THE CARTOGRAPHY OF CAPITALISM:

CARTOGRAPHIC EVIDENCE FOR THE EMERGENCE OF THE CAPITALIST WORLD-SYSTEM IN EARLY MODERN EUROPE

A Dissertation

by

THOMAS MCCALL WOODFIN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2007

Major Subject: Geography

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Chair of Committee,	Peter J. Hugill
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ABSTRACT

The Cartography of Capitalism: Cartographic Evidence for the Emergence of the Capitalist World-System in Early Modern Europe. (December 2007)

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The economic competition between the Netherlands, France and England is documented in the atlases published in Amsterdam, Paris and London between 1500 and 1800. However, the relationship between mapping and economic processes remains mostly unexplored in the history of cartography. World-system theory has application to the history of cartography in the early modern period for identifying the linkages between cartography and long-term economic processes.This research analyzes the production of maps, specifically in world and maritime atlases, in these three cities as the geographic expression of the emergent capitalist world system in early modern Europe.

The economic concepts of core and periphery as proposed by Immanuel Wallerstein are defined cartographically in the structural morphologies of Dutch, French and English atlases published in this period. Each country mapped itself as a core and such cartographic self-definitions reflect their individual geographic and economic contexts. The Netherlands and England created core atlases in the sixteenth century that evolved in support of business and transport as well as state interests. The French core atlas initiated at the end of the seventeenth century was a governmentally sponsored survey dedicated primarily toward state administration control.

The Netherlands, Fance and England also mapped their continental and extra-European peripheries in world and maritime atlases. Dutch engagement in long-distance trade in agricultural commodities created world-system commodity chains of production. Dutch maritime atlases defined these networks of commercial opportunity for the first time. The creators of the first printed world atlases, Dutch cartographers also structured their productions of atlases as a commercial enterprise marketed toward an international clientele. Dutch maritime atlases were an important innovation and Amsterdam atlas publication dominated cartography in the seventeenth century. English publishers adopted Dutch innovations in map production and succeeded to dominance in printing atlases whose structural morphology embodies a world-system of commodity networks.

The relationship of cartography to long-term economic processes is demonstrated by the Dutch and English atlases. Early modern world atlases portray the cartographic world-view of core and periphery. The maritime atlases provide the first portrayal of long-distance trade networks that continue to characterize the capitalist exchange of commodities globally.

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

The expansion of Western European states into the geographies beyond their continental edges following the Columbian encounter necessitated formation of a new knowledge base. This knowledge base is recorded in the cartographic record of the early modern period. My contention is that atlases published by the competing economic leaders (the United Provinces/Dutch Republic, France, and England/Great Britain) create a cartographic record for for the definition of the emergent capitalist world-system's components of core, semi-periphery and periphery. Atlases published in Amsterdam, Paris and London between 1500 and 1800 demonstrate that a capitalist world view was being realized geographically and cartographically. This research addresses how mapping and map making is integral to understanding the competition between the Dutch Republic, France and Britain for economic hegemony in the formative phases of global capitalism.

The story of how mapping responded to and was influenced by other cultural forces at work in this period takes place in a context of social, political and economic change. Economic history and theory offer the opportunity to add important theoretical dimensions to the history of cartography. Models from historical and economic geography provide theoretical frameworks within which the history of atlas maps and their publication can be understood. This chapter outlines current theoretical approaches in the history of cartography, proposes an alternative world-system approach and

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This dissertation follows the style of *Annals of the American Association of Geographers.*

demonstrates the applicability of world-system theory to map making and the publication of atlases in early modern Europe. The relationship between cartography and successive phases of economic leadership by the countries competing in the creation of the capitalist world-system is demonstrated.

Cartography and Economic History

The early modern period in European history, generally agreed to be roughly from 1500 to 1800, was the period in which European trade extended across the world's oceans. Maritime trade networks originating and ending in northwestern Europe formed regular sailing routes for carrying goods from the coasts of England, France and Holland to the western and southern coasts of Africa, the Caribbean islands, and the eastern coasts of North, Central and South America. The Atlantic basin emerged as a new economic space for trade and business before 1700. In European markets the traditional Hanseatic trade in the agricultural products of the Baltic was supplemented by sugar, molasses, rum, tobacco and cotton from the Caribbean and the Americas. The trade in African slaves to the New World completed this triangular network of exchange. This dissertation confines itself to the trade networks of the Atlantic basin because the core-periphery relationships between the European hegemons and the New World were formed and matured as a competitive economic sphere prior to the opening of the Pacific basin. The economic practices, navigation and mapping employed to effect commodity exchanges between western Africa, the Caribbean, Western Europe and the Americas were to be later employed in the exploration and colonization of India, Southeast Asia and the Pacific Rim. The economic history of Asia and its exploitation by Western Europeans is a later chapter in this same history and will not be addressed here. This work presents how

cartography and, in particular, the publication of world and maritime atlases were a vital component to the intellectual software by which capitalists were able to invest and profit from the agricultural commodities available to a growing European market.

Economic historians have studied intently the political and economic activity between the European continent and the New World since the nineteenth century. Two centuries of research have revealed the dawning of the age of capitalism in multiple dimensions. The global network of trade that characterizes contemporary capitalist trade began with the Portuguese overcoming the Venetian monopoly of trade with the Near East and Orient. The Dutch succeeded to global trade dominance in the seventeenth century and were eventually surpassed by Britain in the eighteenth and nineteenth centuries. The broad patterns of economic and political competition between European states have been identified and analyzed in detail by scholars but is not the focus for here.

