 1, p. 323.

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THE WHEELER FAMILY IN THE CANADIAN CORDILLERA

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To relate the contribution of the Wheeler Family to surveys of the Canadian Cordillera is a difficult task for me on several accounts. Can I describe the achievements of my father and grandfather with objectivity? How can I relate my father's career in India to his life in Canada? And, finally, I am hardly in a position to judge my own work.

Accordingly, I have decided that the best course will be to describe briefly the topographical surveys undertaken in the Cordillera by my grandfather, A.O. Wheeler, perhaps make some judgements on their quality and usefulness and illustrate, by means of some anecdotes, the character of his work and some of the people associated with him. In view of the fact that my father, Sir Oliver Wheeler, spent most of his career in India I shall have to digress from the Cordillera to deal with his achievements. Finally, I can relate some aspects of my own geological mapping in the Cordillera.

Arthur Oliver Wheeler, was born May 1, 1860, in County Kilkenny, Ireland. He came out to Canada with his parents in 1876 and took up the profession of land surveying. He began his apprenticeship in land surveys north of Lake Huron in 1877. Subsequently, for the Department of the Interior, he was involved in land surveys and subdivision of townships in the prairies and took part in the Riel Rebellion, being wounded at Batoche. In 1888 he married Clara Macoun, daughter of Professor John Macoun, celebrated naturalist, who became Head of the Natural History Division of the Geological Survey of Canada. By 1890 he had moved to the west coast at New Westminster. There he remained in private practice for three years, spending much of his time in surveys of timber limits. He then rejoined the Department of the Interior Survey Branch and was employed in township and subdivision surveys south of Edmonton.

At this time he was trained in this technique of survey by the Surveyor General, Edouard Deville, who was one of the world's experts. Deville had designed a camera with cross-levels that ensured that the camera, when mounted on the theodolite tripod was absolutely horizontal and its lens vertical.

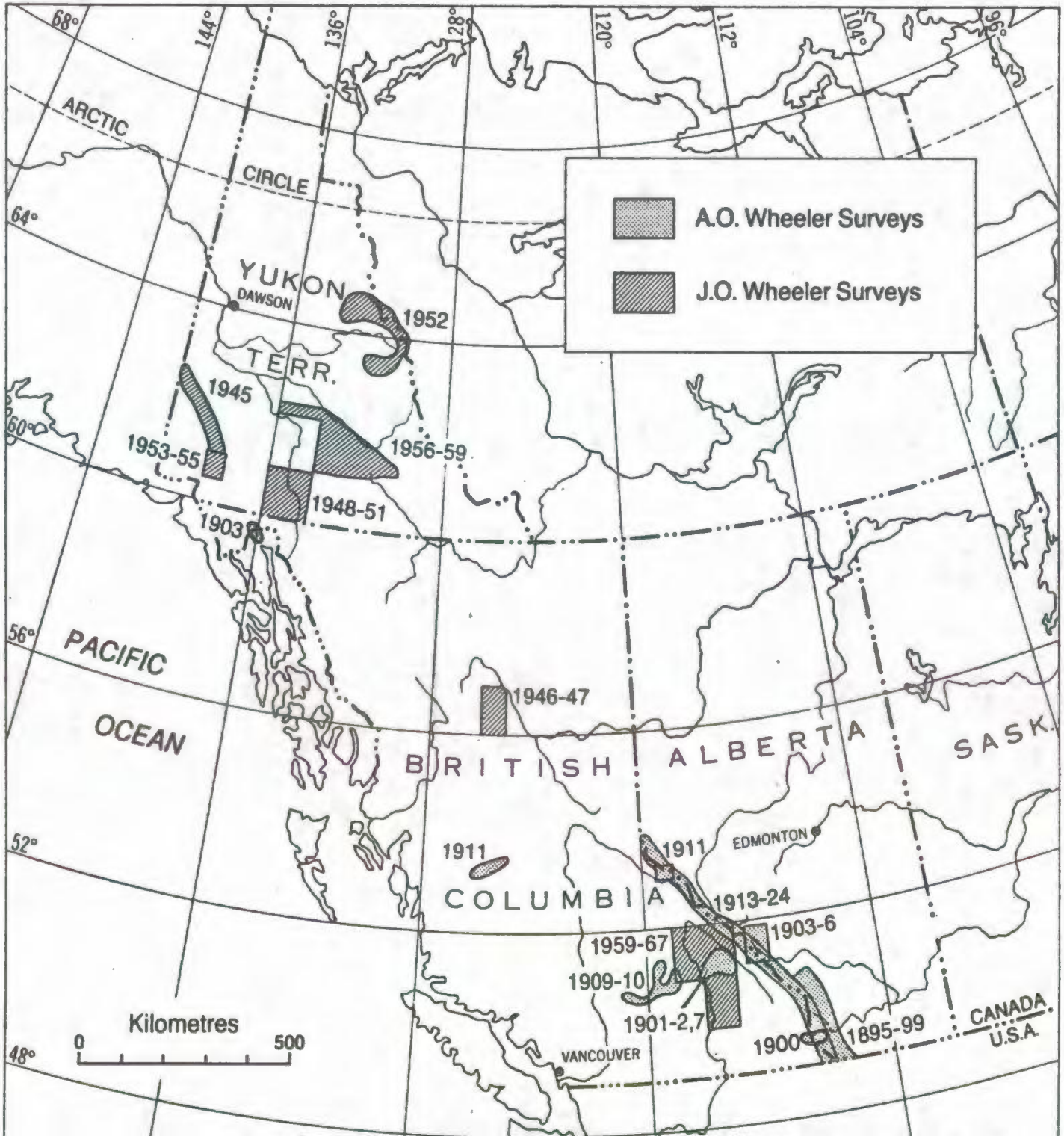
The principle of surveying by the photo-topographical method is similar to that used in plane tabling (Wheeler, 1922, p. 329). In each case stations are chosen that permit topographic features viewed to be visible preferably from at least two other stations. In plane tabling, observations made from a station to various topographic features are recorded on the plane table sheet as rays drawn by means of a sight rule from the position of the observing station to the particular feature. Control can be attained by drawing rays to visible bench marks and triangulation stations. Similarly, rays are drawn from the second and third plane table stations to topographic features visible from each station. Thus the location of the features in question is established by the intersection of the rays from the various observing stations. With experience, a topographer can draw the firm lines of the topography to create the map in the field.

In the case of the photo-topographical method, instead of constructing the map in the field, information in the form of photographs and horizontal and vertical angles to observe features and control points is brought back to the office and compiled to make the map. Thus, at a camera station a round of horizontal photographs is taken up to a full circle of 360° if visibility permits. The orientation of each photograph is recorded and the horizontal and vertical angles to topographic features and whatever control points are visible are read with the theodolite.

The advantage of the photo-topographical method, compared with plane tabling, is that less time is spent observing in the field - an important consideration in high mountains where cold and windy conditions commonly prevail making work difficult with numbed fingers. Moreover, the map can be carefully compiled and drawn in comfort in the office.

One disadvantage of the photo-topographical method is that the map is not compiled and drawn in the field and thus adjustments to gain information to fill gaps in information cannot be made. Another disadvantage is that

Figure 1


A.O. Wheeler Surveys
J.O. Wheeler Surveys
68°
144°
136°
128°
120°
112°
104°
96°
ARCTIC
CIRCLE
64°
YUKON
DAWSON
TERR.
1952
1945
1953-55
1956-59
1948-51
1903
60°
56°
PACIFIC
OCEAN
1946-47
BRITISH
ALBERTA
SASK.
52°
1911
1911
EDMONTON
COLUMBIA
1913-24
1903-6
1959-67
1909-10
1901-2,7
1900
1895-99
CANADA
U.S.A.
VANCOUVER
48°
Kilometres
0
500

twenty pounds of survey camera equipment must be carried in addition to fifteen pounds of the theodolite and tripod.

It takes experience and "an eye for country" to choose suitable camera stations (Bridgland and Campbell, 1920, pg. 89). These are usually at intermediate elevations whereas triangulation stations are established on the more prominent peaks so that they can be provided with unobstructed views and can be recognized from afar.

A.O. Wheeler undertook surveys for irrigation purposes from 1895 to 1899 in the southern Alberta foothills (Figure 1). This required stream gauging, establishment of bench marks, delineation of catchment areas and the definition of reservoir sites. Photo-topographical surveying was an effective way of doing this job. In 1900, he carried out surveys in the Crowsnest Pass and Fernie Basin region for the purposes of coal-mining development undertaken shortly after the turn of the century.

In 1901 and 1902, my grandfather undertook topographic mapping in the Selkirk Mountains. Maps published at 1:60 000 scale were to be prepared for alpinists and mountain travellers at a time when the C.P.R. considered that the Canadian mountains would rival the Alps as a playground for mountain lovers and sightseers. The Selkirk Mountains assignment was probably the most difficult my grandfather undertook. The country is rugged, local relief ranging from 4,000 to 7,000 feet. The valleys are heavily timbered and, where swept by snow avalanches, the slopes are thickly matted by impenetrable slide alder. Pack horses could only be used where trails existed and, since these were few, back-packing was resorted to as the principal means of reaching the more remote parts of the range.

To give some idea of how arduous the task was I quote from "The Selkirk Range", published by my grandfather in 1905 as an account of the survey and a history of travel in the region. "To occupy the stations, it was necessary to make a camp at timber and for this purpose to carry up a light tent, blankets and provisions in addition to the camera and transit, a work of much labour. Indeed, I found it was seldom possible to make an ascent and occupy a station properly the same day. An ascent with packs usually takes from five to six hours, the work at a summit three to four hours, according to the number of camera stations, and the descent about three hours, or 12 hours' continuous labour of the hardest kind; for the instrumental work requires the closest attention and is quite as fatiguing as the physical portion. The above estimate is on the assumption that clear, bright weather prevails throughout the day, which in the Selkirks, is the exception, not the rule. Try this sort of thing for five or six days in the week and then see how you feel on the seventh" (Wheeler, 1905, p. 39-40). When the work at a station was finished, not uncommonly, there was the prospect of a long descent to the valley late in the day. To quote again from my grandfather, "It was late when we finished and darkness overtook us by the way, making the descent difficult. Below, 2,000 feet beneath, could be seen the camp fire burning brightly; and yet, what an immense distance that 2,000 feet seemed to represent. It was a cloudy night, there was barely sufficient light to break the darkness and progress could only be made by feeling. In the very faint light, all slopes seemed precipitous. Twice, climbing down through cedar scrub, I felt my body swinging in space. The feeling was not pleasant. At length, after many checks and tumbles, we reached the shingle of the river bed and came to the conclusion that climbing lacks much of its charm in the

night time." (Wheeler, 1905, p. 104-105).

As can be gathered from the foregoing, my grandfather found the work arduous. His assistants found it more so. "On the 21st of July my two assistants, young men studying for the profession of land surveyors, who had been with me during the surveys of the Crowsnest coal lands left the camp. They found the labour too great for their powers, and they did not desire to become attached to a branch of the profession entailing such hardships and extreme physical exertion." (Wheeler, 1905, p. 41). My grandfather was fortunate, however, in that he was assisted in the balance of the Selkirk work and in the Rocky Mountains for the next eight years by M.P. Bridgland and his brother Hector Wheeler. Even the casual labourers hired to assist in the back-packing found this work not entirely to their taste. "On the 29th, another attempt was made to obtain suitable views from Mount Fox. About half way up, it clouded over and, when reached, the summit was in the clouds. It was freezingly cold and white hoarfrost settled in bunches and sprays on the rocks and other exposed objects. We remained a couple of hours, but eventually had to return without results. The packers had been sent to the Asulkan camp for provisions. When they reached the steep cliffs on the return journey, the one who had cut his hand seemed to succumb to an overwhelming fear. He put down his pack and simply ran back to the railway. I never saw him again." (Wheeler, 1905, p. 92).

