

# *Seventeenth-Century Maps of the Great Lakes: An Overview and Procedures for Analysis*

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Maps are graphic renderings of travel accounts and routes explored. At their simplest level they depict the geographic information which a particular person wished to convey about an area. At their most complex they are graphic and mathematical expressions of area as perceived by an individual, or in the case of compilations, the fusion of complex and at times conflicting information from different sources. With few exceptions, they are a forgotten source of historical, ethnographic and geographic data, a source that can, with careful study, augment the documentary evidence pertaining to an area.

The general purpose of all maps is the portrayal of spatial information in graphic form. For maps to be useful to people other than their maker, they must depict information in an orderly manner, according to generally accepted rules which, though they may change over time, should at any particular point in time be evident to both the cartographer and the map user. Maps are, therefore, graphic models or abstractions of spatial reality as perceived by the maker of the map within the framework of accepted cartographic procedures. Seventeenth-century maps, no exception to these general observations, contain information which the author wished to convey to others and as such are as worthy of study as any written documents. In fact, the sixteenth- and early seventeenth-century maps of New France are the first scientific documents that relate to any part of Canada.

Unfortunately, most geographers are not interested in the past, and those who are rarely take their studies farther back in time than the late eighteenth century, while Canadian historians have tended to view historical events as if they took place in a spatial vacuum. Many scholars assume that because early maps look peculiar and inaccurate when compared to modern

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\* An earlier version of this article, translated into French, appeared under the title "Aperçu des activités cartographiques du XVII<sup>e</sup> siècle dans la région des Grands Lacs et exposé de quelques procédés pour l'analyse de la carte historique," in *Etudes littéraires* 10, nos 1-2 (avril-août 1977): 49-84. In the present article, the titles of printed maps have been set in italics, and manuscript maps in quotation marks. In the titles, the use of the upper case and the oblique line (to indicate line endings) is at the request of the author; these conventions aid in identifying very similar variants of maps. Most of the maps mentioned in this article are available in the National Map Collection, Public Archives of Canada, in either original or copy form.

maps, the early maps are therefore not capable of rendering scientific information and consequently are not worthy of serious study. Although their use as attractive illustrations in various histories is common, the formal characteristics and historical content of the maps are usually ignored.<sup>1</sup> The reasons for this neglect are difficult to understand. Good cartobibliographies of maps relating to New France have been available since the last century,<sup>2</sup> and one of the most thorough discussions of these maps, including reproductions, was published as early as 1884.<sup>3</sup> Moreover, scholars in other countries, notably England, France and Germany, have long demonstrated that historical maps are useful sources of information. Simply stated, the history of Canadian cartography deserves a better fate than it has been accorded.

#### AN OVERVIEW OF SEVENTEENTH-CENTURY MAPPING IN THE GREAT LAKES AREA

The following examination of seventeenth-century mapping of the Great Lakes area should be considered tentative since it is only an overview of maps the author considers interesting and important. Many maps have been omitted from the discussion; additional maps in various archives may yet come to light. The tenuous nature of the dating and of determining the authorship of some of the maps will make revisions of the outline presented here likely. However, this summary should usefully point out the diversity of information available for reconstructing the geography of the Great Lakes in the seventeenth century.

Analysis of seventeenth-century maps shows that cartographic activity increased slowly until the late 1660s, after which the number of maps increased exponentially to the end of the century.<sup>4</sup> This activity is a good reflection of European exploration in the area, which did not occur exten-

1 Some of the best examples of the use to which Canadian historical maps have been put are: H. HARRISSE, *Découverte et évolution cartographique de Terre-Neuve et des pays circonvoisins, 1497-1501-1769* (1900; reprint ed., Amsterdam, 1968); W.F. GANONG, *Crucial Maps in the Early Cartography of Canada* (Toronto, 1964); B.G. HOFFMAN, *Cabot to Cartier: Sources for a Historical Ethnography of Northeastern North America, 1497-1550* (Toronto, 1961); N.M. CROUSE, *Contributions of the Canadian Jesuits to the Geographical Knowledge of New France, 1632-1675* (Ithaca, 1924); J. WARKENTIN and R.I. RUGGLES, *Historical Atlas of Manitoba: A Selection of Facsimile Maps, Plans and Sketches from 1612 to 1969* (Winnipeg, 1970).

2 See for example: H. HARRISSE, *Notes pour servir à l'histoire, à la bibliographie et à la cartographie de la Nouvelle-France et des pays adjacents, 1545-1700* (Paris, 1872); G. MARCEL, *Cartographie de la Nouvelle France: supplément à l'ouvrage de M. HARRISSE* (Paris, 1885); T.E. LAYNG, *Sixteenth-Century Maps Relating to Canada: A Checklist and Bibliography* (Ottawa, 1956); Public Archives of Canada, *Catalogue of the National Map Collection*, 16 vols. (Boston, 1976).

3 J. WINSOR, *Narrative and Critical History of America*, 8 vols. (Boston, 1884-89), vol. 5.

4 This analysis is based on a working catalogue of maps being compiled by the author to illustrate the seventeenth-century exploration and mapping of the Great Lakes area west of the Lachine Rapids on the St. Lawrence River. The catalogue, which now includes more than 140 items, excludes reprints and small-scale maps which contribute nothing to our knowledge of the period.



*De Jode's 1593 printed map is one of the sixteenth-century maps showing information based on vague native accounts of a great lake or lakes beyond the Lachine Rapids (near Montreal). Here it appears as "Lago de Conibas." (National Map Collection, Public Archives of Canada)*

sively until after the dispersion of the Huron in 1649, and the subsequent expansion of the fur trade and missions into the western Great Lakes and the Iroquois country.

For the sake of convenience, the principal seventeenth-century maps of the Great Lakes area can be divided into five periods: precursors, the Champlain period (1603-32), the Jesuit period (1634-73), the Jolliet period (1674-83), and the period of Franquelin and other compilers (1684-1700).

## PRECURSORS

News of a large lake beyond the Lachine Rapids had reached European mapmakers as a result of the voyages of Jacques Cartier. This lake or lakes had various names, among them Lago Conibas, Mare Dulcium and Tadouac. In 1610, just before Champlain's explorations of the interior, a recognizable Lake Ontario, obtained from native accounts, appeared on a manuscript map, known as the "Velasco map," drawn for James I of England.<sup>5</sup>

<sup>5</sup> The map was reproduced in W.P. Cumming, R.A. Skelton and D.B. Quinn, *The Discovery of North America* (Toronto, 1971), p. 266.

### THE CHAMPLAIN PERIOD (1603-32)

With very few exceptions, the maps of this period were drawn by Champlain or were copies of his maps.<sup>6</sup> His first map, made in 1603 from native stories, has since been lost. Part of it was probably incorporated into his great map of 1612, *Carte Geographique De La Nouvelle Franse*. In 1616, Champlain drafted a map that depicted the eastern Great Lakes for the first time, based on European explorations. This map, which he did not complete, was finished by P. Du Val and published in 1653. Champlain's last map, printed in 1632, is an excellent summary of the extent of French knowledge of Canada on the eve of their expulsion in 1629 at the hands of English adventurers led by David Kirke.

### THE JESUIT PERIOD (1634-73)

Almost all the maps drawn during these forty years were either based on information compiled by members of the Society of Jesus, or were drafted by members of the order. The only exceptions are a few copies of Champlain's maps and a magnificent chart of the eastern Great Lakes by the Sulpician priest, René de Bréhan de Gallinée.