Despite the extensive literature on early modern economic history and the development of the capitalist world-system, historians of cartography have lagged behind, stuck in outmoded theories, and have failed to keep pace with economic history. Only token acknowledgment has been given to the influence of trade as a force acting upon the development and profession of cartography and map products. This dissertation focuses on how cartography, cartographic technologies and the production of maps influenced and in turn were influenced by the emergence of a global maritime trading network. What will be shown is that the momentum created by economic growth and trade extension motivated mapping in specific European cities competing for commercial opportunities. The charting of the seas and coastlines became the process by which trade

networks were visualized. The maps and atlases from this period constitute a visible set of geographic images and instructions for accessing that trade.

Cartographic applications expanded outward toward new trade regions and inward within territorial borders with the intent of improving the efficiency of homeland resources available for supporting military action on land and sea. Maps became both an instrument of the state (Akerman 1991; Buisseret 1992; Barber 1997; Konvitz 1987) and an instrument for trade (Van der Krogt 1993; Brotton 1998; Zandvliet 1998). Historians of cartography have, over the past century, developed an accepted canon for the history of cartography in early modern Europe but this canon follows the fifteenth and sixteenth centuries' discoveries with a preponderance of evidence for cartography in service to emergent polities. The sequence of cartographic leadership in early modern Europe is not, however, fully coincident with the sequence of state-making that preoccupies so much of the scholarly literature about early modern Europe.

The trade between medieval cities and the rise of a merchant class whose transactions connected formerly insular self-contained city-states into a network of exchange had already established an economic sphere that expanded to different continents from the sixteenth to nineteenth centuries. As will be described in a later chapter, the cartographic portrayal first of key cities' markets then expanded to show regions with commercial networks connecting them. Finally, beginning with the Dutch world atlases of the sixteenth century, depiction of a potential capitalist world-system was expressed. Scalar distinctions remain between the ubiquitous town and village markets, the networks of commercial exchange between market towns and the port cities who anchored the long-distance trade in commodities through lines of credit and

networks of associates whose economic operations functioned at a system scale. Such a discussion will help explain the 'city-focus' of the early modern economy whose cartographic expression was exemplified by Braun and Hogenberg's *Civitates orbis terrarum* of 1572 – 1617. The artist and engraver of the majority of the city views, George Hoefnagel, began his career as a traveling merchant and his recording of the towns and scenes within them contain much information of interest to a merchant (Nuti 1988). The *Civitates* can be considered the precursor of the world atlases expressing a world-system of capitalism in which "a dominant city always lies at the center" (Braudel 1992: 26). The cities of Antwerp, Amsterdam and London are the succession of economically-dominant cities in early modern Europe and, most importantly, these same cities served as incubators of cartographic expertise and the production of and trade in maps and atlases (Akerman 1991: 12-28, cf. Footnote 21).

World-system theory postulates three economic zones: core, semi-periphery, and periphery as concepts by which the political and economic dimensions of the world-economy should be understood (Taylor 1993: 17-24). World-system theory also narrows the list of dominant commercial cities, or capitalist core cities, to Venice, Antwerp, Amsterdam and London (Wallerstein 1974b; Braudel 1992). Akerman includes these same cities as primary centers for cartographic production in early modern Europe. In contemporary economic history for early modern Europe, the history of leading commercial cities begins with Venice and its Mediterranean trade network. The literature on the emergence of European economic leadership consistently cites a chronology of oceanic trade dominance initiated when Portuguese circumnavigation of Africa broke the Venetian monopoly for eastern trade goods coming overland into Europe from Asia. The

Portuguese maritime explorations round the horn of Africa were then able to cut into the thousand-year-old Silk Road trade connecting Asia with the Mediterranean via a southern connection through the Indian Ocean (Modelski and Thompson 1996; 128). The trade network built by the Portuguese was then ceded to the Dutch as Antwerp became the primary entrepot for the eastern rarities trade. By 1588, when Amsterdam emerged as Antwerp's successor, the maritime trade routes moving goods along the coasts were clearly established and branched east and south into the Mediterranean and around Africa, north bringing agricultural commodities from the Baltic region and west into the Atlantic basin. Amsterdam's leadership position lasted until the late 1600s by which time London and Paris were competing for political and economic dominance in the Atlantic basin.

Mapping in early modern Europe helped to establish the networks of trade and provided the first portrayals of the expanding boundaries of this new world-system. Cartographic techniques, engraving and printing experienced a revolution during this same period so that newly-discovered areas of the world were illustrated in more complete and up-to-date maps. That mapmaking expanded as part of the exploration and reconnaissance of trade expansion is acknowledged by historians of cartography but the economic functions of maps have been left largely unexamined. Distinctions of markets, trade opportunities or portrayal of known trade networks have not been used as a way to interpret map history. In fact, historians of cartography have not engaged in either qualitative or quantitative analyses of the publication of maps and atlases from the centers of cartographic production since Akerman's work fifteen years ago (Akerman 1991). Central to his thesis was an analysis of atlases produced in the centers of

cartographic production that seemed to validate his hypothesis that different nation-states, France specifically, utilized large-scale topographic mapping to visualize the territory of statehood.

Studies of map making within particular early nation-states are typically descriptive chronological accounts of cartographers and geographers and their maps and atlases. When combined with individual scholarship on specific map products such as wall maps, atlases, and maps illustrating books, the researcher seeking to study larger patterns of cartographic production in early modern Europe finds little guidance. The few studies attempting to describe and document cartography's changes over a longer period of time focus on a particular map or set of atlas map plates used by a succession of publishers in multiple editions. The genealogies of the Mercator/Hondius/Janssonius world atlases, the Tavernier/leClerc French core atlases and the Saxton/Speed/Sellers English core atlases have been extensively researched and documented bibliographically. Such studies in the history of cartography are comparable to the study of individual trees within a forest without ever studying the forest itself. It is not surprising that calls for more and better theories in the field have foundered on the rocks of post-modern concepts borrowed from literature that encourage hermeneutic in-depth studies of an individual cartographer or map.