In the course of this work, stations were established on the summits of over thirty peaks - three of which were over 11,000 feet above sea level and eight over 10,000 feet. In addition to the trials of fighting their way through heavy bush and dead-fall, the attainment of many stations required mountaineering techniques employing ropes and ice axes and, on a few occasions, Swiss guides were engaged as well.

In 1903, my grandfather was summoned to Alaska to investigate a report received by the Northwest Mounted Police of the finding of supposed remains of old Russian stone houses and some boundary monuments thought to have a bearing upon the location of the Alaska-Yukon boundary between Canada and the United States, then being adjudicated in London. He made a photo-topographical survey of the terrain involved and reported to Ottawa; the results were turned over to the Boundary Commission. (Wheeler, 1941).

From 1903 to 1910, during which period he was appointed Topographer of the Department of the Interior, he continued photo-topographical surveys of the main range of the Rockies between the North Saskatchewan River and Banff. In 1907 the Selkirk survey was extended eastward to complete the coverage of the Dogtooth Range. In 1910 he began a survey of the Bugaboo-Howser Divide in the northern Purcell Mountains.

It was during this time that my grandfather was the moving spirit in the founding of the Alpine Club of Canada, which took place in 1906. One of the innovations of the new club was the establishment every summer of a camp in the Rockies or Selkirks where club members gathered, climbed together and trained novices. One club objective was to promote an awareness of our mountain heritage and another was to train people to travel

safely in the mountains. Accordingly, on the grounds that the Alpine Club was aiding the promotion of tourism in the mountains, my grandfather was granted a dispensation from the Minister of the Interior allowing his survey party - namely, himself, his brother Hecotr, and M.P. Bridgland leave to erect the Alpine Club camp, lead climbs, train mountaineers and disassemble the camp at the end. My father also assisted in this work.

However, in succeeding years it became increasingly difficult to obtain permission to support the ACC camp. In 1910 the Minister would not renew permission and, therefore, my grandfather resigned from the Department of the Interior and went into private practice that he might devote his time more freely to the Alpine Club of Canada.

In 1909 and 1910 he was engaged in land subdivision for the Department of the Interior around Shuswap, Adams and Kamloops Lakes. This was undertaken preparatory to the promotion of that region for fruit farming, largely by immigrants. In the next few years many orchards and small farms were established only to be later abandoned when most of the menfolk went off to the first war and many of the orchards were killed as a result of the severe winter of 1915-16.

In 1911 my grandfather had a particularly busy season. He was engaged in contract subdivision surveys around Tetachuk Lake in central British Columbia. Access was gained from Bella Coola, seventy-five miles to the south. In mid-summer he undertook a survey of the Mount Robson area on an Alpine Club of Canada expedition in collaboration with the Smithsonian Institution in Washington, D.C., which sent several biologists and zoologists to study wildlife and plant life in the region. Late in the summer he made a reconnaissance around Maligne Lake and finally completed the Tetachuk survey in November. It was a long season indeed.

He continued in private practice until 1913 when he was appointed Commissioner for British Columbia on the survey of the boundary between Alberta and British Columbia. He was responsible for the photo-topographical surveys to locate and document the continental watershed between the United States border and the 120th meridian. R.W. Cautley, Commissioner for Alberta, was responsible for the delineation of the boundary across the major passes and for the erection of boundary monuments there. J.N. Wallace was Commissioner for the Dominion of Canada until September 20, 1915. Thereafter, this function was assumed by Mr. Cautley. This work, over a distance of 600 miles, was carried out from 1913 to 1924. The results of the survey, topographic maps at 1:62 500 scale with major passes mapped at 1:25 000 scale, were published in an Atlas of three volumes. It was accompanied by a three volume report (Wallace et al, 1917; Cautley and Wheeler, 1924; and Cautley and Wheeler, 1925) giving an account of the survey and a description of the country. At the close of this work in 1924 my grandfather retired from active professional work. Subsequently, he devoted most of his time to Alpine Club matters, to the promotion of our mountain heritage and support of national parks. He had formerly in the early 1920's, in collaboration with his packer Ralph Rink, organized a walking tour from Banff to Mount Assiniboine and return. It was not sufficiently supported and only lasted two years. He was one of Canada's early conservationists, making the point that the beauty of our mountains was indeed one of our resources.

A.O. Wheeler was greatly interested in glaciological studies in the Canadian Rockies and Selkirks. For many years he carried out glaciological measurements on the Illecillewaet, Robson, and Yoho glaciers. He encouraged others in the Alpine Club of Canada to participate in glacier measurements. He was for many years Canadian representative on the International Commission on Glaciers.

My grandfather, naturally, had his share of adventures and frustrations during his surveys. He had to persevere to occupy stations even though the clouds would blot out the view and require reascent or by having to overcome numerous obstacles of bush, down-timber, rushing torrents and mountaineering hazards to reach his objectives. I recall my grandfather telling me about the time he slipped on a snow and ice slope near Mount Robson and was rescued by the famous Austrian guide Conrad Kain, who grabbed him just before he was to fall over a 300-foot cliff. On another occasion, he fell into a crevasse, whereupon he called to his companion "Hello, I'm in a crevasse", to which his companion replied "How clever of you to find it!" On two successive occasions on a mountain on the southern Rockies he was unable to complete his observations because of rapidly developing, severe thunderstorms. The instruments buzzed and sparked and his hair stood on end and upon taking shelter he and his party were severely shocked by electrical currents as the summit was hit by a succession of lightning strikes. He was eventually successful on the third try and no wonder he named the station Tornado Mountain. Loss of notebooks required re-surveying of considerable tracts of land. On one occasion a notebook was in his coat pocket and fell out of a canoe as it upset going down the Pitt River and on another ocasion a rucksack fell into a crevasse and could not subsequently be retrieved. He, of course, had his share of adventures with bears.

My grandfather was a strong-willed and determined individual. There was no doubt who was the boss. However, he did his share of work and had the respect, loyalty and, I think, also the affection of most of those who worked with him. He worked his men hard and for the most part he treated them fairly and made the work fun for them. For example, during periods of boredom during bad weather he would organize unusual games and sporting events as diversion. It is significant that his assistants Morris Bridgland, Alan Campbell and A.S. "Spike" Thomson worked for him for periods of ten to fifteen years as did Conrad Kain, the Austrian mountain guide. Ralph Rink, his favorite packer, was with him for many years and continued to be associated in outfitting the walking tour and the Alpine Club camps. However, there were those who did not think that much of A.O. Wheeler. An anecdote comes from the late Jimmy Simpson, famous packer and former owner of the lodge at Bow Lake on the Lake Louise-Jasper Highway. Simpson tells the story of an encounter between Fred Stephens, another famous old-time packer, and my grandfather on route to Mount Robson in 1911. My grandfather had told Stephens that he and some of the boys would go ahead a few miles, pick out a camp site, and cut poles for tents. Stephens was to follow with the pack train. After a few miles Stephens came across a beautiful bunch-grass meadow, ideal for horsefeed. So, in view of the fact that the horses came first and Wheeler very likely a poor second, he decided to stop the night. My grandfather and his assistants meanwhile spent a hungry night around the fire. Next morning my grandfather went back to see what had happened. Stephens was just getting underway. My

grandfather was naturally somewhat perturbed and said "Stephens, I always heard you were a good man - and you're not". To which Stephens replied "Wheeler, I always heard you were an S.O.B. - and you are!" As Jimmy Simpson put it, "since they have both departed this life, wherever they are now, they are probably continuing the argument!" This is a classic case of a dispute that can arise between the packer and the party chief. The packer wants to camp where the feed is and the party chief wants to camp in the place that is most accessible to the work. In my experience the best packers will do all they can, at inconvenience to themselves, to facilitate the work. Stephens' action, I suspect, was one of spite, for my grandfather's diary revealed that they did not get along.

It is perhaps difficult to attempt to be able to evaluate the quality of my grandfather's work. Considering the technology available at that time I judge the surveys to be of high quality. Consider the comparison of the Boundary Survey sheet No. 12 around Mount Assiniboine, with the current 1:50 000 Mount Assiniboine sheet (82J/13E) compiled with the use of air photographs, better instruments, and more accurate control. The topographic form lines are very similar, the larger lakes almost identical and the principal variation being in the smaller lakes. The vertical control likewise seems pretty reasonable as the table of elevations, Table I, (Wheeler, 1920, p. 85) made from Selkirk stations shows when compared with the results of more subsequent triangulations. They all agree within reasonable limits considering the distances over which the observations were made varying from seventy-five miles for Mount Columbia to thirty-five miles for Mount Chancellor.

TABLE I

Mountain	From Selkirk Views	Established Altitude	Difference
Mt. Columbia	12,740 feet	12,294 feet	446 feet
Mt. Bryce	11,686 feet	11,507 feet	179 feet
Mt. Lyell	11,463 feet	11,495 feet	32 feet
Mt. Forbes	12,075 feet	11,902 feet	173 feet
Mt. Chancellor	10,751 feet	10,780 feet	29 feet

It must be remembered, of course, that in judging the quality of a map we must consider when the survey was done and what natural or cultural changes have taken place in the meantime. Many people do not realize the importance of checking the date of a map. I had a dramatic experience of this when I mapped geologically, the same terrain that my grandfather mapped topographically, in the Selkirk Mountains. We were on a traverse north of Glacier Circle when we spied four figures crossing a snow slope. As is usually the case when one is out in the wilds, we immediately went over to see who they were. In the course of conversation we revealed what we were doing and this prompted one of the climbers to say "we don't think very much of the maps here as they are not accurate". "Wait a minute", I replied, "what is the matter, for I have a stake in its quality because my grandfather did the surveys here". As he pulled out the map I recognized that it was the 1:60 000 map published in 1905 but based on surveys made in 1902. "See here", said the climber, "the glaciers are all wrong". "Yes", I remonstrated, "but the surveys were done nearly 60 years ago and since that time the glaciers have shrunk!" Family pride was saved!

However, my grandfather did get caught out once, albeit long after his death. Some mountaineers were climbing west of the divide northwest of the Columbia Icefields and were using the Boundary Survey Sheet No. 23. They proposed to descend into and across Tsar Creek, shown as free of snow and ice. To their surprise there was a large glacier, the Wales glacier, shown on the 1:50 000 Clemencean Icefield Sheet (83C/4). I judge from the account of the survey (Cautley and Wheeler, 1924, p. 72) the head of Tsar Creek was not completely viewed in the surveys of 1919 and the report of that year indicated that additional stations would have to be occupied in 1920 to complete the survey. However, camera stations north of Tsar Creek never completely covered the terrain. The boundary survey guessed and fudged in the topography - but they guessed wrong. The moral of this story is that users believe topographic maps implicitly and so they must. When there is any doubt concerning the depiction of the topography then this uncertainty should be indicated by means of dashed lines so that the user will recognize the uncertainty. Now that complete coverage is obtained by air photos the likelihood of uncertain topography on maps that would require dashed contours is virtually eliminated.