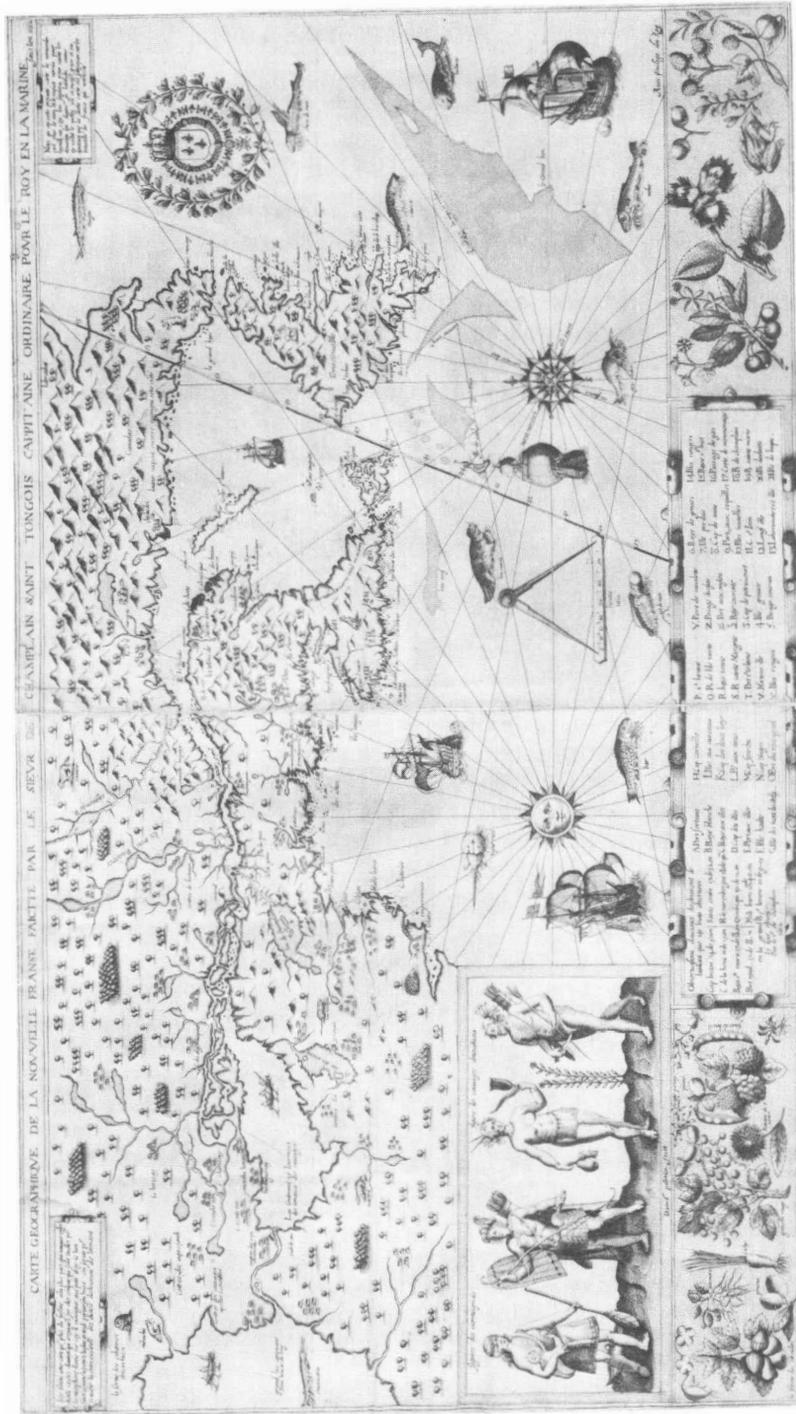
The Jesuits began their mapping in the Huron country. Although some of these early maps have been lost, the four detailed large-scale maps that have survived are accurate enough to aid in reconstructing the distribution of Huron villages and missions before 1650.<sup>7</sup> The first printed map depicting the complete extent of Jesuit exploration and mapping, published by Nicholas Sanson in 1650, was followed by a more detailed version in 1656. Sanson's maps are the first printed maps to show the Great Lakes in their modern form. Both are embellished with native tribal names which greatly aid in identifying the locations of these groups prior to the great dispersions of the 1640s and 1650s. The same tribal names, although usually spelled differently, appear on a manuscript map titled "Novvelle France," believed to be by the engineer Jean Bourdon. This map is tentatively dated 1646 on the basis of Bourdon's map, "Chemin Des Iroquois," which it greatly resembles in cartographic style.<sup>8</sup> Sanson's maps were followed in 1657 by one attributed to Francesco Bressani, and in 1660 by the famous map drafted for François Du Creux. Both maps are graphic testimonials to the explorations and cartographic skill of members of the Jesuit order. The Bressani map is decorated with a number of beautiful and accurate drawings, including the first picture of the martyrdom of Jean de Brébeuf and Gabriel

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6 The Champlain period is discussed comprehensively in C.E. Heidenreich, *Explorations and Mapping of Samuel de Champlain, 1603-1632* (Toronto, Cartographica, Monograph No. 17, 1976).

7 C.E. Heidenreich, *Huronica: A History and Geography of the Huron Indians, 1600-1650* (Toronto, 1973).

8 "Novvelle France," [1646]. Ministry of Defence, Hydrographic Department, Taunton, England—D699/Aa2; "Chemin Des Iroquois," [1646]. France, Archives nationales, N.N. 173.6.



Champlain intended this 1612 chart for navigators who sailed with uncorrected French compasses. The area west of Montreal was mapped from native accounts and native sketch maps. The map is the first reasonably accurate chart of the Atlantic coast and St. Lawrence River area. (National Map Collection, Public Archives of Canada)

Lalemant.<sup>9</sup> The Du Creux map is the first to show the northern Ontario and Quebec river system which carried so much of the early fur trade.

The next great map that commands attention is Gallinée's "Carte du Lac Ontario," dated 1670. The original has not survived but several good copies exist, the most notable being those by François Vachon de Belmont (1680), Claude Del'Isle (ca. 1700) and Pierre-Louis Morin (1854). Both the Belmont and Del'Isle copies include information not on the original map.

In 1673, the Jesuits published their first map of the Lake Superior-upper Lake Michigan area, *Lac Supérieur / Et Autres Lieux*, based on explorations undertaken several years earlier. It was appended to the *Relations* of 1670-71 written by Claude Dablon. At least five slightly different states of this map exist. Jesuit mapping continued during this century, notably by Pierre Raffex (1688 and 1694), but their cartographic activities were overshadowed by the work of others.

Jacques Marquette and Louis Jolliet penetrated beyond Lake Michigan to the Mississippi in 1673. A manuscript map attributed to Marquette is located in the Archives de la Compagnie de Jésus, Saint-Jérôme, Quebec. This very important map is the first to show any part of the Mississippi based on European explorations, and the configuration of this map is continued on the maps of Jolliet.

#### THE JOLLIET PERIOD (1674-83)

With few exceptions the maps of this period were made by Louis Jolliet, were drafted by Jean-Baptiste-Louis Franquelin for Jolliet from the latter's sketches, were made by Franquelin, or were made by others from Jolliet-Franquelin originals.<sup>10</sup> Jolliet seems to have supplied the basic information for most of these maps. Between 1671 and 1674 he had travelled through the Great Lakes and with Marquette to the Mississippi, and in 1679, had mapped the Saguenay route to Hudson Bay. None of the maps attributed to him show great cartographic skill; they are a trader's rather rough sketches which include only the most basic geographic information. Of seven maps signed by Jolliet during this period which have been examined by the author, two were drafted by Franquelin (dated ca. 1675 and 1678),<sup>11</sup> two appear to be copies made by the Abbé Claude Bernou (ca. 1674 and 1679),<sup>12</sup>

9 The map is reproduced in F.M. Gagnon, *Premiers peintres de la Nouvelle-France* (Quebec, 1976), 2:90-91.

10 J. Delanglez, "Franquelin, Mapmaker," *Mid-America* 25, New Series No. 14 (1943): 29-74. For a more complete study of J.B.L. Franquelin, see A. Charbonneau, *Un Cartographe de Québec au XVII<sup>e</sup> siècle: Jean Baptiste Louis Franquelin* (Thèse de maîtrise, Département d'histoire, Université de Montréal, 1972).

11 "Carte de la découverte du Sr Jolliet, où l'on voit la communication du fleuve St Laurents avec les lacs Frontenac, Erié, lac des Hurons, et Illinois," [1674-75]. Service historique de la Marine, Bibliothèque, 4044B, no 37; "Carte g[e]ne [ra]lle de la France septentrionale, contenant la découverte du pays des Illinois; faite par le Sieur Jolliet. Joannes-Ludovicus Franquelin pinxit, 1678." Service historique de la Marine, Bibliothèque, 4040B, no 11.

12 "Carte de la découverte du Sr Jolliet . . .," [1674]. Bibliothèque Service hydrographique, Recueil 67 (4044B) no 52; "Cette carte montre le chemin que Louis Jolliet a fait depuis



*Champlain's well-known map of New France, printed in 1632, records virtually the full extent of his magnificent contribution to the geographic knowledge of northeastern North America. Except for the Virginia area, the Labrador and Hudson Bay coastline and Newfoundland, the map is based entirely on Champlain's explorations. (National Map Collection, Public Archives of Canada)*



Sanson's 1656 map is an enlarged version of his map published in 1650. Based on Jesuit explorations, it is the first printed map to depict the eastern Great Lakes in recognizably modern form, and shows as well many of the native groups of New France. (National Map Collection, Public Archives of Canada)

one is a copy made by an unknown draftsman (ca. 1674-75),<sup>13</sup> and the remaining two, dated 1679 and 1684, both of which are sketches of the 1679 journey to Hudson Bay, appear to be Jolliet originals.<sup>14</sup>

The most significant series of maps of this period consists of nine detailed sketches of parts of the Great Lakes variously ascribed to Bernou and Jolliet. The National Map Collection attributes them to Jolliet<sup>15</sup> because the