The succession of economic leadership in early modern Europe and the theoretical scholarship about that succession does not appear to influence contemporary theoretical approaches in the history of cartography. Mapping in service to the nation-state is the standing theoretical framework for cartographic history of most of the seventeenth and eighteenth centuries. (Akerman 1991; Buisseret 1992; Barber 1997;

Konvitz 1987). No comparisons are drawn as to how the competition for trade dominance between early modern states may have influenced mapping practices. Despite any contemporary economic history that ignores France as a competitor for economic leadership, France is considered dominant in expertise and map publishing from the end of the seventeenth to the beginning of the nineteenth century (Petto 2007; Konvitz 1987; Konvitz 1990). Akerman's analysis of nine general histories of cartography published between 1949 and 1981 found a consistent temporal ordering of cartographic expertise and production to be Italy, Portugal, Holland, France and England (Akerman 1991: 12-28, cf. Footnote 21, 470). Within such 'national' mapping traditions, biographies of individual mapmakers are written. Such histories of maps create a cartographic lineage that remains unquestioned in contemporary scholarship. However, this accepted order of cartographic leadership establishes a framework that limits alternative investigations based upon "the analysis of broader patterns in their evolution or relation to society at large." (Akerman 1991: 30). The inability to see beyond the established canon has limited the possible contributions for economic historians to cartographic history.

This work proposes a new approach to the history of cartography based upon broader patterns identified in political and economic history. It attempts "…to bind these disparate topics together by a common approach – by a search for patterns of arrangements and relationships that allow us to describe and assess complex ensembles and sequences that themselves comprise different classes of phenomena." (Meinig 1978, 1186) The work on the logic and structure of the modern world-system by Fernand Braudel, Immanuel Wallerstein, George Modelski and William S. Thompson, Peter Taylor and Peter Hugill provide a theoretical basis for understanding the recurrent events,

sequences and relationships in the history of cartography. What is required is a set of indicators that permit assessment of how early modern cartography affected and was affected by other rhythms developing in the global economic expansion of early modern Europe. The applicability of concepts in economic history can then be tested by the analysis of the available archival records documenting the history of cartography.

The application of economic history theory to the history of cartography is rare. In a 1988 article decrying the narrow theoretical approaches by historians of cartography, J. Brian Harley makes a single reference to the work of Immanuel Wallerstein on the capitalist world-economy. Harley suggests that a world-systems approach may have relevance in understanding the transformations in European cartography during the early modern period (Harley 1988a, 285). Harley describes mapping as an expression of property rights and as a 'tool of capitalists' to transform labor relations, but only in so far as cartography seems

> embedded in some of the long-term structural changes of the transition from feudalism to capitalism. The world economy and its new geographical division of labour was produced with the aid of geographical documents including maps. Accurate, large-scale maps were a means by which land could be more efficiently exploited, by which rent rolls could be increased, and by which legal obligations could be enforced or tenures modified. (Harley 1988a, 255)

For Harley, the mapping integral to the delineation and legal description of land as property was, at the same time, a process of land commodification necessary to the realization of profit from agricultural production. This process of commodification was, to Harley, much more important <u>within</u> the nation-state than in the broader world-system. The seventeenth and eighteenth century property surveys conducted in England and Scotland enabled "capitalist landowners to see their estates as a whole and better control them. Seeing was believing in relation to the territorial hierarchies expressed in maps."

(Harley 1988: 255). Just as the measurement and surveying of property improved landowners' ability to control their land, increased accuracy in surveying techniques refined the tracking of agricultural production for specific property. Measuring, calculating and managing land resources promoted more efficient and profitable production and the use of human labor in that process.

Advancements in mathematics led to increasingly scientific land surveying techniques. David Harvey asserts that

> The history of cartography in the transition from feudalism to capitalism has, like the history of time-keeping, been very much about refinement of spatial measurement and representation according to clearly defined mathematical principles. Here, too, the interests of trade and commerce, of property and territorial rights … were of paramount importance in reshaping mental structure and materials practices. (Harvey 1996: 239)

Chandra Mukerjee describes a transformation of early modern European geographical thought that promoted cartography for both the capitalist control of land and to chart the oceanic network of markets

> The interests of science and commerce combined to yield a language of cartography that on the one hand emphasized the size & shape of territories and on the other hand provided the navigator with tools to facilitate ocean travel. This language assumed the primacy of property and trade and thus tied scientific cartography to the emerging politico-economic system. (Mukerjee 1984: 30).

Mukerjee assigns two instrumental roles for cartography; first, at a localized scale for cadastral mapping of individual property and second, in the navigational charts and maritime atlases depicting an increasingly globalized network of trade.

Harley, Harvey and Mukerjee describe a period of feudal to capitalist transformation in cartography that is the starting point for many Marxist historians but which is almost completely ignored by cartographic historians. From the perspective of

the beginning of the twenty-first century these authors suggest that it may be possible to look back four or five centuries to see the beginnings of capitalism expressed in early modern map products. However, the quotations given above are highly generalized, sweeping assertions and, while appearing true in the main, fail to identify more than a few examples of exactly which cartographic practices and mapping practices from this period of transition were so important for "reshaping mental structure and materials practices." Their approaches to early modern mapping do not distinguish between different cartographic traditions among early modern cartographers in different cities or try to account for the differences in mapping products, publication and geographic content that resulted. Such generalized statements fail to note what information can actually be displayed at large, medium and small map scales, who the primary users of such cartographic 'tools' may have been and what historical evidence exists to be able to test these assertions. The historians of cartography that might be expected to close this gap fail to do so.