I have here dealt almost entirely with my grandfather's professional career and his contribution to the exploration, discovery and mapping of much of Canada's mountain vastness. I know he enjoyed the adventure of exploring the unknown - perhaps that is what he liked best. However, he was always a meticulous worker and knew that he must do his job well, no matter what the conditions, to create topographic maps that would depict the landscape accurately. Finally, and his devotion to the Alpine Club expressed this best, he was dedicated to the promotion of an appreciation of Canadian mountains and mountaineering. Clearly, he left his mark on the mountains of western Canada in more ways than one.

My father, Edward Oliver Wheeler, was born in Ottawa in 1890. At an early age he visited my grandfather on the Foothills surveys and regularly accompanied him on surveys during summer holidays from 1902 to 1910. He became competent in all aspects of carrying out a topographical survey, from putting up camp, packing horses, operating instruments - he qualified as an Alberta land surveyor at the age of 17 and was one of the leading Canadian mountaineers of the day before the First War.

He graduated from Royal Military College, Kingston, in 1910, with the highest marks ever attained by a cadet up to that time. He joined the Royal Engineers and was ultimately posted to India. He served with the Indian contingent in France and in Mesopotamia during which time he won the Military Cross.

In 1920, following a field season around Fortress Lake with the British Columbia-Alberta Boundary Survey, he joined the Survey of India and as his first assignment he was to carry out some experimental surveys in the Garwhal district to test the suitability of the so-called Canadian method of photo-topographical survey to the Himalayas. At about this time the first expedition was being organized to Mount Everest on the Tibet side. Surprisingly, my father was assigned to the party to carry out the experimental survey in the region immediately around Mount Everest. The

expedition lasted about five months, requiring a month's travel each way to the mountain. Three months were spent surveying 600 square miles to a scale of one inch to one mile. My father's outfit consisted of a camera, theodolite, a small plane table, two tents, bedding and one primus stove for himself and three porters. In addition, from time to time, he was supplied by other porters. He occupied numerous stations between 18,000 and 22,300 feet above sea level - the highest being Lhakpa La (Wheeler, 1922) which was for many years the highest survey station occupied in the world.

The 1921 reconnaissance was undertaken during the monsoon season and, therefore, my father had to exercise great patience and perseverance to take his photographs and make his observations. To quote Howard-Bury, leader of the expedition, "Most of the summer was spent by himself and his porters in lonely camps 18,000 to 20,000 feet high .... often he would spend day after day, at over 20,000 feet, on top of a mountain in bitter cold and driving snow, waiting for the clouds to lift, to enable him to take his photographs. I think that he had the hardest and most trying time of all of us, and deserves the greatest credit for his work". (Howard-Bury, 1922, p. 205).

In the course of the survey my father was able to establish that the East Rongbuk Glacier was the one that would provide access to the North Col - leading to the most reasonable route to the summit. All subsequent expeditions prior to World War II used the East Rongbuk Glacier approach.

Before the expedition began its homeward journey my father joined George Mallory and G.H. Bullock on an attempt on the mountain. They reached an altitude of 23,000 feet at the North Col before the cold and effects of the altitude forced a retreat. Mallory, who was famous for his reply of "Because it's there" in response to why he wished to climb Mount Everest, was lost in a summit attempt in 1924.

His mapping extended into Nepal where camera stations permitted views into that country. However, the south side of the mountain was not completed until after World War II when Nepal became accessible.

Subsequently, my father continued his career with the Survey of India, but ill health for the next few years after the Mount Everest reconnaissance precluded his return to the Himalayas. He became Surveyor General in 1941, was knighted in 1943, retired with the rank of Brigadier and returned to Canada in 1946. Upon his return to Canada he became active again in the affairs of the Alpine Club of Canada serving as President from 1950 to 1953.

Now to deal briefly with my own work in the Canadian Cordillera. I was born in India and came to Canada at the age of 7. After attending Shawnigan Lake School, Vancouver Island, I entered the Applied Science faculty of the University of British Columbia with a view to choosing Civil Engineering as a profession. However, after a few courses in Civil Engineering I recognized the error of my ways and switched to geological engineering. Geology seemed to offer a means of being able to climb mountains and get paid for it.

I suppose I could say I began my career as a student assistant in 1945 under H.S. Bostock of the Geological Survey on a party working along the Alaska Highway west of Whitehorse. I was most fortunate in that I learned much about the geomorphology in the sub-Arctic environment from a master on the subject.

Like many junior assistants I made mistakes in judgement and particularly distinguished myself in the crossing of Koidern River northwest of Donjek River. We were camped beside this river and another assistant and I were assigned a traverse down the far side of the stream. This required us to walk a mile or so up the highway to cross on a bridge. However, we figured we could fell a tree across the creek and reach the far side much more easily that way. We cut down a tree but it was too short and the current readily swept it away. Then we moved farther downstream and found a larger tree and cut that down. It just reached the far shore. However, the current was so swift that this tree was swept away also. After failing with a third tree we finally saw a log jam that extended part way across the stream. A sweeper, that is a tree hanging horizontally across the creek, stuck out from the far side of the creek. This seemed to be a good place to cross. So taking off all my clothes except my shirt and my boots, I waded out into the creek beyond the log jam. In no time I was swept off my feet and ended up hanging onto the sweeper. However, I did not have the strength to pull myself out with my pack on. So I shouted to my companion that I was going to let the pack go and he grabbed a pole in order to hook the pack as it went by. I let the pack go and eventually climbed out to find that he had been unable to hook the pack and it had disappeared down the creek. The prospect before me was to walk five or six miles downstream to the next bridge. I leave it to you to imagine what it was like walking through the Yukon buckbrush at the height of the mosquito season with only a shirt and a pair of boots on! Luck was with me and there, about a quarter of a mile downstream, was the pack grounded on a gravel bar. Needless to say I quickly retrieved my pants! When I arrived back in camp somewhat sheepishly, having achieved nothing, Dr. Bostock merely smiled but I could read the message: "You're the kind that has to learn the hard way".

For two years I served as a senior assistant to Fred Roots of the Geological Survey in the Aiken Lake area of the Omineca Mountains. This gave me the necessary experience on how to run a survey party, pack and look after horses so that I could confidently manage a party of my own.

In 1948 I began mapping for the Geological Survey of Canada in the Whitehorse Map-Area in the Yukon. In those days, promising students were assigned areas by the Geological Survey from which the student had the opportunity to develop a Ph.D. thesis. I was fortunate enough to be offered the Whitehorse area which had been started earlier by John Fyles but which he had to give up on account of illness. My thesis "Evolution of the Whitehorse Trough" discussed the geological history of the region during much of the Mesozoic Era, that is, from 225 million to 135 million years ago. It showed that sediments were deposited in a trough extending from Carmacks, Yukon, southeastward past Atlin, British Columbia. These sediments, at first, were derived from a chain of explosive volcanos lying to the west along the edge of the present Coast Mountains. Later, about 200 million years ago, the volcanic terrain was uplifted and granite masses in

the core of the volcanic chain were exposed to erosion and its debris deposited in the trough. This sequence of events has been found subsequently in several other localities in the Canadian Cordillera.

Another striking feature of the geology of Whitehorse Map-Area is its magnificent display of landforms related to the last glaciation, particularly to deglaciation features formed at the time of retreat and wasting of the ice sheets. These features include abandoned stream channels formed between the ice and valley-wall, old shore lines of lakes trapped between the ice and the containing valley wall, and a succession of deltas resulting from streams overflowing the ridges to the south and east where the ice was higher. They were so abundant that they led me to produce a map of the glacial features (Wheeler, 1961) - the first of a series produced by several of my colleagues in the Canadian Cordillera.

In 1952, I undertook a geological reconnaissance of the Selwyn Mountains, one of the objectives being to determine the source of iron formation discovered in glacial deposits near Keno Hill. Another objective was to determine the nature of the geology and the favourability for prospecting of a number of granite bodies near the head of the Hess River. I started from Mayo with three companions and a pack string of eight horses and made a large swing to the northeast of Rackla River, then southeast along the Bonnet Plume and Selwyn Valleys and finally westward via Hess and MacMillan Rivers to Pelly Crossing. This trip of over 450 miles, I believe, was the last extensive reconnaissance made by the Geological Survey entirely with horses. As I recall, we made about 55 camps. We discovered some iron in-place (Wheeler, 1954) but the big discovery of the Snake River iron came 10 years later (Green and Godwin, 1963, p. 15). Towards the end of the trip Ed Kohse, my sixty-nine year old packer, was kicked by a horse and was unable to ride again and, consequently, we had to fly him out. Our return down the MacMillan River was one of the toughest horse trips I have ever undertaken. The valley was full of beaver sloughs and dead-fall and although we travelled an average of 12 hours a day we rarely did more than eight miles. Clearly, the MacMillan Valley is not horse route.

From 1953 to 1955 I mapped the Kaskawulsh area in the St. Elias Mountains (Wheeler, 1963a). This was in the days before helicopters were commonly used and represents the last of the areas done by what I would call "heroic methods" - entirely by back-packing supported by air drop. On moving days we carried packs weighing, on average, between sixty to seventy-five pounds, and on some occasions, when loaded down with rocks, carried up to one hundred pounds. In respect to air drops, I tried a variety of methods ranging from putting the food drops out ahead of time to having rendezvous where the food was dropped to us. Our experience with rendezvous was sad. Only once did we receive a drop on time and on one occasion after eight days no drop came. So, having retrieved every bit of food from former camps within reach, we headed for the Alaska highway, four days' distance, with six days' food. This permitted us to do two days' work enroute. After three days a plane came over, spotted some of our party and dropped a note. It was a memo from the Resident Geologist at Whitehorse asking one of my party to come out as soon as possible and take over another party in eastern Yukon. There was no mention of the missing air drop. We were somewhat disgruntled by this time which generated the comment "even in the remotest mountains we can't get away from memos". We did not discover until we got

out to Whitehorse that bad weather in central Yukon had not permitted flying and that our air drop was made the day after we left. No wonder we named the rendezvous glacier - Disappointment Glacier! In the end the most effective method was to air drop ahead of time. Stove fuel was dropped on a small parachute and food was dropped free-fall on a succession of low passes after the parachute had landed.

The work in the St. Elias Mountains was arduous indeed. Over three years my party made more than 40 first ascents of mountains ranging from 7,000 to 11,000 feet above sea level. The turbulent and muddy glacier streams were a problem to ford. On more than one occasion we were swept off our feet. On others, we had to detour up to the glacier at the head of the valley, in some cases requiring an extra day's travel, cross on the ice and return down the far side of the valley in order to reach an air drop which, at one point, was only a couple of hundred yards away - but on the wrong side of the creek. Up until the middle of July we commonly used snowshoes as the early summer snow is unusually soft in that country.

With two exceptions, none of my assistants had had mountaineering experience. On reflection, it surprises me that we got around the country, roaring streams, canyons, steep hillsides and heavily crevassed glaciers, without coming to harm. In most instances my assistants rose to the task and enjoyed it. On one occasion as my assistant and I reached the summit of an 11,000 foot peak I asked him how he felt on reaching a peak of this altitude for the first time in his life. He was not one to jump to a conclusion and replied that he wasn't sure and would have to think about it. I got my answer a month or so later when he sent in his travel expense account. "After last summer with you people", he wrote, "I have decided to go into psychology".