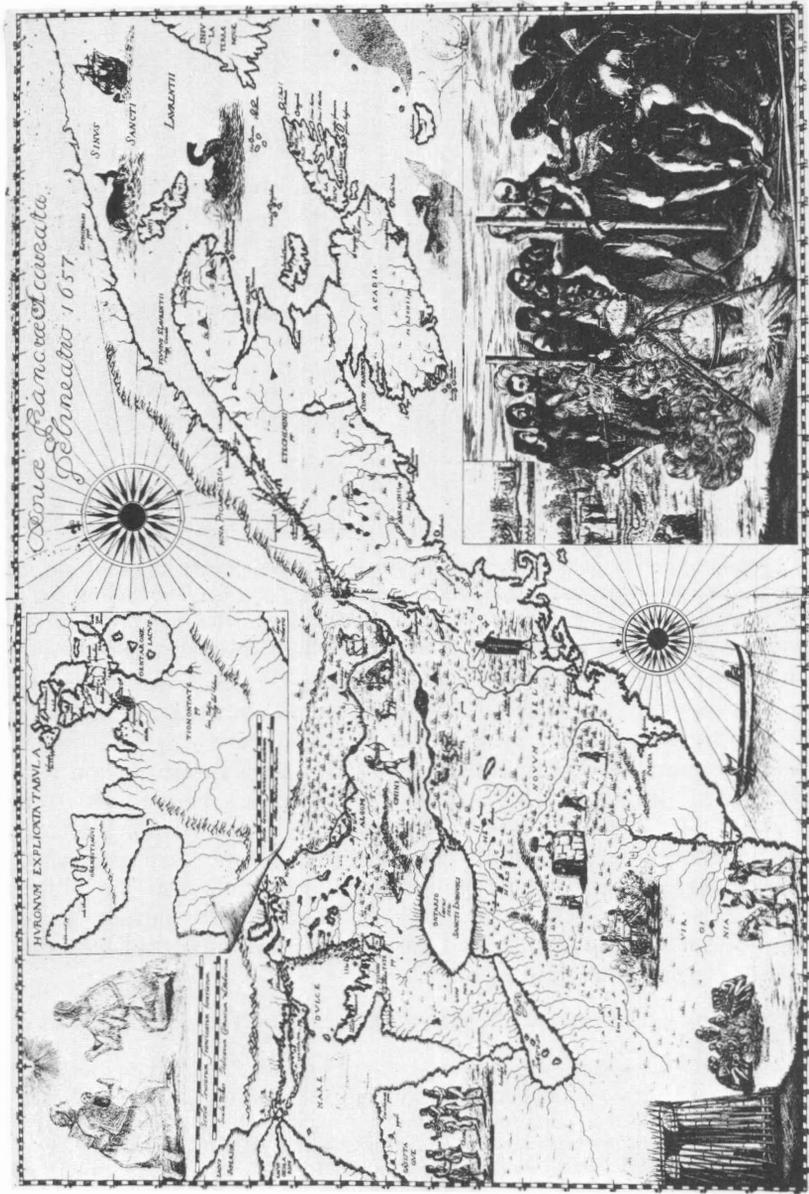
Tadoussac jusqu'à la Mer du Nord, dans la Baye d'Hudson . . . 1679." Bibliothèque nationale, Cartes et plans, Service hydrographique, pf. 123, div. 8, p. 1. For the original Jolliet version of the latter map see W.P. Cumming et al., *The Exploration of North America* (Toronto, 1974), p. 198. Although these maps are usually listed as Jolliet originals, they are in the handwriting of the Abbé Claude Bernou. See J. Delanglez, *Some La Salle Journeys* (Chicago, 1938), pp. 10-12, 32-39. For examples of Jolliet's handwriting see E. Gagnon, *Louis Jolliet* (Montreal, 1946).

13 "Nouvelle Découverte de plusieurs Nations . . . 1673 et 1674." Bibliothèque nationale, Cartes et plans, Don. 4700 (Ge. CC. 1273 B [179]?).

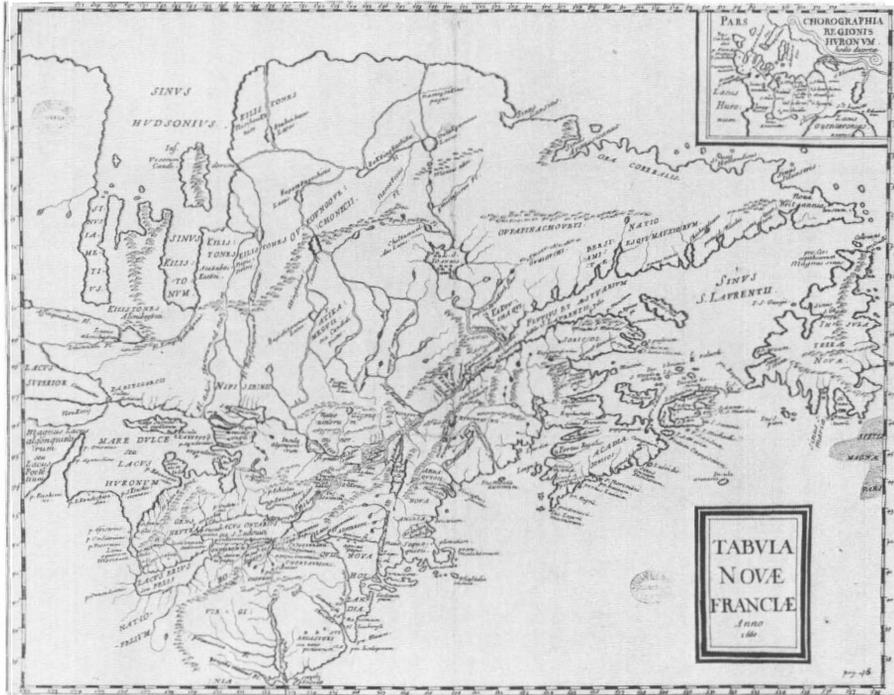
14 "Cette Carte montre le chemin . . . 1679." Reproduced in Cumming, *The Exploration of North America*, p. 198. Another copy drawn by Jolliet in 1684 is held by the Bibliothèque nationale, Cartes et plans, Service hydrographique, pf. 123, div. 8, p. 1/2.

15 Public Archives of Canada, *Catalogue*, vol. 10, pp. 358, 363-64, 386. The Paris catalogue numbers are: Service historique de la Marine, Bibliothèque, 4044B, no 47, 48, 48 bis, 49, 50,

## SEVENTEENTH-CENTURY MAPS



This 1657 map is probably the most decorative map of seventeenth-century New France. Attributed to F. Bressani, S.J., who laboured in New France from 1642 to 1650, it displays a more intimate knowledge of the geography west of Montreal than the Sanson map which it resembles. (Original in the Bibliothèque nationale, France. Copy in the National Map Collection, Public Archives of Canada.)



*Du Creux's 1660 map is the first to portray the northern river system so important to the early fur trade. His information appears to have come from G. Dreuilletes, S.J., who had obtained geographical accounts from natives and traders, among them Radison and Groseilliers. (National Map Collection, Public Archives of Canada)*

small 1674 Jolliet map which forms part of the same series,<sup>16</sup> was signed by Jolliet, and all the maps in the series are in the same handwriting. Delanglez has shown convincingly that they are all in the handwriting of Claude Bernou, and were made sometime after 1680.<sup>17</sup> It appears that Bernou was the author and if this is so, he must have obtained his base maps from someone like Jolliet, Franquelin or even La Salle, since Bernou had no personal experience in New France. The excellence of the cartography of these maps makes it likely that the originals were supplied by either Franquelin or La Salle, both of whom had contacts with Bernou, since Jolliet was not sufficiently skilled as a cartographer to have produced the originals which Bernou must have used.

Two other maps have been attributed to Bernou. The first is a composite

51, 53; and Bibliothèque nationale, Cartes et plans, Ge. D. 8075 and Ge. D. 8078. It should be noted that the last two maps are all but identical to nos. 48 and 49 respectively, mentioned above. They are drawn in a different hand and bear the stamp of the Bibliothèque du Roy, while the others all bear the stamp of the Service hydrographique. If Delanglez is correct in his reasoning that the Service hydrographique series is by Bernou, then the ones from the Bibliothèque du Roy may be the originals. After examining specimens of Jolliet's handwriting, this author is inclined to agree with Delanglez that Bernou is the author of these maps.

16 This is the "Carte de la découverte du Sr Jolliet . . ." [1674-75]. (See note 11.)

17 Delanglez, *Some La Salle Journeys*, pp. 34-39.



of the Bernou maps discussed above, and although dated 1680 to 1686, it may have been made as late as 1851.<sup>18</sup> The other map is of Eastern North America and is thought to be the result of a collaboration of Bernou and N. Peronel sometime around 1682.<sup>19</sup>

Before 1680, Franquelin drafted at least five maps. The first, already mentioned, is the copy of the 1675 Jolliet map.<sup>20</sup> The next two, both dated 1678, are good works of art rather than accurate renditions of the known geography of North America;<sup>21</sup> geographic features are depicted so crudely that the maps can only be described as free-hand drawings. The second-last Franquelin map of this period, tentatively dated 1679 and apparently an adaptation of a Jolliet map, is also a dreadful piece of cartography.<sup>22</sup>

With his map of 1681, produced in four overlapping sheets, Franquelin departed from the cartography of Jolliet.<sup>23</sup> Although Franquelin borrowed his material from earlier sources, he did so wisely and constructed the final version with greater skill than he had displayed in his earlier efforts. Eastern Canada, the St. Lawrence, Lake Ontario and the eastern shores of Lake Huron and Georgian Bay to Sault Ste. Marie, were copied from Bressani's map of 1657 or some common source. Lake Superior is a faithful copy of the Dablon map, while the Mississippi and lower Lake Michigan area may be adaptations from Jolliet.

Four maps remain to be mentioned in order to complete this period. One is a sketch of the Great Lakes area by François Vachon de Belmont, a Sulpician, dated ca. 1680.<sup>24</sup> The Lake Superior-Lake Michigan section is based on Dablon's map, while the rest is an adaptation of the 1670 Gallinée map. The importance of the map lies in Belmont's marginal notes and additions, especially the route from the Bay of Quinte through the Kewartha Lakes to Georgian Bay. This map, the Gallinée original and the later

18 "Carte D'Une Grande Partie Du Canada . . .," [1680-86]. Copy in the Archives of Quebec Seminary (no. 65). This map has been attributed to Michel Baudrand, although Delanglez convincingly shows it to be a composite made by Pierre Margry sometime before 1851.

19 "Carte / De Amerique / Septentrionale . . .," [1682]. Bibliothèque nationale, Cartes et plans, Service hydrographique, pf. 122, div. 2, p. 0.

20 "Carte de la découverte du Sr Jolliet . . .," [1674-75]. (See note 11.)

21 "Carte g[e]n[er]ale de la France septentrionale . . . 1678." (See note 11, second map mentioned.) This map was noted above as being signed by Jolliet, but is actually the work of Franquelin. The second map is the "Carte / pour servir a l'éclaircissement . . . 1678." Bibliothèque nationale, Cartes et plans, Service hydrographique, pf. 125, div. 1, p. 1.

22 "[Carte des Grand Lacs . . . , 1679.]" Service historique de la Marine, Bibliothèque, 4044B, no 40.