Both Harvey and Mukerjee make a simplistic presumption that the accuracy of mapped information improves the utility of a map; the greater the accuracy, the 'better' the map. The retrogressive application of nineteenth and twentieth century standards for surveying and cartographic accuracy simply misses the point other than somehow demonstrating how 'bad' or 'better' different maps have been in their cartographic depiction of locales. For early modern European cartographic history, evaluation of maps solely upon their accuracy compared to modern scientific standards applies an inappropriate standard of assessment and analysis and obscures other dimensions to cartographic production such as maps in service to business and trade in the early modern

period (Cipolla 1976; Edney 1993; Edney 1999). All of the maps in the atlases studied in this dissertation project were printed before the 'discovery of the longitude' and the application of precision latitude/longitude mapping practices. What will be demonstrated is that a capitalist world-economy of trade developed and was promoted by cartography during a period when even the best mapping practices could produce only maps of relative accuracy. Despite the marketing efforts of early modern map and atlas publishers to tout the freshness and accuracy of their work, the impetus for profitable buying and selling of commodities across continents through a global network of trade did not rely upon scientifically-accurate cartography as a precondition. The obsessive scientific rigor applied to the Cassini surveys of France has exaggerated France's contribution to cartography and its role in early modern European cartographic history.

Theoretical Aspects in the History of Cartography

The development of theory in the history of cartography expanded in the last quarter of the twentieth century in alignment with the emergence of post-modern theory in the social sciences. The prolific polemics of Harley in the late1980s initiated a broadening of cartographic historiography from its traditional positivist, biographical and empiricist scope to incorporate postmodern social science theory. Harley challenged historians of cartography to eschew a progressivist evolutionary model of cartographic history (i.e. that maps 'improve' as their accuracy increases) for a deeper reading of maps as social constructions (Blakemore and Harley 1980; Harley 1988a; 1988b; 1989; 1997). Harley studied historical maps as 'thick texts' imbued with social, political and religious meanings (Harley 1989, 9) that permit their assessment as social constructions with an implicit (and interpretable) iconology or semiology.

In what may arguably be his most controversial article, “Deconstructing the Map” (1989a), Harley attempts a Foucaultian analysis of discourse as a method of inquiry to study mapmaking. He asserts two sets of rules to be evident in Western cartography since the seventeenth century: the first “governing the technical production of maps…made explicit in the cartographic treatises and writings of the period.” The second relates to “a hidden aspect of their discourse” that require an understanding of “a broader historical context than either scientific procedure or technique.” (Harley 1989a, 4) Prior to Harley, the predominant scholarship in the history of cartography focused on biographical, bibliographical or map technology investigations. Extensive biographies of the more famous mapmakers and publishers such as Abraham Ortelius or Gerard Mercator have been written. These are complemented by bibliographical studies of the great atlases, map publishers and publishing houses from the first publication of Ptolemy’s second century maps in fifteenth-century Florence through the nineteenth century. Histories of the great trading companies such as the Dutch East India Company and the British East India Company delineate the political, social and technical histories of the maps that first portrayed the great trading networks of the sixteenth and seventeenth centuries. ‘Nationalist’ histories of cartography for France, the United Provinces and England (Konvitz 1987; Smits 1993; Van der Krogt 1993; Delano-Smith 1999) demonstrate changing roles of mapping in nation-state emergence (Buisseret 1992; Kain and Baigent 1984). Technical advancements in engraving, printing and publishing (Woodward 1974) supplement histories of map publishers and their production and distribution of maps and atlases (Pedley 1979; 1981). Theories of representation implicit

to the role of cartography in creating a visual culture focus on the iconography of maps and map symbols (Delano-Smith 1985; Wood 1993; Mukerji 1984).

In the decades since Harley's crusade to broaden the theoretical approaches to the subject, a new generation of historians of cartography has sought to meet the scholarly challenges he posed. Edney (1993; 1999; 2005) and Belyea (1992) attempted to formulate more explicitly a postmodern social science inquiry applicable to the study of historical maps. Approaches to theory in the history of cartography include studies of knowledge space (Stone 1993) and the change from the medieval world-view to the perspective of the Renaissance (Headley 1997; Turnbull 1996). David Woodward, co-editor of the multiple-volume series, *The History of Cartography*, described a methodology for studying cartographic history, but his proposed format is primarily mechanistic and bibliographical with a minimal theoretical framework (Woodward 1974).

Harley recognized that "maps can be seen to be imbedded in some of the long-term structural changes of the transition from feudalism to capitalism" and cites the theories of Immanuel Wallerstein as offering "many clues to this process" (Harley 1988a, 307). He describes the role of maps in the establishment and maintenance of state power (Harley 1989a, 12) and asserts that the establishment of property rights concepts in early modern Europe are demonstrated in the creation of cadastral and estate maps, specifically in England and Scotland. The delineation of private property and the mapping of an emergent infrastructure of roads, mills and field enclosures by the land-owning economic elite are demonstrative of this transition from feudalism to capitalism (Harley 1988b, 84). He also posits a role for cartography in the mapping of estates in Scotland by capitalistic

land owners in the division of labor required for the emergent world economy. However he offers no examples beyond property or cadastral map scale for how maps supported the emergence of the capitalist world system.

The role of cartography in the establishment of state administrative control over territory in the fifteenth through seventeenth centuries is described in Buisseret (1992) and Kain and Baigent (1992). The development of increasingly accurate surveying instruments and techniques with an expansion of mathematical education for the economic elite (E.G.R. Taylor 1954; 1966) promoted a conception of geography that implicitly incorporates capitalist tenets for land and labor control.