On looking back I would have to say that for the effort expended we were not particularly productive. Still we managed to determine that formations of Devonian age, not previously known, were extensive in the area. We recognized one major thrust fault but missed the extension of the Denali Fault through the northeast corner of the map-area. We made some measurements on the rate of movement of ice and determined, from the examination of tree rings, that the glaciers had been more extensive in the early part of the eighteenth and nineteenth centuries.

From 1956 to early 1959 I undertook work in southern Yukon in the Pelly Mountains. This was very varied geology and provided a new experience for me in that, for the first time, I had the opportunity to work in very fossiliferous rocks. I began working with horses in 1956 but later, beginning in 1958, I collaborated with J.A. Roddick and L.H. Green on "Operation Pelly" - the second major aircraft-supported operation in the Canadian Cordillera, "Operation Stikine", under E.F. Roots, being the first. The 1958 season was spent working out of all available lakes using a Super Cub float plane for transport. A two-man party could be moved with its gear and food in two moves.

In 1959 we used a helicopter. It was used mostly as a taxi for two-man geological traverse teams which would be set out in the morning and picked up at night. It also serviced fly camps by setting out the traverse team in the morning so that they might traverse back conveniently to their camp that day. It was also used for spot observation by the senior geologists

as a means of linking up the geology done from the foot traverses. However, at this stage in our experience with helicopters, logistical efficiency dominated scientific efficiency and the machine was the master of man. Consequently, "Operation Pelly" was done perhaps more rapidly than it should have been. But even so, it served to outline the major units of the geological framework of central Yukon. Folded thrust faults and displacement metamorphic terrains were recognized for the first time in the region (Green et al, 1960a, 1960b).

In mid-summer 1959 I left the Yukon, after having spent 12 field seasons there, and began mapping in southeastern British Columbia. I continued work there until 1969. The map areas, Golden West Half, Seymour Arm East Half and Lardeau West Half, embraced the Monashee, Selkirks, northernmost Purcell and western Rocky Mountains, encompassing the region drained by the Bush River and its tributaries. It included much terrain mapped nearly 60 years before by my grandfather. By this time helicopter support was shared between various neighbouring geologists - that is to say, those within 50 to 120 miles of one another. One of these neighbours, I might say, was Dick Campbell, son of Alan Campbell who assisted my grandfather on the Boundary Survey for so many years. Each of us had the use of a helicopter for about two weeks at a time, two or three times a season. I used the intervening time to carry out long traverses across the grain of the geology by means of two- to four-week back-packing trips, supported by food caches set out by helicopter, a day's journey apart. In the course of these long trips, involving considerable mountaineering, we developed the control from which the geology could be rapidly extended when the helicopter was available.

During the 1960's two advances were made in the use of helicopters: (1) Helicopters with supercharged engines were developed which allowed them to operate up to the highest elevations (over 11,000 feet) in the region, and, (2) Geologists had learned to become master of the machine. No longer did pilots feel that helicopters were not being used efficiently if they were not flying all the time. The number of landings required was dictated by the geology; some days we would only make five or six landings, on others we might make 25.

The use of the helicopter has more than doubled the speed of mapping and has greatly increased its quality. Geological formations and structures can be mapped far more accurately than previously, and best of all, the increased mobility permits the return of the geologist to problem areas for a second and third look. This luxury was never available in the pre-helicopter days; one had one look at the country and that was it. Now, with more expensive but faster, larger and more versatile helicopters further modifications are being introduced by geologists to use them more effectively and efficiently. Their greater speed and capacity permit geologists to set out a traverse team for more than one traverse per day and to range much farther than formerly, leading to a further spedding up of the mapping.

The work in the Monashees, Selkirks and Rockies permitted my colleagues and I to outline the geological characteristics of the core of the mountain system in the eastern Cordillera. The heart of the core is characterized by domes of complexly deformed metamorphic rocks that have been heated,

stewed and mobilized. These occur in the Monashee Mountains (Wheeler, 1965a). Going eastward into the Selkirk Mountains the rocks are still complexly deformed but are less metamorphosed. The structure is characterized broadly by a huge fan-shaped profile (Wheeler, 1963b). Farther east in the Rockies we have been able to delineate a change from a structural style somewhat similar to the Selkirks eastward into more simple structures featured by geological units characterized by huge cliffs alternating with those forming recessive benches and ledges. The resulting topographic forms are the castle-like mountains one sees in the Lake Louise region. We now realize that this difference is inherited from the change in the character of the original sediments that were deposited on the flanks of the North American continent 400 to 500 million years ago (Price and Mountjoy, 1970).

In southeastern British Columbia I undertook a study of tree growth near existing glaciers and discovered that growth had been retarded in the early eighteenth and mid-nineteenth centuries at a time when the glaciers were more advanced than today - an observation similar to that I made near the Kaskawulsh Glacier in the Yukon. In addition, we discovered logs about one foot in thickness, buried in gravels, more than 1,000 feet above present timber line. Radiocarbon dates on these logs revealed that the climate was much warmer 3,000 to 5,000 years ago (Wheeler, 1965b).

In the course of this work I have had my share of adventures including: spending more than one night out because I lost the horse tracks in the dark and could not find camp; finding my way back to camp only by blazes illuminated by moonlight; crossing the wrong pass in a blizzard; steering by compass for hours in the fog; surviving, somewhat miraculously, several slips and falls on the mountains; dealing with a variety of emergencies in remote areas ranging from stitching up a head-wound caused by rock fall to rescuing an assistant suffering from a nervous disorder; worrying about where my assistants were when it got dark and they had not yet returned from their traverse; and, of course, the inevitable bear stories - especially the one about how I ran into the same bear twice while looking for fossils. I could go on but it would require much more space to tell all the stories!

One of my particular interests has always been regional geological synthesis - how did the geological framework evolve? In this I have been particularly fortunate to collaborate on several occasions with Hubert Gabrielse, currently Head of the Cordilleran Subdivision in Vancouver (Gabrielse and Wheeler, 1961; Wheeler and Gabrielse, 1972), an association that began when we were roommates at Columbia University back in our Ph.D. days. Also, between 1961 and 1970, when I was based in Vancouver, I was associated with a very enterprising, productive and stimulating group of geologists in the Cordilleran Section of the GSC, as it was then called. This group always had a common interest in Cordilleran problems that formed the basis of a very fine esprit de corps. There was a willingness to discuss, argue and criticize. Moreover, everyone was generous with information and ideas. In the course of many discussions one could not recall who introduced an idea and who modified it. As a result there was a certain synergism to tectonic syntheses of the Cordillera emerging from this group - the product was more than the sum of its parts.

Since 1970, when I moved to Ottawa and became concerned with the geology of Canada as a whole, many younger geologists have been revising and improving on my work - "rearranging the geology" as I refer to it. This is as it should be and is characteristic of geological mapping. It illustrates the difference between it and topographic mapping. The topographer maps the landscape as it is. Revisions are required less for natural changes, although these are reflected in advances and retreat of glaciers and changes in river channels and shorelines, than from man-made changes affecting roads, towns and man-made lakes and reservoirs. Geological mapping, however, has highly interpretative components that reflect the geological wisdom of the day. As ideas change and new information is available geological maps are re-interpreted to the degree than an area requires re-examination and additional information sought. Geological mapping, therefore, is an on-going dynamic process that will keep geologists busy for a long time. I count myself fortunate that I participated in the golden age of geological mapping in the Cordillera, starting at a time when only one-third of the region was mapped geologically. Now, the cycle started after the Second World War is almost finished and my colleagues are embarking on the next one.

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TWELFTH ANNUAL CONFERENCE - REPORTS

REPORT ON MAPPING BY THE GEOLOGICAL SURVEY OF CANADA

J.O. Wheeler
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Geological Survey of Canada
Ottawa

INTRODUCTION

This is the first time that the Geological Survey of Canada has reported to the Association of Canadian Map Libraries. Accordingly, a brief explanation of the role and responsibilities of the Geological Survey of Canada is in order.

ROLE OF THE GEOLOGICAL SURVEY OF CANADA

The Geological Survey of Canada is a branch within the Science and Technology Sector of the Department of Energy, Mines and Resources. It has four principal missions:

- To determine the potential of Canada's mineral and energy resources.
- To elucidate the geological framework and mineral and energy resource base of the country and thereby facilitate the discovery of needed resources.
- To investigate the capability of the landmass to withstand the pressures of resource development, urban growth, and disposal of waste.
- To provide the geoscientific information required in the conservation of Canada's natural environment.

Towards the achievement of these objectives, the GSC conducts systematic surveys and regional studies and produces national compilations in the form of a series of thematic maps. Information is acquired on the bedrock geology of the Canadian landmass and how it evolved. It is also obtained on the evolution and nature of the Canadian landscape, including its surficial materials, terrain properties, processes, hazards and capability for use. All this information, obtained under the Earth Sciences Services Program of the Department, contributes to the knowledge base required for identifying and appraising Canada's mineral and energy resources and for evaluating the impact of resource development. Thus it contributes to the formulation of national policy on the use of resources and the maintenance of mineral and energy supplies carried out under the Mineral and Energy Programs of the Department. This information is also used directly by industry in formulating its exploration strategy; planners, consultants and engineers concerned with development; provincial governments and universities.

STATUS OF MAPPING

Of interest to the Association of Canadian Map Libraries are the map products that emerge from the Geological Survey's systematic surveys and regional

and national compilations. The status of these mapping programs is as follows:

Bedrock Geology

The geological reconnaissance of Canada at a minimum of 1:500 000 scale (1:250 000 in the fold belts fringing the Precambrian Shield) has been completed except for Yakutat (1140)*, Tatshenshini (114P) and Nass River (103P) map-areas in British Columbia. Field work on the first two of these remaining sheets is being done in 1978 and Nass River will be completed in 1981.

Coverage at 1:250 000 scale has been obtained for about 30% of Canada. Emphasis on this work is in the Territories where the level of information is lowest. This must be raised in response to the need for orderly development of the frontier energy resources and related activities. Although 1:250 000 scale mapping is currently being carried out in British Columbia, Newfoundland and Quebec, the Geological Survey is doing less mapping in the provinces than formerly because the level of information is higher there and most provinces have a mapping competence of their own.

Geological mapping at 1:50 000 scale is usually applied only for problem-oriented studies. The main exception is the bedrock mapping of the Canadian Rockies in which systematic mapping was undertaken at 1:50 000 scale to adequately display the degree of detail needed to depict and understand the geology there. New 1:250 000 scale maps expected to be published in 1978-79 are: Trepassey (1K) in Newfoundland; Icebound Lake (37G), Steensby Inlet (37F), Conn Lake (37E), Buchan Gulf (37H), and Scott Inlet (27G) - all on Baffin Island; Contwoyto Lake, west half (76E W1/2) and Point Lake east half (86H E1/2) in the Northwest Territories. New 1:50 000 scale maps will be published of Banff, west half (in 820), Mount Raleigh Pendant, British Columbia (in 92K), and Nanchvak Fijord and Ramah Bay straddling NTS 14M and 14L in Labrador.