23 "Carte contenant une partie du Canada . . . 1681." Service historique de la Marine, Bibliothèque, 4040B, no 2; "Carte de la Nouvelle France . . . 1681." Service historique de la Marine, Bibliothèque, 4040B, no 3; "Partie de l'Amérique septentrio[nale] . . . 1681." Service historique de la Marine, Bibliothèque, 4040B, no 4; and "Carte contenant une partye de l'Amérique septentrionale . . . 1681." Service historique de la Marine, Bibliothèque, 4040B, no 5.

24 "[Carte du cours du Saint-Laurent . . . lac Superieur . . . 1680.]" Bibliothèque nationale, Cartes et plans, Ge. DD. 2989.



Abbé C. Bernou's map of ca. 1676, from an original by Franquelin and Jolliet. With this and other maps, Bernou initiated the hoax that La Salle had explored the Ohio River. By making this map appear as a Jolliet original, Bernou hoped to give additional weight to his and La Salle's claim. (Source: see footnote 11, map I. From a copy in the National Map Collection, Public Archives of Canada.)

Del'Isle copy deserve close study.<sup>25</sup> Although poor cartographically, two maps, by Thevenot and Louis Hennepin, are significant because they are the first published maps of the discoveries of Jolliet and Marquette.<sup>26</sup> The last important map of the period is in manuscript, attributed to Hugues Randin (also Raudin).<sup>27</sup> Like other map compilations of the period, it incorporates the Great Lakes from Jolliet's maps, possibly the one drafted by Franquelin in 1674-75,<sup>28</sup> but the Atlantic coast and St. Lawrence River appear in a form different from any previous depictions.

#### THE PERIOD OF FRANQUELIN AND OTHER COMPILERS (1684-1700)

The maps of the Great Lakes area made between 1684 and the end of the century are, with few exceptions, made by Franquelin or based on information supplied by him. The major cartographers who include the Great Lakes area in some detail during this period are, in order of the number of maps they produced, Jean-Baptiste-Louis Franquelin, Pierre Raffex (S.J.), Vincenzo Coronelli, Hubert Jaillot, Louis Hennepin, Pierre Mortier and, at the close of the century, Guillaume Del'Isle. Of these, Franquelin's and Raffex's maps are what could be termed primary sources. The rest are adaptations and to some extent the reworking of original material. Franquelin's importance to the developing cartography of New France is rivalled only by that of Champlain. From 1684 until the end of the century, Franquelin was the major compiler and disseminator of cartographical information, and all the great mapmakers of the period—Coronelli, Jaillot, Mortier and Del'Isle—are indebted at least in part to him.

From his early association with Jolliet, Franquelin moved to be official cartographer for Cavalier de La Salle in 1684, and in 1686 was appointed Hydrographe du Roy at Quebec, a post he held until 1697, and again from 1701 to 1703.<sup>29</sup> During his years in New France, he became personally acquainted with major explorers, and as Hydrographe du Roy, was the person charged with the responsibility of keeping the maps of New France up-to-date for the king and his advisors.

25 This map appears to be a sketch by Claude Del'Isle made sometime around 1700. It does not have a title but exists in four separate sheets catalogued in the Bibliothèque Service hydrographique as pf. 178, pièce 1.18; pf. 75, pièce 152; Archives nationales JJ75.

26 Thevenot published a version of the upper Mississippi, *Carte de la découverte / fait l'an 1673 dans l'Amerique / Septentrionale*, in his *Recueil de Voyages* (Paris, 1681). A second copy, *Carte / de la nouvelle découverte . . .*, catalogued in the Bibliothèque nationale, Estampes Vd 30, is so similar to the published Thevenot map that they can both be attributed to the same author. Hennepin published a number of maps. The first of these, titled *Carte / De La / Nouvelle France . . . 1683*, appeared in his *Description de la Louisiane* (Paris, 1683).

27 "Carte / De / L'Amerique / Septentrionale . . .," [1674-82]. John Carter Brown Library.

28 "Carte de la découverte de Sr Jolliet . . .," [1674-75]. (See note 11.)

29 Jolliet was appointed to succeed Franquelin and held the position until his death in 1700. Franquelin succeeded Jolliet in 1701 but was relieved of the post in 1703, whereupon Jean Deshayes was appointed. Besides mapmaking, these men were supposed to teach hydrography and geography. In 1708, the Jesuits took over this function and held it until the end of the French régime. N.W. Burke-Gaffney, "Jean-Baptiste-Louis Franquelin," in *Dictionary of Canadian Biography* (Toronto, 1969), 2:228-31.

In 1684, Franquelin produced his first two original maps.<sup>30</sup> Both are known today only in the form of copies, the originals having been lost, but these maps depict the Great Lakes more realistically than any earlier charts. Two additional maps incorporating the Great Lakes appeared in 1686, another one in 1687, and three more in 1688.<sup>31</sup> Although these maps are excellent, the cartography of the Great Lakes does not change much from 1684 versions. After 1688 Franquelin was employed as acting engineer to draw plans for the battery at Quebec and lake charts of the coast of New England, but returned in 1697 to continue updating his maps encompassing all of New France.<sup>32</sup> His masterpiece appeared in 1699, an enormous map in four sections with detailed insets of locations along the St. Lawrence from Lake Ontario to Tadoussac and a beautiful view of Quebec.<sup>33</sup> Other maps by him incorporating the data of the 1699 map were drafted in 1700, 1701 and 1708.<sup>34</sup>

- 30 "Carte / De La / Louisiane / Ou / Des Voyages Du Sr De La Salle . . . 1684, Paris." The original of this map has been lost, but a tracing appears in R.G. Thwaites, *Jesuit Relations and Allied Documents* (New York, 1959), vol. 63, endpiece. A second map made in 1684, "Carte / De La / Louisiane / En l'Amerique Septentrionale . . .," is located in the Bibliothèque nationale, Cartes et plans, Ge. D. 2987 (8782).
- 31 a) "Amerique Septenlle / Depuis environ 27 jusqu'a / 62 degrez de Latit.," [1686]. Ministère des affaires étrangères, Paris.
- b) "Carte de l'Amerique Septenlle . . .," [1686]. Service historique de la Marine, Bibliothèque, 4040B, no 8. This map is listed in Delanglez, "Franquelin, Mapmaker," p. 63. This author has not seen a copy of it; apparently it is not in the National Map Collection, Public Archives of Canada (PAC). A partial copy of the map is given in Cumming et al., *The Exploration of North America*, p. 153, with the entry Service historique de la Marine, Paris, SHM 66 (8-9-10-11).
- c) "Amerique Septentionlle. Composée corrigée . . .," [1687]. Service historique de la Marine, Bibliothèque, 4040B, no 6. This map is listed in Delanglez, "Franquelin, Mapmaker," p. 65, but is not in the National Map Collection, PAC. The author has not seen a copy of this map.
- d) "Carte / De L'Amerique Septentrionlle . . .," [1688]. Service historique de la Marine, Bibliothèque, 4040B, no 10a. The map has a view of Quebec in the northwest corner entitled "Quebec / Veü Du / Nordouest."
- e) "Carte / de L'Amerique Septentrionnelle / . . ., 1688." Service historique de la Marine, Bibliothèque, 4040B, no 6. This map has a view of Quebec in the southeast corner entitled "Quebec / Comme il se voit du cote de l'Est." The map is reproduced in Sarah Tucker, *Indian Villages of the Illinois Country* (Springfield, Illinois, 1942), vol. 2, pl. XIA.
- f) There is a map whose author is supposed to be de Fonville which is dated 1699 and dedicated to Le Comte de Maurepas, but it is undoubtedly the work of Franquelin: "Canada / Ou / Nouvelle / France," Service historique de la Marine, Bibliothèque, 4040B, no 9 a-d. This map is very similar to 4040B, no 6 and can therefore tentatively be dated 1688. On the southern margin of the map is a detailed chart of the St. Lawrence entitled "Le Grand Fleuve / De St Laurens / Depuis Le Cap Tourmente / Jusqu'au Fort / De Frontenac." Fonville seems to have cut Franquelin's name from the map and pasted his name and the dedication into the northwestern corner.
- 32 The author has seen this map only in the form of a partial copy by Guillaume Del'Isle. In the Bibliothèque, Service hydrographique, the map has been given the title "[Canada, Tiré de Franquelin]." pf. 178, pièce 1.15; pf. 75, pièce 155; Archives nationales JJ75 (14, 67).
- 33 "Partie / De L'Amerique / Septentrionale / . . . 1699." Service historique de la Marine, Bibliothèque, 4040B, no 12 a-d.
- 34 "Partie De L'Amerique / Septentrionale . . . 1700." Ministère de la guerre, Section technique du génie, Bibl. Fo. 33b. The map has a "Veüe de Quebec / comme il parroist a l'Orient," in the southwestern corner. "Carte De La Nouvelle-France . . . 1701." Bibliothèque nationale, Cartes et plans, Ge. D. 2987 (8536). This map has a "Veüe De Quebec a l'Est" in the southeast corner. "Carte Generale / De La / Nouvelle France / . . . 1708." Service historique de la Marine, Bibliothèque, 4044C, no 10.