Eighteenth century map making is described as different from the previous centuries due to improvements in printing technology, an expanding market for sales of maps and atlases and the prevalence of a scientific focus for informational accuracy. Edney has differentiated different cartographic modes or practices that converged in the eighteenth century as mathematical cosmography. The scale of maps produced ranged from small scale chorography or the portrayal of large areas typical of atlas maps to large scale topographic maps utilized by polities for administration of territories and the protection of borders. For Edney the "'formal cartography' which is prosecuted within the commercial and governmental confines of the modern capitalist state" is the branch of cartography that best illustrates how mapping practices were most transformed in the early modern period (Edney 1993, 54). During the same period that French triangulation techniques for national surveys were being adopted by other European states, navigational pilot atlases and sailing guides were in constant revision and published simultaneously in Paris, Amsterdam and London. Their prolific and frequent publication

indicates that maps for plotting the trade networks in the Atlantic world grew in importance. Edney notes that the mathematical cosmography of this period was not restricted to maps alone but also itineraries of travels, descriptions of visits and encyclopedic 'geographic grammars' (Edney 1999, 193). The knowledge base of the early modern world was described and depicted in multiple forms of prose and graphic expression.

Aside from oblique and generalized adjectival reference to the 'economic' aspect or motivations to map certain portions of the world, the historians of cartography (with the exception of Harley's single reference to Wallerstein) have largely ignored the potential application of economic history theory to the history of cartography. The following section outlines world-system theory briefly with a focus on the patterns of commerce and trade that occurred parallel to developments in mapping. In addition the role of the central state bureaucracy in administration of territory, boundary-setting and control of commodity flow will be considered.

A World System Approach to the History of Cartography

Much of world-system theory originates in a series of books and articles by Immanuel Wallerstein. Wallerstein's sweeping analysis of the early modern period of competing European states deals with the Dutch United Provinces, France and England as their trade relations expanded between east central Europe and the Baltic and Mediterranean seas to incorporate other regions of the world. Wallerstein focuses for the most part on changes in the structure of labor relations initiated and imposed upon those states' external trade regions. However, he also suggests that the phases and expansion of the edges of the European economy might be successfully visualized in a series of maps:

"We might want a series of successive synchronic maps at intervals of 25 years that would show the volume, value and direction of trade in both luxuries and essentials and 'cumulative' maps for 1500-1650 and 1600-1750." (Wallerstein, 1980:9). While he imagines a constructed map series with little evident expectation of its realization, my research explores how atlases produced during that 250-year period demonstrate the emergent geography of the world-system

> that European trade involving primarily essentials rather than luxuries was carried on within boundaries that lay between eastern Europe, one the one side, and Russia and the Turkish Balkans on the other, and between the Christian and the Moslem Mediterraneans; and these boundaries would include the Americas but exclude Africa and Asia (Wallerstein 1974b: 9).

The maps in the world atlases published in Amsterdam, Paris and London do indeed show the expansion of the world-economy. My examination of the historical record of world atlases published from 1570 to 1800 illustrates graphically the expansion of the world-economy. The maps in these atlases do not, however, exclude Africa and Asia, regardless of Wallerstein's attempt to leave them outside his world-economy because their labor relations were not the same as within the Atlantic basin. Unfortunately Wallerstein and his adherents do not include any more detailed expectations of what those maps might convey about the world-economy. The 'geography' of the capitalist world-economy is ignored except for those examples that illustrate his view of labor relations between periphery and core. For Wallerstein, the issues between core and periphery revolve around control of the means of production – raw material sources, monetarization of the core economies and an evolving set of labor relations between core cities and their periphery.

Singular examples are cited by Wallerstein whose explications reinforce theoretical assertions but fail to be generalizable. The core-periphery dyad is defined in terms of labor relations within the social economies of the geographic regions respectively labeled as core and periphery (Hopkins and Wallerstein 1982: 45). Subsequent definitions for these respective labor relations concern the types of control over labor engaged in commodity production exercised by the core over its periphery. Unfortunately the examples of labor relations do not perform as distinctly as these world-system theorists would prefer and cannot be characterized as only one type of labor (forced labor, indenture, etc.) in either core or periphery.

Wallerstein utilized several geographic descriptors to locate the labor relations between the economically-dominant cities of early modern Europe and their distant ports of trade: core, periphery and semi-periphery. In his great work, Fernand Braudel took up Wallerstein's descriptors and described them in more geographically-explicit language than the former ever attempted (Braudel 1992). However, the definition of core and periphery in world-system theory seems almost tautological:

> In the world-system perspective, the core-periphery relation as such is itself central, designating as it does the single over-arching division of labor defining and bounding the world social economy in its successive phases of development. Core-cum-periphery and periphery-cum-core form and develop always and only in relation to one another, by definition…One may thus speak of a state's being 'in' the core or 'in' the periphery and, even, as 'moving' over time from 'core status' to 'semiperipheral status', or vice versa. (Hopkins and Wallerstein 1982, 45)

Since Wallerstein's geographic categories of core, periphery and semi-periphery are defined in terms of each other, the ability to signify edges or to bound the zones is important theoretically. Yet Wallerstein's analysis fails to develop a geographic context within the material character of the regions identified. The geographic extents of core,

semi-periphery, semi-core and periphery are defined by Wallerstein and Braudel at the broadest levels of boundary such as nation-states and at a localized level through specific examples found in the historical record. The descriptions have a geographic dimension from the standpoint that so-called city-based economies are demonstrably economic cores during their respective periods of hegemony over economic activities external to their immediate location. Overall, however, the actual geography of the world system is described as a series of economic relationships without much recognition of the spatial context, the geography of the arena in which those relationships were fostered.