Surficial Geology

Field work for surficial geology reconnaissance to at least 1:500 000 scale has been achieved for 45% of Canada. Mainly uncoloured and Open File releases have been produced for about 30% of the country. They have been released in this preliminary form so as to get the information to the user - the consultant, planner and engineer - as quickly as possible. Most of this work has been undertaken in the Territories because of the priorities dictated by proposals for a Mackenzie Valley Pipeline, Polar Gas Pipeline from Melville Island via Boothia Peninsula to west of Hudson Bay, and lastly the ALCAN Pipeline route through Yukon. About 20 new maps in the uncoloured B-series at 1:500 000 scale will be published for the Mackenzie Valley.

Offshore Surveys

In the offshore areas surrounding Canada the GSC publishes jointly with the Canadian Hydrographic Service a variety of resource maps which are

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* National Topographic System identification

the result of marine multiparameter and offshore geological surveys. The status of charting achieved is too complex to convey in this report but can be readily ascertained from Indexes of Natural Resource Maps from the Canadian Hydrographic Service. In brief, about 40% of the Atlantic Continental Margin has been covered by bathymetric charts, at 1:250 000 scale, 20% by magnetic anomaly and gravity (Bouguer) anomaly maps at the same scale. Multiparameter maps for 10 map-areas will be released in 1978-79 northeast of Newfoundland and east of northern Labrador. Multi-parameter coverage has been attained for 10% of the Pacific Continental Margin. Bathymetry and magnetic charts for 5 sheets will be released west of Vancouver Island in 1978-79. In the western Arctic 4 sheets showing bathymetry and magnetic anomalies will be issued for western Amundsen Gulf region.

Aeromagnetic Surveys

Aeromagnetic Surveys under federal-provincial auspices has produced aeromagnetic maps of most of the Precambrian Shield and of about 75% of the land area of Canada. In 1978-79 this program will produce 1:50 000 maps and 1:250 000 scale compilations of the following areas:

198 maps of Melville and Coppermine Regions of the Northwest Territories.
141 maps of NTS 104A, B, G, H, I and J in British Columbia.
139 maps in New Quebec.

Twenty-two 1:50 000 scale maps in Nova Scotia are being produced under a DREE agreement for the Nova Scotia Department of Mines.

High resolution gradiometer surveys at 1:25 000 scale will produce 40 maps in Kasmere Lake map-area, Manitoba (64N) and 28 maps in northern Saskatchewan in areas fringing the Athabasca Basin. These maps will provide information to complement radiometric and geochemical maps resulting from the Uranium Reconnaissance Program.

Six maps at 1:25 000 scale from gradiometer surveys are being released in 1978-79 in poorly exposed parts of Ontario for identifying homogeneous and unfractured granite plutons as potential sites for radioactive waste disposal. Four maps in Chats Falls area have been made for Ontario Hydro for assessing structural weaknesses in unexposed bedrock near potential dam sites.

Radiometric Surveys

Numerous maps are now being published under the aegis of the federal-provincial Uranium Reconnaissance Program. Since 1973 this has resulted in coverage of about 25% of Canada with 1:250 000 scale radiometric maps. In 1978-79 the following maps will be released:

44 maps (within NTS 45, 46, 56, 65 and 75) in Melville Peninsula and Keewatin Districts of the Northwest Territories.
14 maps in Alberta in NTS 74 and spanning parts of 72, 73, 82 and 83.
1 map in Saskatchewan in 64D.
8 maps in Manitoba in NTS 64, 63 and 53.
7 maps in Ontario in NTS 31, 41 and 53.

One 1:50 000 scale map will be released in Prince George (93G), British Columbia and two in Sharbot Lake area, Ontario, in 31C.

Geochemical Surveys

Similarly numerous geochemical maps at 1:250 000 scale are now being produced under the Uranium Reconnaissance Program. Since 1972 this has resulted in the coverage by geochemical maps of about 15% of Canada. Lake and stream sediments are analysed for U, Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe, Mo, Hg, As and loss on ignition. Releases in 1978-79 will include:

60 maps in British Columbia in NTS 82F, 82K and 104N.
14 maps in Saskatchewan in parts of 64L and 64M.
28 maps in Ontario in parts of 42D, 42E, 52A and 52H.
75 maps in Newfoundland (Labrador) in 13B, 13F, 13G, 13H, 13J and parts of 13I, 13O and 13E.
45 maps in Yukon in 106D, 116A, 116B and in parts of 106C, 106E, 106F, 116C, 116F, 116G and 116H.
30 maps in the Northwest Territories in 46N, 46O, 46P and parts of 47A and 47B.

Regional Compilations

Regional compilations of bedrock geology at 1:1 Million scale have recently been systematically compiled. The following sheets are to be released in 1978-79:

Gatineau River (31) Ontario and Quebec
Southern Ontario (straddling 30, 31, 40 and 41).
Athabasca River (83) Alberta and British Columbia.
MacMillan River (105 and 115) Yukon.
Iskut River (104)
Skeena River (103)
Parsnip River (94)
Fraser River (92)

British Columbia

The last six maps are to be exhibited at the Circum-Pacific Mineral and Energy Resources Conference in Hawaii in August 1978.

The coverage available for regional compilations at 1:1 Million scale for parts of the Atlantic Continental Shelf is as follows:

Gravity (Bouguer) anomaly maps	- 20%
Magnetic anomaly maps	- 20%
Surficial Geology	- 8%
Bedrock Geology	- 5%

Regional magnetic anomaly maps and surficial geology compilations at 1:1 Million scale will be released beginning in 1979-80.

A highlight for 1978-79 will be the publication of the metamorphic map of the Canadian Shield at 1:3.5 Million scale. It was a major undertaking to make a metamorphic map of such complexity for such a large area - the largest Precambrian Shield in the world. It will be the core and keystone for the forthcoming Metamorphic Map of Canada.

National Compilations

Since 1978 the Geological Survey has produced a series of national thematic maps as follows:

Physiographic regions
Geological map
Tectonic map
Isotopic age map
Mineral Deposits map
Glacial geology map
Retreat of Wisconsin and Recent Ice
Magnetic Anomaly map

These maps will be revised in the mid 1980's and will be accompanied by additional national metamorphic, metallogenic, coastline, radiometric and surficial geochemical maps.

Distribution Policy

Geological Survey maps are sold through Vancouver, Calgary and Ottawa offices. Because of the low sales volume commercial distributors who handle topographic maps are not interested in selling geological maps. All maps, except radiometric and geochemical maps from the Uranium Reconnaissance Program, are issued as hard copy. Those from the Uranium Program are issued as microfiche.

Geological Surveys - An On-going Task

The Geological Survey is making reasonable progress towards completing the coverage of Canada with geological maps of various types but the question might well be asked when will it finish the job? The reply is that it likely never will. The reason being that geological maps are interpretative and reflect the concepts of the time they were compiled; they become obsolescent as concepts change. At present such obsolescence requires revisions about every 25 years. Geological mapping, therefore, is an on-going task if the needs of users are to be met effectively. Furthermore, resource exploration and the analysis of resource endowments are iterative processes and each iteration demonstrates the need for more information and refinement or changes in approach and methodology. Clearly, the Geological Survey will continue to produce maps for many years and will keep Canadian map librarians busy cataloguing, archiving and retrieving maps for some time to come.

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NATIONAL MAP COLLECTION REPORT

B. Kidd and T. Nagy
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Public Archives of Canada
Ottawa

This is the fourth consecutive year that the National Map Collection has had the opportunity to present a report of its activities at the annual meeting of the Association of Canadian Map Libraries. The Collection is always pleased to do so, but would also like to learn about the programs, acquisitions, changes in personnel, etc. in other Canadian map collections; these are of mutual interest to all of us. The National Map Collection urges all of you to use the Association's Bulletin as a vehicle of communication.

The past year in the National Map Collection has, once again, been both busy and productive. In retrospect, we might number among the highlights the successful implementation of the 105 mm microfilm program, the publication of the fire insurance plans catalogue, the extension of the redistribution program to include Canadian materials, a highly successful seminar on cartographic archives and increased control - both physical and intellectual - over large segments of our diverse holdings. The realization that so much remains to be done and that so many of our programs and parts of our collections are suffering from inadequate storage, insufficient staff and limited funds tends to discourage all of us from time to time.

In the fiscal year, 1977-78, the National Map Collection acquired 64,271 items - the breakdown among sections being 41,309 to the Government Cartographical and Architectural Records Section; 22,712 to the Modern Cartography Section; and 250 to the Early Canadian Cartography Section.

The early material includes the 1600 Arnoldi map of the Western Hemisphere, described by Nebenzahl as "one of the rarest maps of America", and incidentally reproduced as number 13 in the A.C.M.L. facsimile program; the 1532 "Typus Cosmographicus Universalis", usually ascribed to Sebastian Munster, but because of the artistic design of the maps, some authorities now suggest that it should be attributed to the renowned artist Hans Holbein the Younger; and a pair of globes, dated in the 1830s, by James Wilson an American.

Modern collections donated to the Public Archives include: a) Trevor Lloyd's collection of maps and atlases of northern areas. Mr. Lloyd was formerly director of the McGill Centre for Northern Research and Studies, and is now director of the Association of Canadian Universities for Northern Studies; b) Fire insurance plans from the Waterloo Mutual Insurance Company, most being additional to those listed in our recently published catalogue; and c) Bertram MacKay's map collection. Mr. MacKay is a former geologist with the Geological Survey and an honorary director of the Bytown Museum with a great interest in early Ottawa history, especially at the time the Rideau Canal was being constructed. His map collection reflects his wide range of interests.

Federal government records include materials from Militia and Defence (maps prepared by the Canadian Engineers at Vimy during World War I), Public Works (plans of public, mainly military, buildings across Canada), Interior (coal mining maps), House of Commons (charts and plans from the Sessional Papers Office), and the Bilingual Districts Advisory Board (maps showing population type and density).

Architectural material from the private sector included the F.J. Alexander collection (an Ottawa architect, Alexander is best known for his work on the interior of the Parliamentary Library); brewery and ship plans from the records of the Molson Companies Limited; and the Noffke collection of Ottawa building plans donated by architect Brian Pye.

In its public service role, the National Map Collection responded to over 3700 enquiries in 1977-78 and supplied almost 25,000 photoduplications to researchers. The major exhibition in which the Collection was involved was the Arctic Images exhibition - a photocopy exhibition - held last summer and early autumn. Photocopies of 33 early maps of the Arctic were displayed in the section 'Arctic Images: The Dawn of Arctic Cartography, Fourth Century to 1822'. The exhibition, and catalogue of the same title, were researched and prepared by Lawrence Earl and Betty Kidd. Other exhibitions, in which the Collection participated in selecting and/or lending material included the May 1978 exhibition "Keeping the Record" at the Public Archives, the Canadian material for the July 1978 International Cartographic Association conference, the travelling exhibition to mark the 75th anniversary of mapping by the Department of National Defence, and the Vancouver Maritime Museum's Cook exhibition.

The major publication in the past year is Fire Insurance Plans in the National Map Collection/Plans d'assurance-incendie de la Collection nationale de cartes et plans. This publication by Bob Hayward, lists more than 2,000 plans which graphically document some 1,400 cities, towns and villages. Copies are available free of charge from the Information Services Division of the Public Archives.