A few other seventeenth-century cartographers deserve mention here because their printed maps saw much greater circulation than Franquelin's manuscripts. In 1685, Hubert Jaillot produced a map showing Lake Nipigon fairly accurately for the first time, a configuration which was soon incorporated in other maps.<sup>35</sup> Later in the century, he printed additional maps which are either versions of his 1685 map or copies of Sanson's famous map of 1656. In 1693, Pierre Mortier published a close copy of Jaillot's 1685 map with a few additions.<sup>36</sup> Although Mortier and Jaillot owe some debt to Franquelin, the cartographer who profited most from the manuscript maps sent from New France was Vincenzo Coronelli, a Venetian Conventual friar in the Franciscan order. As official cartographer to Louis XIV he was supplied, mainly by the Abbés Renaudot and Bernou, with copies of maps originally made by Jolliet and Franquelin. Bernou also gave Coronelli copies of his own sketch maps.<sup>37</sup> Coronelli's first excellent compilation, which appeared in 1688, underwent many editions in the seventeenth century but with little change in the Great Lakes area.<sup>38</sup> It is a skilful fusion of the original Jolliet-Franquelin-Bernou data.

In 1703, Guillaume Del'Isle published his justly famous *Carte Du Canada*, the map which became the prototype for the most influential maps of the early eighteenth century.<sup>39</sup> The preparatory work for this map was begun by Claude Del'Isle, father of Guillaume, in the late 1680s.<sup>40</sup> An early sketch was finished by 1696, and a printed version in 1700.<sup>41</sup> Although the Del'Isle maps are based on a vast amount of information, including numerous sketch maps derived from written published accounts, the essential characteristics for the Great Lakes area are derived from Franquelin.

In order to complete the study of the seventeenth century one last cartographer warrants attention. Dated approximately 1688 and 1694 are a number of sketch maps by Pierre Raffeix, S.J., including a sketch of the Great Lakes and upper Mississippi,<sup>42</sup> a map of the Iroquois country,<sup>43</sup> and

35 *Partie De La / Nouvelle France / . . . 1685*, in *Atlas François* (Paris, 1695), plate 11.

36 *Le Canada Ou Partie Dela Nouvelle France . . .* [1693], in *Le Neptune François* (Amsterdam, 1693-1700), vol. 2, no. 33.

37 Delanglez, *Some La Salle Journeys*, pp. 36-39.

38 *Partie Occidentale / du Canada ou de la Nouvelle / France . . . 1688*. National Map Collection, PAC.

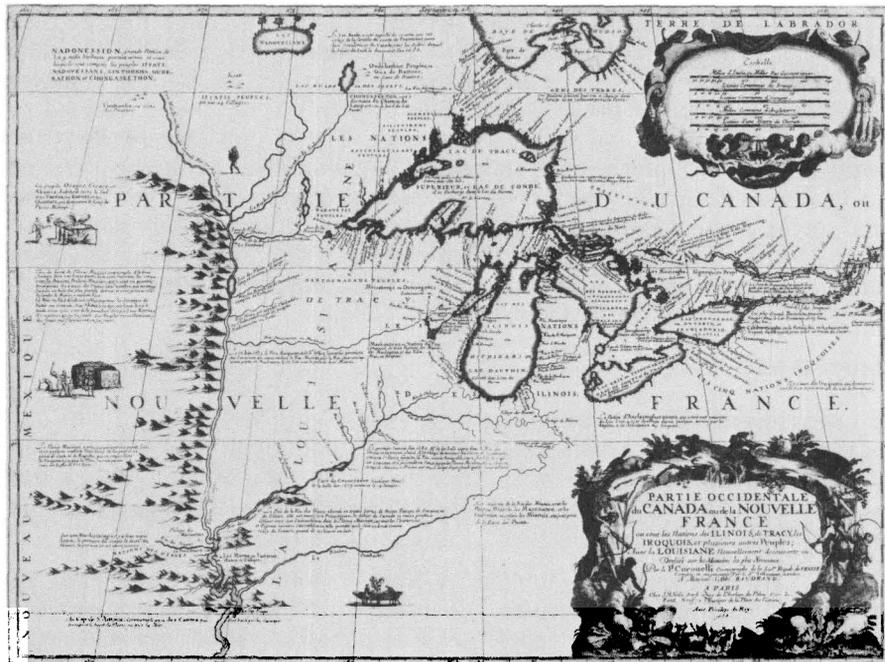
39 *Carte / Du Canada / ou de la / Nouvelle France . . . 1703*. National Map Collection, PAC.

40 J. Delanglez, "The Sources of the Deslisle Map of America, 1703," *Mid America* 24, no. 4 (1943): 275-98.

41 "Carte / De La / Nouvelle France / Et Des Paÿs / Voisins. / 1696." Bibliothèque, Service hydrographique, pf. 178, pièce 29; pf. 75, pièce 130; JJ75. *L'Amerique / Septentrionale . . . 1700*.

42 "Parties / Les Plus Occidentale / du Canada," [1688]. Bibliothèque nationale, Cartes et plans, Ge. D. 8042 (ancienne cote pf. 40 [36]). Some date this map as early as 1683; see Crouse, *Contributions of the Canadian Jesuits*, p. 119.

43 "Le Lac Ontario avec Les Lieux / circonuoisins & particulièrement / Les cinq nations Iroquoise / 1688." Bibliothèque nationale, Res. Ge. D. 8043; pf. 40(37). A slightly rearranged version, perhaps by Franquelin, appeared in the same year: "Le Lac Ontario / avec les lieux circonuoisins & / . . . 1688." Service historique de la Marine, Bibliothèque, 4044B, no. 64.



Coronelli's map of 1688 is the first major printed map of New France since Sanson's of 1656. On the several later editions of this map, little change occurred in the Great Lakes area. (National Map Collection, Public Archives of Canada)

two maps of the eastern Great Lakes and the St. Lawrence.<sup>44</sup> Along with the Iroquois map, one made by Franquelin based on information supplied by Raffex should be mentioned. Both Franquelin's sketch and the completed map have survived.<sup>45</sup> Raffex's maps are of particular interest since the Great Lakes map details the routes followed by Marquette, Jolliet, Dulhut (also du Lude) and La Salle, and the Iroquois maps, including Franquelin's versions, are the earliest detailed maps of that territory. In a sense they complement the maps made by the Jesuits forty-five years earlier of their mission to the Huron. The information portrayed on these Iroquois maps was included on Franquelin's maps of 1688.

Lastly, while on the subject of the Iroquois territory, there are two un-

44 "[Carte de la Nouvelle France . . . , 1694.]" Service historique de la Marine, Bibliothèque, 4044B, no. 67. A somewhat different version showing more of Lake Huron and Lake Nipissing is catalogued as no. 70.

45 "Pays des Iroquois." Service historique de la Marine, Bibliothèque, 4044B, no. 51. The following note is written on the map: "Carte faite conformement a la description du pays des Iroquois / quén a fait le R.P. Raffex dela C.D.J. qui avu, exactem / ce pays y ayant été long-tems Missionnaire." Franquelin completed this map as "Carte Du Pays Des Irroquois, Par I.B.L.F. Ydrographe du Roy." Service historique de la Marine, Bibliothèque, 4044B, no. 63.

dated, untitled, anonymous sketches of parts of that country.<sup>46</sup> One is a beautifully drawn sketch of what appears to be the route followed by Frontenac's army from Lake Ontario to the Onondaga in 1696 detailing the Onondaga village as well as the temporary fort set up by the engineer Levasseur. Because of the skill that went into this map, one is tempted to assign it to a professional such as Levasseur. The second map portrays the route from Lake Ontario up Irondequoit Bay and River to the missions of La Conception and St. Jacques in the Seneca country. The map seems to date to the Jesuit mission among the Seneca and most probably the period from 1670 to 1680 when Father Raffeix was there, and who, as noted earlier, produced some excellent maps of the Iroquois country. The handwriting of this map resembles Raffeix's very closely.

#### PROCEDURES FOR ANALYSIS

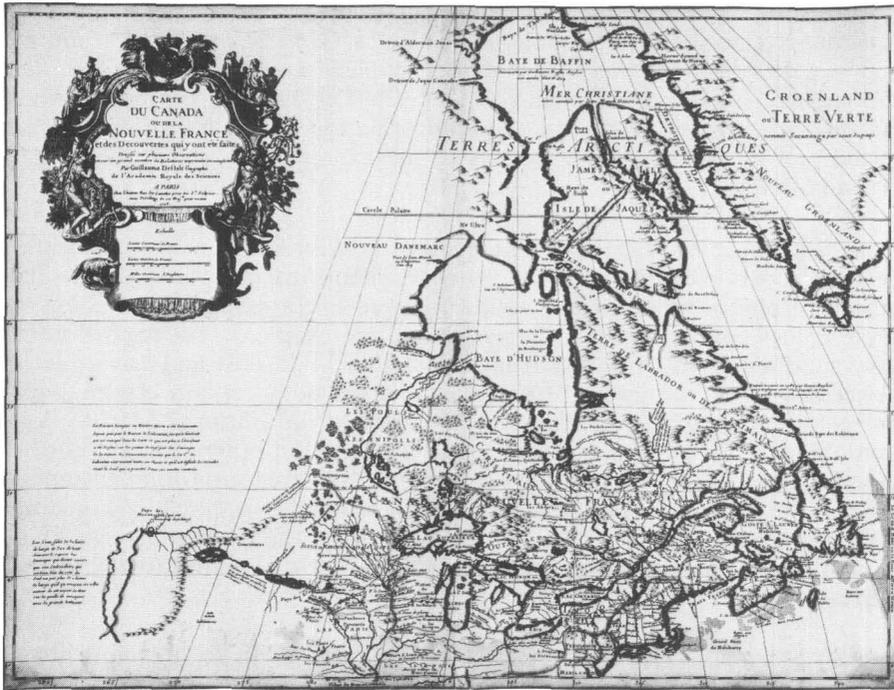
In order to establish the usefulness of a map it must be examined with the same rigour as any other historical document. Although almost every map presents some unique problems, there are a set of common procedures which the author has found useful in unravelling the cartography of the Great Lakes Area.