The cartographic expression of economic relationships would not effectively display the trade networks Wallerstein imagines (Wallerstein 1980). While Wallerstein describes as desirable some series of thematic maps demonstrating volumes of trade flows for visualizing the emergence of and changes in the world economy, he does not explore what empirical data or cartographic record may exist that would depict the actual geography of economic relationships in that time. In the twenty-first century we are able to imagine how contemporary business and many other dimensions of economic activity can be relatively easily displayed in cartographic format to demonstrate the geography of economic activities. The most effective displays are a series of maps whose bases are conventionally the countries of the world including coastlines with a series of arrows indicating movement, transport, flows of goods and other connections between a specific core and its peripheral entrepots. The cartography of the period 1500-1800 does provide examples of the geography of trade in early modern Europe and its expansion. In fact, the historical record of printed atlases enables a more detailed and complex visualization of the differences between competing core states.

To develop a broader view of the trends in the publication of maps and to examine in more detail the actual published products of the economic competitors during this period requires the adoption of a new theoretical framework. This framework should provide a proper orientation for the creation of a dataset that can be analyzed and questioned. To develop world-system theory as espoused by Wallerstein into this more complex theoretical framework requires us to re-establish that the economic relationships occurred in real space and time, to bring geography back into the theory. The geographical extension of world-system theory thereby becomes a fresh theoretical approach to the history of cartography.

In developing the methodologies required for studying economic history from a world-systems perspective, Wallerstein and his collaborators have devoted much attention to establishing definitions that do not rely on more traditional theoretical frameworks such as the history of state-building or the history of capitalism from the perspective of a single polity. This is a difficult challenge since most datasets available for analysis are organized and compiled within the prevailing statist model; nation-state theory is the coin of the realm. Unfortunately, their Marxist approach to economic history seems to use geographical concepts for definitions but to rely upon social contracts for meaning. For example, the definition of capitalism from the world-systems point of view asserts that "the two fundamental processes remained the 'commercialization' of land and the 'proletarianization' of labor." (Hopkins and Wallerstein 1982: 56) However, the commercialization of land is defined and described only to the extent required to be able to focus on and then explain the proletarianization of labor. Wallerstein is not a geographer and takes a much less rigorous approach to geographical concepts and the

role of geographical location, context and meaning than the more familiar ground of political and social relations. My dissertation grounds the previously poorly-defined geography of the world system in the early modern period on the archival cartographic evidence of the three centuries under examination.

The role of mapmaking in expansion of the geographic size of the world by European states is evident in the increase of map and atlas production beginning in Amsterdam in the late sixteenth century. Maps were increasingly valued and used for exploration and discovery of new lands and incorporation of those lands into trade networks, primarily seaborne. Map archives should then contain evidence of the dependence that royalty, merchants and financiers had on maps. The relevance of capitalist world-system theory to understanding the history of mapmaking has not yet been attempted by historians of cartography. Wallerstein and other world-system theorists have outlined the role of core-states and the definition of core, semi-periphery and periphery within the system. These labels indicate roles that shift over time as the geography of commodities changes in response to wars, city growth and technological demands for raw materials in manufacturing. The development of city entrepots and hegemonic urban capitals (Braudel 1992: 403), long-distance commodity transport (Braudel 1992: 26; Wallerstein 1974: 38) and seaborne transportation networks (Vance, 1970; 1989) grew in importance. In addition, national demands for naval and continental military capability to protect territorial borders and trade networks illustrate some of the geographic dimensions in world-system theory traceable in the early modern cartographic record.

Theoretical models from historical geography also have applicability to the history of cartography. The role of transportation in city growth and capitalist systems (Clark 1958; Vance 1970, 1989) appears to reflect in abstract map diagrams the actual character of maps from the early modern period of Atlantic expansion into the West Indies and the American east coast. Vance's diagrams of the mercantile model and central-place models (Vance, 1970) bear an uncanny resemblance to actual Dutch, French and English atlas maps from the seventeenth and eighteenth centuries as do his later map diagrams describing transportation development stages from medieval to capitalist geographies (Vance 1989, 134 - 140). Donald Meinig's diagrams of a model for European colonial exploration, outreach and plantation (Meinig 1986, 67 - 71) appear to rely almost literally on three centuries of European mapping of the Atlantic world. However similar these theoretical geographies may appear to the actual maps produced during the seventeenth and eighteenth centuries, their applicability to understanding the history of cartography has not yet been made explicit.

Wallerstein and Braudel describe and begin to analyze the differences in trading policies, labor conditions and national economies in the economic leadership transition from Holland to England with discussion of the late seventeenth and eighteenth-century economic preponderance of France during the same period. The differences echo the conclusions of Edward Whiting Fox and his concept of the 'other France' (Fox 1991) and extend the implications for long-term roles in the capitalist world-economy that eventually culminated with Britain's emergence as undisputed economic leader or hegemon in the nineteenth century. Vance, Tilly, Meinig and Wallerstein (Genovese and Hochberg, ed. 1989) build upon Fox's 'history in geographic perspective' that address the

geographies of transportation, state-building, plantation and trade networks that also have potential applicability to a theoretical framework in the history of mapmaking by the three nation-states. Hugill has extended Mahan's concepts of naval strength and Fox's concepts of the competing interests in eighteenth-century France by distinguishing between trading states and continental states (Hugill 2005). This distinction is useful in exploring the mapmaking differences between the three economic hegemons active during this period.