A contract was signed with the University of Toronto Press, who will co-publish with the Public Archives, the volume on maps relating to the Riel rebellions prepared by Bill Oppen. Bill, by the way, has moved from the National Map Collection to the Yukon Archives.

A considerable allotment of time was utilized for several publications which we trust will be available before the next conference. These include the union list of topographic series and a guide to Indian Reserve maps of western Canada.

This year has been a very important one for the redistribution program, although results are just now becoming visible. In the last two weeks, approximately 21,000 Canadian topographic sheets have been mailed to various participating collections. A large number of foreign maps will be mailed in July, and duplicate electoral and boundary atlases will be sent to archival/historical collections shortly. The program, as introduced last summer, with the National Map Collection responsible for all the work sorting, listing and mailing - is too expensive and time consuming for the limited resources available. In an earlier A.C.M.L. Bulletin we suggested that institutions might consider participating by sending staff members to the Public Archives to sort and select material. Lack of positive reaction to

this proposal - only a few institutions replied that someone could be sent and others expressed strong disagreement - has resulted in a decision to at least delay the implementation of this suggestion. Instead, we are investigating a possibility that the regional centres of the Public Archives in Halifax, Montreal, Toronto, Winnipeg, Edmonton and Vancouver be used. Maps, pre-sorted in Ottawa by region, would be forwarded to the centres and interested collections in that region would be invited to send someone to select from the material, according to their needs.

After working with 105 mm microfilm for a year, the staff of the National Map Collection are convinced that 105 mm is especially suited for cartographical materials. A paper by Gilles Langelier later in the conference will outline this program in detail.

The National Map Collection continued in the past year to gain control of its holdings, through various forms of documentation. Although fewer entries for separate sheets were prepared, than anticipated, it was verified that material can be catalogued using the ISBD(CM) and the Canadian cataloguing rules for maps. The entries for the 1977 Canadian contribution to the Bibliographie cartographique internationale have been prepared using ISBD(CM). The progress, which continues nationally and internationally, in the establishment of cataloguing rules and the related automation aspects will be discussed in the report of the National Union Catalogue of Maps Committee. Greatest progress in control of holdings was made through preparation of inventories and finding aids for government records, preparation of listings for collections, and better systems for control of series sheets.

The seminar on cartographic archives held in early April was described in the most recent Bulletin and the paper by Yves Tessier in the same issue entitled 'Cooperation between map libraries and map archives', points out how important the two types of collections are to each other.

Before ending this report, may I remind you, as has been done in other years, that the National Map Collection will be very pleased to provide further information on any of the topics which have been touched upon so briefly today and that a complete report of the activities of the National Map Collection is published each year in the Annual Report of the Public Archives of Canada. Thank you.

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TWELFTH ANNUAL CONFERENCE - BUSINESS

Minutes of the Twelfth Annual General Meeting of the ASSOCIATION OF CANADIAN MAP LIBRARIES/ASSOCIATION DES CARTOTHEQUES CANADIENNES held at the University of Victoria, Victoria, B.C., on the 13th day of June, 1978 at the hour of 14:45 o'clock in the afternoon.

PRESENT: 23 members

With the unanimous consent of the meeting, Richard Malinski took the chair and Anwar Qureshi acted as the Secretary of the meeting.

CONSTITUTION OF MEETING

A quorum was recognized and the chairman declared the meeting to be regularly constituted.

MINUTES OF THE 11TH ANNUAL GENERAL MEETING

On motion duly made, seconded and unanimously carried, the minutes of the 11th Annual General Meeting held on May 19, 1977, at McGill University, Montreal, Quebec, were adopted as printed in the ACML Bulletin of October, 1977.

OFFICERS' REPORTS

(i) Treasurer's report

On motion duly made and seconded, the treasurer's report was unanimously accepted.

(ii) Summary of Committee Chairmen's Reports

On motion duly made, seconded, the Committee Chairmen's reports were accepted as submitted.

Matters relating to the following Committees were discussed.

N.U.C. Committee

Joan Winearls reported on the map project of Ontario University Libraries Cooperative System. She said that the N.U.C. Committee should cooperate in the matter to keep the incentive going.

Map Microreproduction Committee

The Chairman read the proposed project of the Map Microreproduction Committee to produce maps of Canada and the provinces. It was generally agreed that the project was interesting and worthwhile. The Chairman said that the new Board of Directors would look into the matter. Yves Tessier, the Chairman of the Map Microreproduction Committee said that a feasibility study of the project was going on.

National Commission on Cartography

Barbara Farrell, the ACML representative to National Commission on Cartography requested Richard Groot, the Chairman of the N.C.C. to speak about the matter. Richard Groot emphasized the role of various cartographic associations in N.C.C. He said, it is interesting for cartographers to know what map librarians are doing. The ACML has made major contributions to N.C.C. through their representative Barbara Farrell. He also promised to submit a report.

(iii) Editor's Report

Ronald Whistance-Smith, the editor of the ACML Bulletin expressed his concern that very little was being received for publication. A discussion followed and various suggestions were put forward by the members about contents, format and the ways to improve the quality of the Bulletin by getting better articles. Joan Winearls offered to do the editorial for one of the coming Bulletins.

ELECTION OF OFFICERS

The Secretary announced the results of the Election of the new Board of Directors as registered by the Nominations and Elections Committee as follows:

President: Thomas Nagy (acclaimed)
First Vice-President: Jean Marc Garant (elected)
Second Vice-President: Aileen Desbarats (elected)
Secretary: Maureen Wilson (acclaimed)
Treasurer: Heather Stevens (acclaimed)

ACML 1979

Alun Hughes from Brock University submitted a report and a program of activities for the ACML conference, 1979 to be held at Brock University, St. Catharines, Ontario

OTHER BUSINESS

The incoming President, Thomas Nagy praised the working of the outgoing Executive of the ACML especially in connection with incorporation. He further remarked:

The Facsimile program was very much appreciated (an applause for Serge Sauer, the Chairman of Facsimile Committee followed). Bruce Weedmark was doing a lot of work for distribution of publications. Richard Malinski and Kate Donkin had moved to other positions in their respective institutions. During the year, the executive would aim to upgrade the Bulletin and to put out an editorial policy.

There being no further business to come before the meeting, the meeting then adjourned at the hour of 17:20 o'clock.

(signed) Richard Malinski
Chairman

(signed) Anwar Qureshi
Secretary

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CONFERENCE DELEGATES

Geographical Representation

Atlantic Provinces	1
Quebec	5
Ottawa-Hull	11
Ontario	5
Saskatchewan	1
Alberta	4
British Columbia	48
U.S.A.	6

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REVIEWS

NEW ZEALAND ATLAS. Ian Wards, editor. Wellington, Government Printer, 1976.

Reviewed by Bruce Rains
Department of Geography
University of Alberta

This atlas is the long-awaited successor to *A Descriptive Atlas of New Zealand* published in 1959. The stated aim of the *New Zealand Atlas* is "to explain New Zealand, its history, its shape and substance, its people and its economy in a series of articles, maps and photographs." Clearly no single work is likely to fulfil such an aim to every reader's satisfaction but, with some exceptions, the atlas admirably encompasses a very wide range of topical material. The basic format combining textual sections, maps and photographs is attractive. A total of twenty-six topical essays provides more than one hundred pages of background, factual information, complementary to approximately seventy-five pages of maps and seventy pages of photographs. In addition a gazetteer and index comprise twenty-nine and six pages respectively. At the beginning of the atlas a series of sectional maps, with descriptive notes, outline the general, contemporary geography of New Zealand. The remaining twenty-five texts focus on more specific themes, for example, patterns of settlement, climate, geology, soil, mineral resources and tourism. In the main the texts are informative and interesting -- some are outstanding, while others are somewhat "dry" and pedantic. To this reviewer four sections are particularly well done, those on forestry, fauna, soil and farming. It is refreshing to find the occasional infusion of wry humour to a serious work such as an atlas. A prime example comes from R.A. Falla, author of the text on fauna, who in discussing the unique national bird notes.

> "From recent field studies it seems likely that, at least in certain circumstances, kiwis are polyandrous, and that a female will lay as many eggs as she can find broody males with burrows to incubate. Such extreme emancipation of the female in New Zealand's national bird must provoke sobering reflection"!

To a degree this oblique reference to contemporary human relationships in New Zealand is one of the few implicit or explicit critical comments within the atlas. In general the texts are unrelentingly academic with little discussion of the more frivolous aspects of life in "Godzone country". For example the New Zealanders' intense love of sports, the outdoors, and beer, plus other distinctive elements of the national psyche are barely alluded to. A major flaw of the atlas is that the texts are very uneven in both quality and quantity - they range from one to twelve pages in individual length. Perhaps some more specific criticisms are warranted here. It is quite surprising that little attention is given to the oceanic surroundings of the country; significant amounts of repetition and overlap occur between some sections (e.g. those mineral resources and energy resources); a persistent bias towards historical material in part overshadows discussions of present conditions and, finally,

there is a too pronounced emphasis throughout on the role of government departments and agencies in the functioning of the country. The text on tourism exemplifies this by almost completely ignoring the very significant contributions being made to tourism by private enterprises.

In terms of cartographic presentation the atlas is outstanding. A varied and attractive array of colour tones, relief shading and symbolisation has allowed the incorporation of a vast amount of material without loss of clarity. With some very minor exceptions the maps are visually appealing, informative and collectively they constitute the most valuable part of the atlas.

The great variety of landscapes present in New Zealand is well illustrated by the numerous colour and grey-tone photographs included. These were deliberately selected to focus on varieties of physical environments and thus have a rather minor human component. It is in keeping with the general tenor of the atlas that the character and beauty of the country receive rather more attention than the character and beauty of the people!

Finally, it must be noted that the sequential arrangement of topical sections leaves much to be desired. There is seemingly little logic to the order in which many sections fall. This unfortunately leaves the reader with a fragmented rather than integrated impression of the country and detracts considerably from the work's value.

Bruce Rains
Department of Geography
University of Alberta

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PARRY SOUND DISTRICT ATLAS. David K. Martin, editor. Ontario Ministry of Housing et al., 1976.

Reviewed by Geoff Lester/Department of Geography/University of Alberta

This is a light blue soft covered atlas with a black spiral binding, measuring 35.5 x 56 cm. There are 28 fold-out maps 52 x 54.7 cm on sheets measuring 65.5 x 56 cm. The 12 cm. right hand margin on each page is occupied by explanatory notes. Preceding the maps are the title page, contents page and introduction, all printed in brown.

Three reasons are given for publishing the atlas:

> First, the terms of reference for the District of Parry Sound Local Government Study included the collection, analysis and publication of material necessary for a land use planning for the Study Area...
>
> Second, the need for a single, published reference source of spatial information in the Study Area, ... at a single scale on a common base ... [and] in an up-to-date compilation.
>
> Third, this atlas is one of a series of publications of the District of Parry Sound Local Government Study. It presents in a visual manner the characteristics and patterns ... described ... in the study's Research Report. It is also a companion volume to the study's Final Report and Recommendations.

The introduction identifies a variety of intended users, among them local elected representatives, local and provincial officials, professional and academic researchers and consultants, local groups, residents, schools and libraries. The introduction also makes reference to the study area, explanatory notes, sources of information, map currency and sequence.