Maps can vary greatly in complexity from manuscript sketches made by one person of the areas he visited, to printed compilations which embody the original work of several people made at different periods and reworked by the engraver of the map. Some maps or portions thereof can even be native sketches or graphic renderings of written accounts. Factors that add to the complexity of analysis are the differing observational and drafting skills of the explorer and cartographer, and the loss or distortion of information that may have occurred in producing a printed map from a manuscript. One cannot but sympathize with the map compilers who worked before the days of systematic surveys, and whose problems in evaluating the quality of the information they received were staggering. A study by Delanglez on Del'Isle's *Carte Du Canada* of 1703 demonstrates the pains that some map compilers took in order to produce what they thought to be an accurate version of the geography of an area.<sup>47</sup> Their main difficulty was that even after all their painstaking work, they had no way of determining how accurate their maps were. This must be kept in mind when analyzing a map.

Map analysis consists of examining the map's history, its formal characteristics, and its content. The history includes the authorship, its date and its printing history, while the formal characteristics encompass the mathematical properties, among them scale, latitude, longitude, orientation and projection, as well as such non-mathematical aspects as symbols, decoration, lettering and methods of preparation. An analysis of map content focusses

46 "[Riviere Et Fort Des A Nontague . . . , 1696.]" Service historique de la Marine, Bibliothèque, 4044B, no 91. "[Riviere du Marais . . . , 1670-87.]" Service historique de la Marine, Bibliothèque, 4044B, no. 68.

47 Delanglez, "Deslisle Map."



*This famous map of 1703, the culmination of seven years' research by Claude Del'Isle and his son Guillaume, was the most accurate map of New France to date and the first to depict latitude and longitude more or less correctly. This is the first state of the map, with the "Rue des Canettes" imprint. (National Map Collection, Public Archives of Canada)*

on geographical and historical information. Although most scholars seem to be interested mainly in authorship or content, the formal characteristics of a map also yield useful information: they are the best measure of the technical knowledge and skill of an explorer or mapmaker, and an excellent reflection of the growth of measuring techniques over time. Thus, a study of the formal aspects of maps adds to biographical information as well as to the history of science.

#### PROBLEMS IN TRACING THE HISTORY OF A MAP

It will come as no surprise that many seventeenth-century maps are anonymous and undated. Establishing authorship or date cannot be done satisfactorily in every instance. In the case of manuscript maps, handwriting or lettering style can be compared with maps or documents where authorship is certain. Sometimes the context in which the map was located is of help. Unfortunately, the fact that maps have similar content is no sure guide due to the practice of map copying and, even when a map is signed by an author, caution must be exercised. Typical of these problems are the Jolliet maps of the 1670s. All were signed by Jolliet, but in fact most were drafted by Franquelin or Bernou from Jolliet originals. In the case of the Bernou maps, dated tentatively 1680, the only clue to their authorship lies in the

handwriting. Even in the case of printed maps, authorship should be examined critically. For example, Du Val's *Le Canada*, dated 1653, and De Fer's *Carte de la Nouvelle France*, published in 1669, are in fact Champlain's maps of 1616 and 1632.<sup>48</sup> Du Val and De Fer both merely added their names and a bit more information to Champlain's original plates, yet in catalogues the authors of these maps are usually given as Du Val and De Fer.

Another problem relating to authorship concerns the many nineteenth-century copies of earlier maps not always identified as copies. Before the advent of photocopying, artists were employed to copy early maps. Some of these copies contain errors, whereas others are excellent. Yet regardless of how good a copy is, it differs from the original. Pilinski's and Laverdière's nineteenth-century copies of Champlain's maps both contain errors. Even the good copies of seventeenth-century maps in the National Map Collection made by Pierre-Louis Morin, P.M. O'Leary and others, should not be used for illustrative or interpretive purposes in preference to originals unless they are carefully checked. Because of these problems, authorship should be assigned not only to the cartographer who made the draft of a map, but also to the person who compiled the original information and finally to the engraver who produced the final copy.

Dating a map is as difficult as assigning authorship to an anonymous map. To find the best clues which lie in the historical information on the map requires a thorough knowledge of history of the period under study. For example, it is not only important to know when a particular fort or mission was built, but also the routes and dates of travel of particular individuals who were capable of making observations suitable for mapping. Other clues to dating lie in the book in which a map may have been printed, the documents among which a map was found, and the similarity between it and maps of known date.

Even maps that are dated present problems. In effect, all that a date on a map really indicates is the year the cartographer finished it. Because of the way in which maps were compiled using other maps as sources, the information on various portions of the map might have different dates, a problem further complicated by the time lag that usually occurs between the exploration that produced the information and its appearance on a map.<sup>49</sup> Ideally, as in the case of attributing authorship, a series of map dates should be assigned: the date the map was drafted, the date or dates of the information on the map, and finally its date of printing. Since in most instances this will not be possible, bracketing dates must be assigned giving the earliest and latest possible dates that the map could have been drafted. Such bracketing dates had to be assigned, for example, to the *Corographie*

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48 Heidenreich, *Explorations and Mapping of Samuel de Champlain*.

49 Even in the case of modern topographic maps, the time between the compilation of the information and the year in which the map was issued can be ten or more years. For this reason, the date of the information is printed on the map, and not the date it was issued.

*du Pays des Hurons*, a map presumed to be of Jesuit authorship.<sup>50</sup> The earliest date the map could have been made is 1639, since that was the year the mission of Ste. Marie, prominent on the map, was built. Since Ste. Marie II, built on Christian Island in 1650, is not on the map and the eastern Huron villages destroyed in 1648 are, bracketing dates of 1639 to 1648 are reasonable.

Taking everything into consideration, the most important date is the date the information was compiled. From knowledge of historical events this date should also be the easiest to assign.

A final point for study is the printing history of a map. Although primarily of interest to map curators, the printing history must also be understood by the map user. It is important, for example, to discover a map's predecessors and compare them to determine the changes made between the different states or editions. If changes were not made, it is usual to consult the earliest version, as its date most clearly represents the information on the map. The number of printings also indicates a map's popularity, and therefore may reflect the esteem in which it was held. The most reprinted and copied maps of the seventeenth century were Champlain's *Carte de la Nouvelle France* (1632), Sanson's *Amerique Septentrionale* printed first in 1650, Coronelli's *Partie Occidentale du Canada* (1688), and finally the excellent map *Carte/Du Canada/ou de la Nouvelle France* by Del'Isle, compiled in the previous century and printed in 1700. These maps were not only the most popular of the seventeenth century, but also were the most accurate.

#### THE FORMAL CHARACTERISTICS OF A MAP

The basic mathematical ingredients of all the seventeenth-century maps of Canada were estimates of distance and observations of latitude and of compass direction. A cartographer would use these observations along with explorer's sketch maps, journal descriptions and earlier printed maps to produce his map, which was thus a fusion of various pieces of information. Since the original sources were often conflicting, a cartographer had to judge what data he was going to use, ignore, or modify. The skill with which he juggled his material is reflected in the map. Because the mathematical properties of a seventeenth-century and a modern map can be compared, the degree of variation and therefore the accuracy of the older map can be determined and in some cases errors can be explained.

Since the seventeenth-century and modern calculations of latitude were based on the same principles, the latitudinal grids can be compared. Accuracy can be determined either by taking the latitude of a large sample of points from the old map and comparing these to latitudes taken from the same places on a modern map, or by simply interpolating the modern lines on the old map or the old lines on a modern map and measuring the extent

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50 C.E. Heidenreich, "Maps Relating to the First Half of the 17th Century and Their Use in Determining the Location of Jesuit Missions in Huronia," *Cartographer* 3, no. 2 (1966): 103-26.

of similarity. If a latitudinal scale is not given on the map, lines of latitude can be interpolated from a modern map to the old one. The degree to which these lines deviate from a straight line or a smooth curve would give some measure of latitudinal distortion. If desired, standard statistical methods can be used when comparing the latitudes of old and modern maps.<sup>51</sup>

Scale is a more difficult problem, for while latitude in the seventeenth century was calculated with instruments, distance was merely estimated. This problem is complicated by the numerous types of measures used.<sup>52</sup> Furthermore, a cartographer often fused a number of existing maps into one, occasionally joining pieces from maps having different scales. The scale variations which can thus occur on a map can aid in comparative map analysis. Similarities in scale variation between maps point to map copying, or at least the copying of basic data. Variations in scale also give an indication of differences in distance perception and therefore probably travel time, since the two were so closely related in the minds of the early explorers. The degree to which a cartographer minimized scale variation is an excellent measure of his skill, or the skill of the person who made the original observations.

The original or intended scale of a map can be satisfactorily ascertained only if the cartographer drew both a bar scale and a latitudinal scale. By comparing the two, one can determine which league or mile the cartographer used. Champlain, for example, used a scale of 17.5 leagues to a degree of latitude on his 1632 map. (This is the old Spanish league which was 3.45 statute miles in length.) When a bar scale is given in some unit of measure, but neither the nature of that unit nor a latitudinal scale are indicated, a modern latitudinal scale can be placed on the map and the two compared. By doing so it is readily apparent that Champlain used the Spanish league as well on his 1607 manuscript map, which has a bar scale marked in unspecified leagues, but no lines of latitude. Having determined the original scale of a map, one must however guard against believing that an author actually used that scale, or used that scale consistently. Taking Champlain's 1632 map as an example, one can determine that he in fact used three different measures of distance: the Spanish league in the Gulf of St. Lawrence, the French *lieue commune* on the St. Lawrence, and probably the short *lieue de poste*, or possibly the *petite lieue*, during his inland explorations. It appears that the scales given on Champlain's maps were meant only for navigating the high seas or coastal waters of New France.