Cartography as a Leading Indicator of Economic Growth

Political scientists have sought to explain the emergence of certain states as leaders within the long cycles of economic growth and decline by identifying sectors of innovation whose development permitted certain polities to become the dominant economies, the economic hegemons, in the world-system (Modelski and Thompson 1996). The outbreak and conduct of wars between early modern polities serves as the focus for one such analysis with seven questions being posed as to the role of war in long-term economic processes (Modelski and Thompson 1996: 42). These seven questions have been adapted in examining the role of cartography in the emergence of the capitalist world-system:

1. What are the influences of long-term economic processes on cartography?
2. How does cartography influence long-term economic processes?
3. Are all actors equally sensitive and important to the cartography – economic growth relationship?
4. How far back in time does the cartography / long-term economic growth linkage exist?
5. Is there reason to anticipate evolutionary change in the nature of the cartography / long-term growth linkage?
6. Is there systematic evidence to support the existence of a cartography / long-term economic growth linkage?
7. Are there major anomalies to the hypothesized pattern?

The influences of long-term economic processes on cartography are demonstrated in the emergence of cartography as a tool for both the nation-state and the capitalist world-system. Wallerstein defined the world-economy in social terms but without identifying the specific geographic dimension, a geography of goods and labor as the plane of economic activity. Early modern cartography and specifically, early modern world and maritime atlases, create a geographic narrative through goods, labor and capital moved. The rate of movement for goods was not often steady nor predictable between core and periphery. If the successive capital cities that were the hegemonic cores of the early modern world-system are mapped onto a Von Thunen economic surface, the 'gravity well' of capital and shipping from the Amsterdam and then London cores would influence movements across the entire geography. Paris had its own specific gravity in its dominance of the inland French provinces. The pattern of movement is radially concentric around Paris and appears little disturbed by movements beyond the French borders and coastlines.

Another dimension to the influence of economic processes upon cartography can be assessed by evaluating the publication rates of atlases from the competing economic cores of Amsterdam, Paris and London. Is it possible to detect the timing of publications in relation to broader economic activities? This is traditionally demonstrated with charts of trade goods or tax tolls but could also be illustrated by the collation of atlas maps that depict specific arenas of economic activity. Cartographic production increases in the economic cores since the core capital cities are where technology and skilled labor are concentrated to be able to publish maps and atlases. In terms of long-term economic processes, the portrayal of coastal entrepots in the Italian portolan charts of the

Mediterranean in the fourteenth and fifteenth centuries marks the beginning of the use of early modern maps for commercial purposes that has continued to the present.

The continual portrayal of economic opportunities in the form of cities, regions and networks of roads can be noted by the emergence of maps and atlases as valuable commodities. To address the second question of the influence of cartography on economic processes it is important to distinguish the different cartographic practices applied to the core, semiperiphery and periphery. By 1728, an English maritime atlas can state in its introduction that only those places visited by English ships for trade are included in the atlas (Halley 1728), a clear assertion that it is a commercial atlas whose contents and constituent geography is determined by trade information.

The sensitivity of different actors to the cartography / long term growth relationship is best described by noting that mapping processes is integral both to the emergence of capitalism and the formation of the early modern polities. The same actors, whether polities, states, armies or merchants, used maps as instrumental tools in action. At a state administrative scale, those states that did not map themselves as a core found their lands mapped by others with a subsequent loss of control over their own history. Dominant states map for dominance over land if they have territorial ambitions. Overlaying the political geography are the networks of economic opportunity upon which merchants and investors focused their commercial ambitions. The territorial atlases of the French betray their rulers' focus on controlling territory regardless of its economic value.

How far back in time do the cartography / long-term growth linkages exist? The archival records demonstrate that the first recording of Mediterranean ports in manuscript portolan charts. But their simplistic portrayal was soon transformed into the Dutch rutters

and pilot guides and eventually into maritime atlases focused on specific economic arenas such as the *English Pilot* series with its separate volumes for Europe, America, Africa, the Mediterranean and eventually Asia.

Did evolutionary change in the process of mapping and publication occur that affected the cartography / long-term growth linkage? As the technology and techniques of surveying and astronomical observation grew more accurate, the ability to map territory and seaborne networks improved as well. The positivist tradition in the evaluation of early maps for their accuracy documents the numerous efforts by scholars to link improved accuracy to the definition of a 'better' map. But the capitalist world-system emerged during the years of relative accuracy in mapping, an accuracy that held dangers for ships and their cargoes but sufficient to build the seaborne linkages between core and periphery.

The existence of a cartography / long-term growth linkage has never been explored. The analysis of atlas publication rates from the early modern core cities provides direct confirmation of this linkage. Post-modern scholarship focuses on how the commodification of land and its cartographic portrayal has been primarily to the benefit of those in power and enhanced their ability to control and manage property and resources. Beyond this interpretation is evidence that the advent of the capitalist world-system was also the beginning of the use and control of the seas on a global scale as a network of economic activity, the "opening of an entirely new age of seapower" (Modelski and Thompson 1996: 4). The world-system emerging during the early modern period expanded to occupy a global arena and the cartographic portrayal of the 'new'

arena, particularly following the discoveries across the Atlantic, is visible in the terrestrial and maritime periphery atlases.

Several anomalies to the hypothesized pattern emerge in the traditional canon for the history of cartography. The mapping of the cores was a different process and occurred at an earlier period than the mapping of the periphery as will be discussed in Chapter III. The techniques available for creating terrestrial world atlases evolved at the same time as knowledge and familiarity with new territories grew. But the approaches by the cartographers in Amsterdam, Paris and London reflect differences in both why and how the periphery could and should be portrayed. France, as a territorial state, exemplifies the use of cartography to reinforce its expanding ambitions on the European continent. But its cartographic production was folded inward to serve this focus while its rivals, the Netherlands and England, applied their cartographic attention to external arenas to manage and expand their trade networks. France is given pride of place for its eighteenth century national survey efforts but this assignment of first position elides the contribution of the more pragmatic atlases published in Amsterdam and London that create a different picture of the world. In particular the production of pilot guides, sailing instructions and maritime atlases was initiated by the Dutch and copied by the English. The French were never active participants in the maritime cartographic trade.