The first omission on turning to the maps is the absence of a clear and visible indication of the map numbers and title. Since the maps are foldouts it would be most helpful to have the number and title on the outside, bottom right, of the foldout, for easy reference and identification. As it is, the map number appears in the top left hand corner of the map, unobstructed by the foldout, but in an awkward location. To know the content of the map it is necessary to go back to the table of contents.

The maps themselves all share a common base at a scale of 4 miles to the inch. The base features are brown and include highways, roads and railways, district and township boundaries (with names), towns and villages, provincial parks and Indian Reserves. The Study Area boundary is a solid brown 2mm line. Lake shorelines are blue, with the lakes and Georgian Bay sometimes filled with a light blue screen, otherwise water areas are left white. The area outside the Study Area is a screened brown. On each map (bottom left) is a key map, a legend box ($11\frac{1}{2}$ x $12\frac{1}{2}$cm) with white background. On the right is the title, north point and the scale, stated and as a segmented line.

The overall design is clear and open. The colours, in 'pastel' tints of varying strength, are red, green, purple, blue, orange, brown and yellow. They are restful and harmonious, not vibrant and clashing. The symbols, in various colours are clear and unambiguous.

One of the inconsistencies of the map is the coloured areas in relation to the base material, e.g. lakes. For instance, on map 3: Macro Relief, the hydrography is in a light blue and the green and brown depicting the relief is restricted to the land area. However in map 4: Soil Depth, Georgian Bay (that part that is not covered in purple depicting bare soil) is in white, while the land area

including the lakes is totally covered by the various colours. Technically, of course, to depict the hydrography as open white is initially awkward and time consuming and to isolate every island, tedious, but there should have been a consistent treatment nevertheless.

Though it has been emphasized that one of the strengths of the atlas is the uniformity of scale throughout, this, in fact, is a questionable virtue. The content of some of the maps does not justify a scale of 1" to 4 miles. However that may be, it is to be wondered why the compilers did not settle on a scale of 1:250,000 thus bringing these 28 maps in line with National Topographic Series thereby enhancing their usefulness.

Criticism of individual maps could be made. Some of the registration is off. Mistakes will occur despite the most critical editorial control, i.e. surely Parry Sound has a firehall, though none is depicted.

Overall those who were engaged in the production of the atlas can be justly proud. Whether their idealistic aims for the atlas will be realized is another matter. Probably, like the Christian Bible, it will occupy space on many a shelf, unread, its precepts ignored.

NOTICE BOARD

THE HISTORY OF CARTOGRAPHY INTEREST GROUP CANADIAN CARTOGRAPHIC ASSOCIATION

will hold a meeting at the University of Toronto on Friday & Saturday November 10 & 11th, 1978.

Several papers will be given on such topics as early surveying techniques, historical atlases, Hudsons Bay Co. mapping, French cartographers of the 18th Century and, the Murray map of the St. Lawrence River among others.

All are cordially invited to attend.

If you are not on the CCA mailing list and wish further information, please contact: Joan Winearls, Map Library, John P. Robarts Research Library, University of Toronto, Toronto, M5S 1A5.

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WORKSHOP ON MAP LIBRARIES, UNIVERSITY OF GEORGIA

On Sunday November 19, 1978 the Third Workshop on Map Libraries in the Southeast U.S. will convene in Athens, Georgia. This meeting will be a pre-convention workshop held in conjunction with the 33rd Annual Meeting of the Southeastern Division of the Association of American Geographers. Special consideration will be given to topics dealing with the southeastern U.S.

The previous two workshops were held in conjunction with the 30th and 32nd Annual Meetings of the Southeastern Division of A.A.G. These meetings will continue to promote communication among geographers and librarians.

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NEWS FROM THE NATIONAL MAP COLLECTION

Acquisitions: Among the most interesting recent acquisitions is a 1695 globe by de Rossi, an excellent example of 17th century graphic decorative art; it is now the earliest globe held by the Collection. World maps by Apianus (1545), Tavernier (1643) and Jaillot (1694) were also acquired. A manuscript map of Parry's discoveries in the Canadian Arctic was purchased from an Australian dealer. The government cartographical records transferred include material from the Berger Commission.

Physical re-organization: Plans submitted by the National Map Collection to re-organize some storage areas to release additional space for researchers and to ensure better conservation and security practices have received approval. A vault will be constructed in our stack area and a microfilm reading room will be prepared. The installation of metal screening at 151 Bentley will improve security. This re-organization means that numerous maps and a lot of map storage equipment has to be moved.

Redistribution: Three students have been employed for the summer months in sorting surplus cartographical materials by region. Over 20,000 N.T.S. sheets (1:50 000) were distributed to university map libraries and provincial archives.

Cartographic Archives Seminar: A report has been prepared on the seminar held in April and discussed in the June Bulletin. It is available on request.

Staff notes: A number of staff members contributed to the Archives Courses, both English and French, held in April and May. Two staff members, Ginette Saint-Cyr and Gilbert Caron attended the French-language course.

Vivien Cartmell attended an intensive two-week training course in PRECIS (Preserved in context index system). The course, at the College of Library and Information Science, University of Maryland, was conducted by Derek Austin of Great Britain and Jutta Sorenson of Denmark.

Each year, the Department of Energy, Mines and Resources holds a week-long cartography course for geography teachers. This year, two of our staff members, Francine Cadieux and Gilbert Caron, attended and found the course very worthwhile.

Hugo Stibbe returned from French language training on May 23. Bruce Weedmark (who has been responsible for distribution of A.C.M.L. publications) started his French course at the end of June. Nadia Kazymyra-Dzioba, Early Canadian Cartography Section, started language training in May.

Lou Seboek has transferred from the Early Canadian Cartography Section to the Government Cartographical and Architectural Records Section.

Staff members have recently been active in attending conferences of various associations and in participating in working groups - these include, in addition to the A.C.M.L., the Society for the Study of Architecture in Canada, the Fur Trade Conference, the Canadian Cartographic Association, the Association of Canadian Archivists, the Association des archivistes du Québec, the Canadian Historical Association, the International Cartographic Association, the Formats Subcommittee of UNICAT/TELECAT and the Groupe de travail des noms géographiques.

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IFLA: SECTION OF GEOGRAPHY AND MAP LIBRARIES.

NEWSLETTER NO. 7, MAY 1978.

Dear Colleagues,

I. The IFLA-meeting in Brussels.

The newly elected Standing Committee - officers are:

Chairman	Dr. Helen Wallis, British Library, London
Secretary	Drs. E. Hans van de Waal, State University Utrecht
Treasurer	Dr. Lothar Zögner, Staatsbibliothek Preussischer Kulturbesitz, Berlin

Under the new IFLA-statutes the section serves under the Special Library Division, of which Dr. Wallis was chosen as a secretary.

II. The decision to enlarge the standing committee has resulted in the nomination of the following members:

Dr. H.J. Aschenbaum, State Library, Pretoria, South Africa (observer)
Hermann Günzel, University Library, Marburg, Bundesrepublik Deutschland (member S.C.)
Leena Miekkavaara, Helsinki University Library, Finland, (member S.C.)
Mireille Pastoureau, Bibliothèque Nationale, Paris, France (observer)
William C. Roselle, Milwaukee Library, Wisconsin, U.S.A. (member S.C.)
Elena M. Santiago, Biblioteca Nacional, Madrid, Spain (observer)

The standing committee now consists of 12 members.

III. At the moment the following working groups are functioning within the Geography and Map Libraries Section:

Working group for the training of map librarians

Chairman	Dr. Lothar Zögner
Members	E.H. van de Waal (Netherlands)
	J. Wolter (U.S.A.)
	I. Kodes (U.S.S.R.)
	J. Winearls (Canada)
	nomination of U.K. member awaited.

Terms of reference:

a. To investigate the current situation in respect of the training of map librarians and make recommendations;
b. To prepare a Practical Manual for Map Librarianship;
c. To hold seminars.

Working group on the International Glossary of Cartographical Terms

Chairmen	A.V. Kozlova (U.S.S.R.)
	D.K. Carrington (U.S.A.)
Members	Lisette Danckaert (Belgium)
	Egon Klemp (D.D.R.)
	Nomination of U.K. member awaited.

Terms of reference:

a. To prepare for publication an International Glossary of terms for cartographic documentation in Map Libraries;
b. Liaison with the ICA Commission of the Multilingual Dictionary of Technical Terms in Cartography.

UNIMARC Cartographic Materials Working group

Chairman	Dr. Hugo Stibbe (Canada
Members	David Carrington (U.S.A.)
	E. Hans van de Waal (Netherlands)

Terms of reference:

To compile an adoption for UNIMARC concerned with cartographic materials.

Working group for the preparation of a World Directory of Map Collections (2nd edition)

Chairman	John Wolter (U.S.A.)
Members	To be appointed

Terms of reference:

To prepare a second edition of the World Directory of Map Collections. The first edition was published in August 1976.

IV. The International Standard Bibliographic Description (Cartographic Materials) is published and obtainable for £ 5. at the IFLA Office for Universal Bibliographic Control, Great Russell Street, London WC1B 3DG - United Kingdom.

V. Terms of reference of the G. and M. Section:

a. To promote, encourage and improve bibliographies, directories and glossaries in its field.
b. To promote, encourage and improve the training of map librarians.
c. To consider the care of geographical and cartographic collections.
d. To encourage the organization of national bodies, concerned with Geography and Map Libraries.

These are the terms on which the members of the Standing Committee agreed during the meetings in Brussels.
They find expression in the working groups' activities and the plans for seminars on Automation of Map Catalogues, and Training of Map Librarians (see Calendar). In order to realize these aims it is necessary that the Section should have more branches on a national level. A first step into this direction will be the enquiry, planned for 1979, after national organizations in the field of geography and map libraries.

At the moment the stress within the Section is more specifically on map libraries. We intend to pay more attention to geographical libraries and to involve them more actively in the work of this Section. The first explorational contacts have already been made with the International Geographical Union. The international exchange of geographical bibliographical data seems to be a subject that could do with a lot more attention.

The establishment of a new working group is being considered; an "Inter-Associational Working Group".

Terms of reference:

To make known international developments concerning the documentation of geographical and cartographic materials in the broadest sense. At the

international level several organizations are working on similar projects, e.g.

a. International Standards for Bibliographical References in IFLA, UNESCO-UNISIST and ISO;
b. Glossaries concerning cartographical documents are at present being produced within IFLA and the ICA.

It is hoped that an "Inter-Associational" working group, at the level of Geography and Map Libraries, between IFLA, ISO, UNESCO-UNISIST, FID, ICA, International Photogrammetric Association, International Geographical Union and other relevant international organizations will minimise confusion and unnecessary duplication between international standards on the same subject. In order to avoid misunderstandings the following quotations of the letter of the Professional Board d.d. 21-4-1978:

1) IFLA Group could - and were even encouraged - to associate professional organizations active in the same specialized field.
This means, for instance, that your contacts with the ICA (International Cartographic Association) are most welcome.
2) and could, however, not directly approach more general oriented I (N) GOs (International (Non) Governmental Organizations), such as UNESCO, ISO and FID. The relations with these bodies must be maintained through the IFLA Central Secretariat (IFLA Secretary General) in order to avoid confusion as to IFLA Policy.
This does not mean, however, that the Secretariat of IFLA does not appreciate your help and suggestions with regard to the relations with these I (N) GOs when topics of interest to you are discussed by these organizations.