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51 A simple measure that can be used to describe the accuracy of a line of latitude on an old map is the mean and standard deviation of the error of a large number of points along that line. The points forming the sample can be taken at standard intervals along the line of latitude (for example, every 30 minutes of longitude) and the error computed by finding the latitudinal difference between that point on the old map and the same place on a modern map. The greater the mean and standard deviation of the points along a line of latitude, the greater the error in the map.

52. C. E. Heidenreich, "Measures of Distance Employed on 17th and Early 18th Century Maps of Canada," *Canadian Cartographer* 12, no. 2 (1975): 121-37. See also H. Doursther, *Dictionnaire universel des poids et mesures anciens et modernes, contenant des tables des monnaies de tous les pays* (1840; reprint ed., Amsterdam, 1965).



*Not all seventeenth-century maps carried such an elaborate set of bar scales as this one from Jaillot's Partie de la Nouvelle France. Included are the principal units of measure in use in Europe at that time. (National Map Collection, Public Archives of Canada)*

Variations in scale across a map and the consistency with which a given scale was used can easily be determined by a few mathematical computations. The usual method is to take a number of distances from a map and compare them to their modern equivalents. An average league-to-mile ratio is then taken to be the scale of the map. If no scale is present on the map, it is common to calculate and express such an average scale in terms of miles per inch. Although this method is simple, it can be misleading because it will not disclose the systematic use of more than one scale on a map. In order to test whether more than one scale was employed, the author found regression analysis useful. A fixed point on the eastern portion of the map was taken (Cape Race, Cape Gaspe or Tadoussac), and from this point consecutively longer distances were scaled to other points found on the old as well as a modern map. These distances, in the measure used on the old map, were then regressed against the same distances taken from a large-scale modern map. The more points sampled, the better were the results. It was also found useful to take sample points along well-established routes of travel and to compute separate regressions for different routes. When the scatter of points was plotted on a graph, changes in map scale appeared as changes in the slope of the scatter. Separate regression lines were calculated

for each change in slope and converted into map scales, thus enabling one to determine variations in scale across the map. The product moment correlation coefficient can easily be computed, indicating the degree of consistency with which the original estimates of distance were made. Large deviations from the regression line showed large errors of estimate and therefore reflected large errors in the space relations of the old map.

When the original map did not have a scale, the same method was still used. Inches or centimetres measured directly from the map were substituted for leagues. Changes in slope still indicated changes in scale, but of course the resulting scales were in miles per inch or kilometres per centimetre. Errors in estimating distances still appeared as deviations from the scatter.

In summary, all maps have more than one scale: the scale indicated on the map by the cartographer and the actual varying scale of the map. The most common reasons for this phenomenon are the difficulties encountered estimating distances over winding watercourses and rough terrain, the copying of maps which were often in different units of measure, and finally, the practice of using different units of measure for different topographical conditions without making the necessary scale adjustments before mapping.

Longitude was a vexing problem to navigators and cartographers until the chronometer was invented in 1759. Although several methods were advocated for calculating longitude, the most common was by dead reckoning (estimating distances). Longitude was numbered in 360 degrees eastward around the globe from a prime meridian. Unfortunately, there was no universally agreed upon prime meridian in the seventeenth century.<sup>53</sup> By decree in 1634, Louis XIII fixed Ferro (Hiero) in the Canary Islands as the prime meridian for French maps, but it is not known how consistently French cartographers adhered to this decree. In every case where lines of longitude appear on a seventeenth-century map, a check should be made to see which prime meridian was used. This may be done by the method outlined below.

Since longitude was determined by dead reckoning, the problem of determining the accuracy of the longitude of a map is akin to determining its scale. To study the correspondence between the lines of longitude on a seventeenth-century map and the modern grid, it is useful to run a regression between the longitudes of points on the old map against the same places on a modern map.<sup>54</sup> This method has several advantages. First, the slope of the regression line clearly expresses the agreement between the degrees used on the map and the true length of a degree. A problem that plagued mapmakers during most of the seventeenth century was that no one knew the precise circumference of the earth and therefore the length of a degree. The exact length of a degree was not measured by the French until

53 The author has determined that there were at least a dozen prime meridians in use on sixteenth- and seventeenth-century North American maps. These lay between the western Azores and the coast of Africa. See Heidenreich, *Explorations and Mapping of Samuel de Champlain*, p. 59.

54 For details of the method and examples see *ibid.*, pp. 55-76.

1671 when Jean Picard established it to be 57,060.13 toises,<sup>55</sup> leading to a change in the official length of the degree in 1688. Before that time the accepted length of a degree was shorter than its true length, with the consequence that the longitudes on almost all seventeenth-century maps contain a systematic error which can be calculated from the slope of the regression line. Since the error occurred simply because the true length of a degree was not known, the deviations from the regression line are therefore the true errors. Once the systematic error is known, an equation can be formulated to correct all lines of longitude for this error. The result is a longitudinal grid that reflects the accuracy of the original observations made by the explorer or cartographer.

Regression analysis also permits one to determine the approximate location of the prime meridian from the equation of the regression line. For this purpose it was found best to use points in the Gulf of St. Lawrence between Cape Race and Tadoussac for the regression. Distances estimated across stretches of open water tended to be more accurate than estimates made inland, and since this area was the first to be explored, it was therefore also the best-mapped area of New France with longitudinal observations on most maps tending to be fairly accurate.

The scales determined by the regression of longitudes can be used to check the figures obtained for the actual scale or scales of the map calculated earlier. These should in fact be similar over east-west distances since longitude was obtained by simply converting distance estimates into degrees. Once these scales are corrected for the systematic error mentioned earlier, they should also be similar to the scale calculated over north-south distances if the latter was determined instrumentally by means of an astrolabe or crosstaff. If they are different, the chances are that north-south distances were also estimated. In that case, a north-south scale or scales can be calculated in the same manner as the longitudinal scales. For Champlain's maps, the latitudinal scale was obtained instrumentally and the longitudinal scale was estimated. This in part explains the peculiar east-west stretching of his maps.

As suggested in the discussion on map scales, the points forming the regressions of longitudes should be taken along well-established routes of travel. If one area of a map is suspected to be a copy, a separate regression can be run for this area to see if the slope of the regression line is similar to that of the rest of the map. Differences between regressions may point to different map origins.

Finally, the lines of longitude from which the systematic error has been removed can be converted to modern measures and plotted on a map on which can also be interpolated lines of latitude as discussed earlier. The resulting grid is a true reflection of the mathematical accuracy of the seventeenth-century map being examined.

The problem of latitudinal and longitudinal distortion can be handled in another manner. The latitudinal and longitudinal co-ordinates of a large sample of points can be calculated from the old map and transferred to a

55 Heidenreich, "Measures of Distance," pp. 121-37.

modern map after longitude has been corrected for systematic error. With the resulting points joined to their true location by a line or vector, the final map would depict the displacement of co-ordinates by vectors and would give the map reader a good impression of distortion.<sup>56</sup>

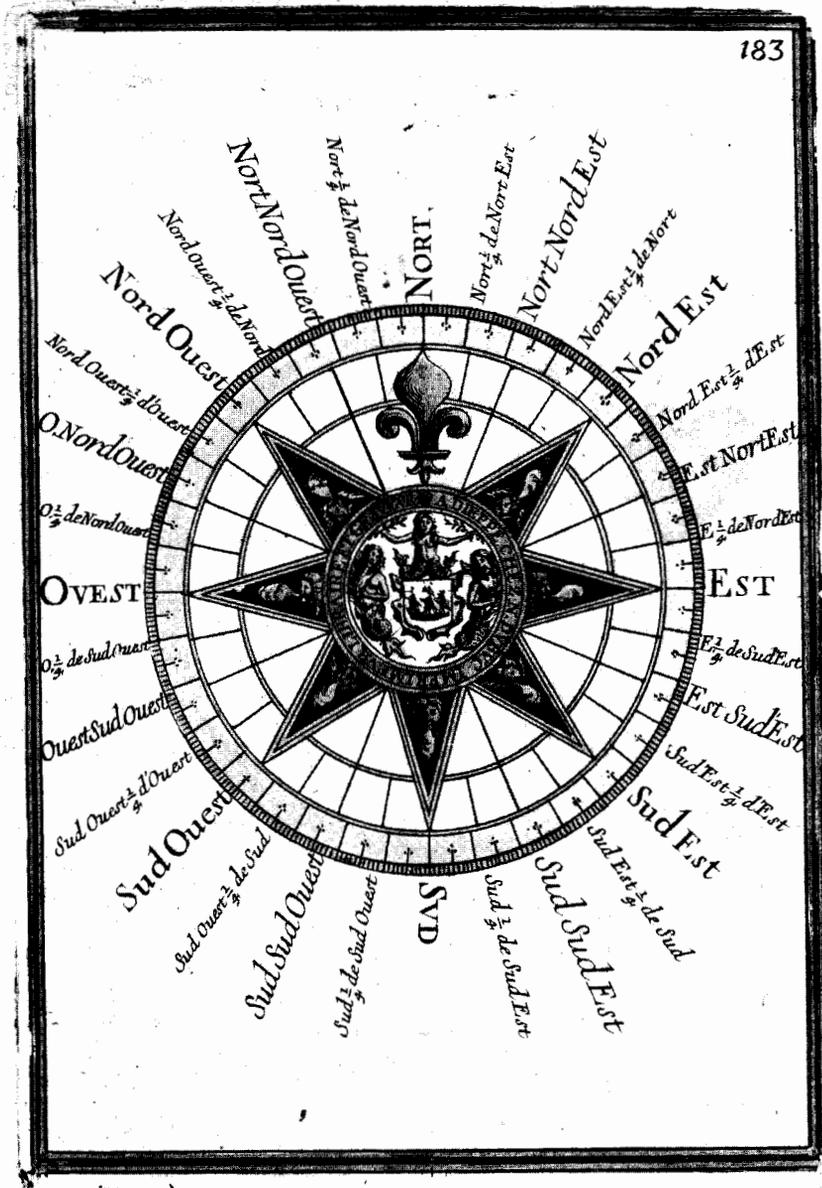
The problem of compass direction and orientation of the features on seventeenth-century maps has not been adequately studied. All explorers and cartographers during that period were aware that their compasses did not point to the geographic north and had to be corrected for declination. It was only in the 1630s, however, that they also learned that the difference between true north and magnetic north changed annually. In order to make accurate compass observations, their instrument had to be corrected for the place where an observation was to be made. The procedure for doing this was well known, but the accuracy with which it was done or the consistency with which corrections were made varied from one observer to the next. By means of a few simple procedures, one should be able to determine how well a cartographer made his corrections.