Immediate Action:

1. In order to open up communication with the ICA, Hans van de Waal will be delivering a paper which will be published in the ITC Journal, 1978. It is proposed that this Working Group should appoint a secretary; it should be independent of any international organization; and that as far as possible it will work by correspondence.
2. A session of the Geography and Map Libraries Section will be devoted to this subject at the IFLA meeting in Czechoslovakia, 1978.

VI. Calendar

IFLA congress 1978 will be held in TATRY-Strbské Pleso, Czechoslovakia, 28 VII-3 IX 1978. The general theme will be Universal Availability of Publications.

A regional conference of the Special Library Association together with the Special Library Division of IFLA, will be held in Honolulu, 9-14 June 1979. The topics for the meetings are Pacific cartography and Map Libraries of the Pacific region. Paper ideas must be sent to Mary Larsgaard prior to August 1, 1978; abstracts must be received by October 1, 1978. Her address to June 15, 1978, is: P.O. Box 3584, Eugene OR 97403, USA. After June 15, 1978, her address will be: Map Librarian, Library, Central Washington University, Ellensburg WA 98926, USA.

In consideration:
A British Library Seminar in March 1979 on the "Automation of Map Catalogues".
A "Training of Map Librarians" seminar in Turkey in 1980, organized by the IFLA Geography and Map Libraries Section.

(Signed) Helen Wallis
Hans van de Waal

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SPECIAL LIBRARIES ASSOCIATION, GEOGRAPHY AND MAP DIVISION, 1978 HONORS AWARD

In a 1967 article, "The Emergence of Maps in Libraries", Dr. Walter Ristow, then Chief of the Geography and Map Division of the Library of Congress, describes a "new generation" of map librarians that will "lift the profession to new heights of service and productivity". One of the map librarians named as representative of this "new generation" is the 1978 recipient of the Honors Award for outstanding achievement in geography and map librarianship.

Active in both geography and map librarianship, the recipient holds long-standing memberships in the Association of American Geographers, the Geography and Map Division of Special Libraries, the Association of Canadian Map Libraries and the Western Association of Map Libraries. Her educational background includes a bachelor's degree in Geography from Wayne State University, a Master's of Art in Geography from Southern Illinois University at Carbondale, and a Masters of Library Science from the University of Wisconsin at Madison. The recipient began her library career at Detroit Public Library and was appointed Map Librarian at Southern Illinois University in 1961. In 1965 she assumed her present position as Map Librarian at the University of Wisconsin at Madison.

Within the Geography and Map Division of the Special Libraries Association the recipient has played a significant role in the promotion and development of the Division. She served as Chairman-Elect in 1971, planning the most successful San Francisco conference, and became Chairman of the Division and presided at the Boston conference in 1972. It was during her term as Chairman that she guided the Division through many troubled waters. Due to her wisdom and effective leadership a much stronger Division has emerged today. The recipient worked closely with the former editor of the Special Libraries Geography and Map Division Bulletin to revise the nature and scope of the Bulletin. Since 1969, she has been Associate Editor for Book Reviews of the Bulletin and has recently begun a new column dealing with map publishers' catalogs.

Among her more significant contributions to the professional literature are "The Recataloging/Reclassification Project at the Map and Air Photo Library, University of Wisconsin-Madison", Geography and Map Division Bulletin in 1977, a chapter co-authored with Alberta Wood, "Maps and Map Collections" in Pearce S. Grove's Non-Print Media in Academic Libraries in 1975; "Acquisitions Tools and Sources of Maps" Illinois Libraries June,

1974; "Anglo-American State and Provincial Thematic Atlases/A Survey and Bibliography" in Canadian Cartography, June, 1969, co-authored with Richard W. Stephenson, and "Equipment for Map Libraries" in Recent Practices in Map Libraries, published by Special Libraries Association in 1971.

Perhaps her most significant contribution to the field of map librarianship has been her counseling services to those new to the field. She has been a ready advisor and a source of knowledge and encouragement to many new map librarians. The Midwest Map Librarian's Conference she instituted and organized in 1967, is only one indication of her continual support and interest in fellow map librarians.

It is with great pleasure that the Geography and Map Division presents the 1978 Honors Award to Mary Galnedar.

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SPECIAL LIBRARIES ASSOCIATION, GEOGRAPHY AND MAP DIVISION, HONORS AWARD

The Bill M. Woods award for excellence of authorship in the 1977 issues of the Bulletin, Geography and Map Division, Special Libraries Association, has been presented to Charles A. Seavey. His article "Map of the American State Papers" appears in Bulletin No. 107. It was chosen by the Division's Honors Award Committee for its unique contribution to the knowledge of geography and map librarianship. Mr. Seavey is the Map Librarian at the University of Northern, Iowa. The award was presented at the Division's annual business meeting on June 12, 1978, during the Special Libraries Association's annual conference in Kansas City, June 11-15, 1978.

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BIBLIOGRAPHY OF CARTOBIBLIOGRAPHIES

Robert Karrow, Curator of Maps at the Newberry Library in Chicago, is compiling a bibliography of cartobibliographies of pre-1900 maps of Canada and the United States. His goal is to gather together as many tools as possible that can be used by researchers to identify or locate old maps of North America. The compilation will include published and unpublished cartobibliographies, catalogs (including card catalogs), archival listings, facsimile atlases (which reproduce, but not necessarily describe old maps), bibliographies which include a section on maps, and dealers, library, and exhibition catalogs devoted to maps of North America. Cartobibliographies of any area, from village to continent are included, as are cartobibliographies (biocartobibliographies?!) devoted to maps by a single cartographer.

He has examined the more-or-less well known sources available at the National Map Collection of the Public Archives of Canada, the National Library of

Canada, the University of Toronto, the Ontario Archives, the Newberry Library, and the Library of Congress. There is obviously much more material of this sort in other repositories or "hidden" in local bibliographies and historical journals, theses, appendices in books and reports, etc. If you know of any such material, he would very much appreciate a short note with a reference to it. His address is: The Newberry Library, 60 W. Walton St., Chicago, IL 60610, U.S.A.

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NATIONAL ATLAS OF THE UNITED STATES

A series of nineteen maps, indicated as part of the National Atlas, were prepared in 1976 by the U.S. Geological Survey. They were originally published as part of a report by the Committee on Energy and Natural Resources and the Committee on Commerce, Science and Transportation, U.S. Senate. Copies of the report "National Energy Transportation", stock #052-070-04018-1 are available from the Superintendent of Documents, U.G.P.O., Washington, D.C. 20402. Copies of the maps, individually or in sets, are available from the U.S.G.S. offices in Reston and Denver.

The map numbers and and titles are:

1-421	Natural gas movement by pipelines: 1974
2-422	Coal movement by railroads: 1974
3-423	Coal movement by highways: 1974
4-424	Coal movement by water: 1974
5-425	Total coal movement: 1974
6-426	Coal resources and distribution: 1974
7-427	Crude oil movement by pipelines: 1974
8-428	Crude oil movement by water: 1974
9-429	Petroleum products movement by pipelines: 1974
10-430	Petroleum products movement by water: 1974
11-431	Total crude oil movement: 1974
12-432	Total petroleum products movement: 1974
13-433	Total petroleum movement: 1974
14-434	Electric power transmission: 1974
15-435	Nuclear fuel materials movement by highways (truckloads): 1975
16-436	Nuclear fuel materials movement by highways (BTU): 1975
17-437	Pipeline transportation systems: 1974
18-438	Railroad, highway, and water transportation systems: 1974
19-439	Total interstate energy movement: 1974

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SUSPICIONS CONFIRMED

A recent advertisement from Alberta Transportation states a requirement for a cartographic technologist "to be involved in the complication and

production of final bases for monochrome and multi-coloured maps".

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ANADARKO, OKLA. (AP)

Maps are a popular item in this southwest Oklahoma town, particularly the ones that show the location of a marijuana field.

"We caught some kids from Cement and Cyril selling maps of it for $5 each", said Sheriff Walt Brown.

"They were selling maps to soldiers and kids and making money at it, too."

"Trouble is, we couldn't charge them with anything", Brown said. "There's nothing wrong, legally, with making and selling maps."

The maps, which point out a large marijuana field flourishing along a creek bank, will apparently be of short term value.

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TWELFTH ANNUAL CONFERENCE - TOUR DAY, THURSDAY, JUNE 15TH

Ronald Whistance-Smith

Our tour set off from U. Vic shortly after 8:30 a.m.. The first stop was at the Pacific Forest Research Centre. We were shown through the computer facility where large scale maps of forest conditions are being produced experimentally. Moving on to the entomology building (the bug house) we were shown a film which described some of the work of the Centre in fighting insect damage in the forest. Our last stop at the centre was in a greenhouse where seedlings are grown for reforestration purposes.

After a stop for coffee and bran muffins, we were off to the Dominion Astrophysical Observatory. We were met by Mr. Frank Younger, a real, live astronomer, so he claims. Mr. Younger described for us the two exciting moments in the history of the 72 inch telescope mounted at that site, namely the day of the great purse snatcher, and the day the mirror left Antwerp for Canada. It was on the last ship to leave Antwerp before the Germans captured the city.

In his dry humorous way, he conveyed to us the quiet, patient, methodical manner required of an astronomer and the fascination of this science.

Lunch was at the Institute of Ocean Sciences at Patricia Bay and was followed by a tour of the Canadian Hydrographic Service cartographic facilities. We were able to see many of the stages in the preparation of new charts and the amendment of old charts. It is quite obvious after seeing the latter operation why CHS is giving strong consideration to abandoning this procedure.

Our final tour took us to the Pacific Geoscience Centre in the same building where Dr. Milne and Dr. Riddihough explained the collecting and recording of earthquakes and conversion of this information into map form.

We returned to U. Vic shortly after 5:00 p.m. On behalf of all those who took advantage of this tour I thank Doris Stastny for a well organized and informative tour.

EXCHANGE

CARLETON UNIVERSITY - GAZETTEERS AVAILABLE FOR EXCHANGE
U.S. BOARD ON GEOGRAPHIC NAMES. GAZETTEERS

Afghanistan (2 copies	July 1971
Americas. Supplement	Sept. 1971
Bahrain, Kuwait, Qatar and United Arab Republics	March 1976
British Solomon Islands and Gilbert and Ellice Islands	May 1974
Cambodia	Nov. 1971
China, Republic of	May 1974
Congo, Republic of the (2 copies)	1964
Dominican Republic	March 1957
Europe and U.S.S.R. Supplement	June 1971
Fiji, Tonga and Nauru	May 1974
Gambia	June 1968
Ghana	1967
Guyana	March 1976
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Laos	Nov. 1962
Libya	June 1958
Malawi	Feb. 1970
Malta	Nov. 1971
Morocco	June 1970
Mozambique	June 1969
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New Hebrides	May 1974
Nicaragua	April 1976
Nigeria	May 1971
Oman	March 1976
Rhodesia	June 1973
Surinam	May 1974
Undersea Features	June 1969
U.S.S.R. and Certain Neighbouring Areas. Vol. I (A-B), Vol. VII (U-Z)	March 1959
Yemen, Peoples Democratic Republic of	Nov. 1976

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The UNIVERSITY OF ALBERTA has a 35 page list of items available for exchange. If you are interested in receiving this or subsequent lists, please write to:

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