With few exceptions, all seventeenth-century maps are oriented toward the geographic north, conventionally indicated by a fleur-de-lis on the compass rose. On a few maps, such as those by Champlain, the magnetic north is given by a smaller arrow on the same compass rose. Unfortunately, this information is virtually useless unless the author of the map also indicates the place at which the reading of declination was taken; of the seventeenth-century maps examined by the author, only Champlain's maps of 1607 and 1612 contain lists of places with their readings of declination. There is of course no way to check whether the readings of declination on seventeenth-century maps and documents were accurate due to the change of compass variation over time. Because most navigators sailed on rhumbs or fractions thereof, the compass roses on most seventeenth-century maps are divided into thirty-two points rather than 360 degrees. Compass readings were in fact estimates which varied in accuracy with the instrument and the observer. In checking the directional accuracy of the maps, one must therefore expect errors, the size of which reflect the skill of the observer, and the accuracy of the instrument at his disposal.

If a compass rose or north arrow are not given on a map but lines of longitude are, the latter can of course be taken as indicating true north. In the absence of both of these, the latitudinal scale often indicates true north. Some caution must however be exercised because a latitudinal scale on the map margins only indicates north if the map is on a rectangular projection. Many of the seventeenth-century Canadian maps are in fact on a rectangular projection, the remainder are mainly on a sinusoidal projection which is easily recognizable by the readings of longitude usually indicated along both the northern and southern map margins.

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56 For an application of the method see W. Ravenhill and A. Gilg, "The Accuracy of Early Maps? Towards a Computer Aided Method," *Cartographic Journal* 2, no. 1 (June 1965): 48-52.



An engraved seventeenth-century compass rose from Mallet's *Description de l'univers* (Paris, 1683). Some compass roses on maps also showed the magnetic north, an important navigational aid. (National Map Collection, Public Archives of Canada)

In order to determine errors of compass direction across a map, one can take pairs of points a short distance apart, join these by a line and measure the angle formed by this line with respect to the geographic north of the map. These angles can then be compared to the angles formed by the same points and true north on a modern map, with the difference between the angles being the error. These errors can be plotted on a modern map as departures from true north to give a good impression of the directional accuracy of the original map.

Non-mathematical aspects of a map encompassed by the loose heading of "formal characteristics" are lettering, symbolization of information, decoration and method of map preparation. All of these, except the process by which the map was produced as a final product, can be highly individualistic. In the seventeenth century, most maps were drawn in ink on paper or vellum, or were copper engravings and occasionally woodcuts printed on paper. The last two processes required tremendous skill because the image had to be not only transferred accurately from the original, but also in reverse. The final product was often clearly a work of art, made by a skilled craftsman, and for this reason an engraver deserves mention in a map catalogue as an author.

Map symbolization was not completely standardized in the seventeenth century and few cartographers supplied a legend, although one can be deduced by a careful reading of the map. The scroll work surrounding a cartouche, as well as other decorations and pictures are evidence that maps at one time had to be beautiful as well as functional, a fact appreciated by map collectors, but by very few art historians. Maps that come readily to mind as real works of art are Champlain's maps of 1612 and 1632, Bressani's map of 1657, the Bernou-Peronel map dated about 1682, and some of the maps by Franquelin. Certainly a systematic study of seventeenth-century maps as works of art could be rewarding.

#### ANALYZING THE CONTENT OF A MAP

There are no standard procedures for analyzing the content of historical maps, although a thorough knowledge of the historical events of a period is a prerequisite for any map interpretation. As a general rule, interpretation should proceed from the well-known, readily identifiable areas of a map to the less-known, poorly depicted areas. Interpretation should also proceed from the permanent physical features of the landscape to the more transitory man-made features. The author usually proceeds from an identification of the islands, bays and points on the St. Lawrence River, to the rivers that flow into it. These rivers are traced into the interior as far as positive identification permits. Similar procedures are then followed along the Ottawa River and the perimeter of the Great Lakes, for the physical skeleton of the map must be clarified before the cultural features of the map can be unravelled. Here again it is best to proceed from the known locations of places such as Quebec and Tadoussac to the more ephemeral band and tribal territories of the various native groups.

A note of caution: the map interpreter must keep scale variation and errors in compass orientation in mind throughout his analysis of content, at the same time recognizing that in such cases as the western portion of Champlain's map

of 1612 and the northern portions of Du Creux's *Tabula Novae Franciae, 1660*, native sketch maps and verbal accounts have been incorporated. The various native groups as well as some untutored Europeans tended to draw route diagrams, instead of maps, on which rivers and lakes were exaggerated in size because of their importance as routes or meeting places, and not necessarily because they were prominent physical features. In a sense these were mental maps rather than scientific charts. Map compilers often incorporated such information when other evidence was not available, and at times rendered written accounts and other information into a final printed map.<sup>57</sup>

#### EVIDENCE FROM HISTORICAL MAPS

Historical maps can provide a good indication of the growth of European knowledge over time. There is often a time lag between exploration and its conveyance to maps, but the maps are generally a better indicator of knowledge about an area than are vaguely worded travel accounts. Most of the maps were in fact constructed solely in order to express the current state of knowledge about an area. It is interesting to compare French, English and Dutch mapping of the Great Lakes during this period, and astonishing to see how slowly French knowledge of this area filtered through to other European countries.

Maps can be of considerable help in determining the location of places whose names have changed over time. Such identifications are often difficult to make from journal entries alone, yet they are frequently crucial in determining the route of an explorer or the location of a native settlement. Early place names in native languages on some of the Jesuit maps in particular should also be of interest to linguists.

Some maps, as mentioned above, portray native knowledge of lands beyond European exploration. The precision with which such information was incorporated was highly dependent on the rapport established between an explorer and his native informants. In some cases, native sketch maps were employed, while elsewhere verbal accounts were rendered graphically. These maps provide interesting information on the space perception as well as the extent of knowledge about an area by native groups. Territorial and political claims between France, Holland, England, the Hudson's Bay Company and others also appear on maps.

The information most frequently depicted on maps is the location of canoe routes, portages, missions, trading posts, native groups and their villages. These items of information furnish a variety of locational data that are extremely difficult to obtain from traditional documentary sources alone. Canoe routes and portages are particularly well portrayed. Since the maps were made during the hey-day of the fur trade in eastern Canada, changes in the importance of the various routes mirror changes in the thrust of the fur trade. On some maps, all portages and rapids are indicated. Bressani, for example, even numbered them consecutively up the Ottawa River from the Lachine Rapids. On the most detailed maps, European and native settlements are placed with

<sup>57</sup> For an example see A.J. Ray, "Early French Mapping of the Western Interior of Canada: A View From the Bay," *Canadian Cartographer* 9, no. 2 (1972): 89-98.

great precision. The Jesuit maps of Huronia, and later maps of the Iroquois country, are good enough to aid archaeologists in making identifications. Without these maps it would be impossible to locate mission and village sites since the documents of the period are simply not good enough and archaeological dating methods too imprecise.<sup>58</sup> Similarly, the maps are of great help in identifying the tribal and band areas of the more prominent native groups. Since some of these groups shifted seasonally and most underwent changes in location as a consequence of intertribal war and the exigencies of the fur trade, the locations depicted on the maps are only approximate. Maps, documents and archaeological data must be used together in order to obtain a clear picture of native areas and their movement over time.

This list does not exhaust the types of information contained on historical maps, but summarizes information the author has gleaned from maps of the Great Lakes area. Not included here are the hydrographic charts of the St. Lawrence River and the Atlantic coast, or the early urban and cadastral surveys of the St. Lawrence valley, all of which deserve greater study.

Several aspects of a methodology for map analysis of early, particularly seventeenth-century, maps have been presented. As is evident in this study, the complexities of early maps can lead users to some of the same pitfalls as do other documents, but additional, unique problems arise not encountered elsewhere in historical enquiry. Since most maps contain errors, some contain distortions—intentional or otherwise—and others are simply badly made, they must be critically evaluated in order to be useful to scholars. On these documents must be focussed the attention of numerous specialists: historians of art, science, navigation, surveying and printing, along with the more traditional students of the past, geographers and historians. These specialists will need to work in conjunction with the map curator whose primary role will be to enrich the existing collections, to gain a greater knowledge of the maps and related documents, and to make this body of knowledge increasingly accessible to scholars. An hitherto obscure source of historical information will thereby yield the wealth of evidence it holds.

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58 Heidenreich, *Huronia*.