The rates of atlas publication have never been assessed by historians of cartography. With the exception of Akerman's work in the early 1990s, there have been no efforts to find motivations for mapping in the early modern period beyond the utility to the early modern state. An entire genre of plain, miniature atlases whose primary function was the communication of useful geographic information has been ignored.

Succeeding chapters in this dissertation will provide answers to how and why cartography and specifically the publication of atlases is an integral and evolving dimension to the emergence of the capitalist world-system.

CHAPTER II

DATASET OUTLINE: SEEING THE FOREST FOR THE TREES

Atlases as an Analytical Research Tool

The analysis of temporal trends in atlas publication during the early modern period can be made by the assessment of consolidated inventories of atlases through a series of specific classification schemes. The character of such inventories does not readily promote time-series analysis since the inventories may be in a library catalog or published as an annotated bibliography. There exists no major list of early modern atlases published in Europe. The researcher is forced to winnow archive holdings to create a dataset for analysis.

Major bibliographies of atlas archives have been published for the Library of Congress (Phillips 1909; Phillips and Le Gear 1975) and the British Library Map Library (Shirley 2004). Information about each atlas in these archives typically includes date and place of publication, subject area of geographic coverage and type of atlas. Other bibliographies of atlases in archives narrowly represent a particular period and/or country of origin (Pastoureau 1984). Some bibliographies record all atlases produced by a specific country's cartographers and all copies (original or facsimile) of a map or atlas in the libraries of the world (Koeman 1967; Van der Krogt 2007). Simply stated the bibliographies of historic atlases do not have a common focus. Map and atlas bibliographers are not consistent in their documentation. Such a criticism is not meant to imply that the bibliographies are incomplete or sloppy, simply that inconsistencies in organization are immediately confronted when seeking to perform analyses of early modern atlases.

Studies of atlases as a specific genre are not plentiful. The studies of national atlas output are typically organized topically, biographically, geographically or chronologically. The information recorded varies from general descriptions of whole atlases with only a summary of individual map contents to extensive collations of the maps published in different editions of a particular atlas. National cartographic histories (Pastoureau 1984; Delano-Smith and Kain 1999) are organized topically by author, the type of maps produced or for a particular period, place or firm. Each topical discussion is typically structured in a temporal sequence. Pastoureau alphabetically catalogued French atlases published in Paris between the sixteenth and seventeenth centuries by the author's name. Delano-Smith and Kain organize the history of English mapmaking by topical chapters describing different kinds and scales of maps. Their description begins with the first known manuscript maps of the British Isles. Printed atlases are included in the topical discussions of different kinds of maps. The major archives in Western Europe whose atlas holdings have been published in some form include the Bibliotheque National (Pastoureau 1984) and the British Library Map Library (British Library 1998, Shirley 2004). Other archives with partial bibliographic listings include the Biblioteca Nazionale Marciana in Venice (Falchetta 2000), the Ryhiner Collection of Switzerland (Kloti 2003), the National Library of the Netherlands and the Deutsche Bibliotheksinstitut of Berlin. Many European national archives have digital records that can be queried for their cartographic holdings. Libraries may catalogue historic atlases among all other holdings or place their cartographic materials in a special collection whose contents may or may not be accessible remotely. However, bibliographic records for historical maps and atlases have only become a separate category listing in library

catalogues within the past decade. The capability to conduct searches through on-line catalogues varies by specific library and collection and in extent, detail and the formatting of individual descriptive records. The difficulties encountered during attempts to search, identify and then group an archive's cartographic holdings by author, date or place of publication discourages scholarly comparative investigations into the larger patterns of atlas production of the early modern period. In this research, the analysis of patterns of publication over time is the basis for ascertaining when and where atlas publication occurred in order to determine whether such publication can be considered an indicator of economic growth.

The holdings in contemporary cartographic archives appear to be relatively stable in their size and composition although an active map trade flourishes among private dealers. The few bibliographies of cartography published in this century provide sound inventories and descriptions of atlases held in the major archives in Europe and America. Several were published before the advent of digital publishing standards and can only be consulted in their printed book form (cf. Pastoureau, Phillips and Le Gear, Karrow). Obstacles to research on atlases as a distinct form of geographical knowledge begin with the biographical and bibliographical approaches traditionally used for cataloguing and describing historic cartographic documents. Biographical approaches are typically arranged alphabetically by author, cartographer or atlas publisher. Bibliographies also follow the convention of listing works in alphabetical order by the author's name. Attempts to develop a chronological sequence of cartographic production is not simple for these reasons, and this author's experience with experts in the history of cartography indicates that knowledge of the historic record can only be gained by long familiarity

with the subject. This familiarity begins, obviously, by reviewing the literature and reading the many books published on the history of cartography.

Nevertheless, an understanding of the rates of publication or centers for cartographic production cannot be derived by simply studying the entries in a typical cartographic bibliography. Six primary bibliographies produced in the history of cartography over the past century arrange all entries alphabetically by author or topic. Only the most recent bibliographies of the British Library are products of computerized databases (British Library Map Library CD-ROM 1998; Shirley 2004). But all of these by their arrangement and classification schemes take a traditional biographical approach to the history of cartography that structurally elides alternative approaches to the subject. The format and arrangement of information contribute to the furtherance of approaches in the well-worn paths of biography. The disadvantage to purely biographical approaches is the inability to frame atlases within any particular history, to compare atlas production rates between production centers or to compare atlas publication with other quantitative indicators of economic activity in the early modern period. The arrangement of cartographic bibliographies, despite their individual completeness, literally dictates that only biographical and topical approaches to the material can be taken without a great deal of effort to re-arrange the data into a different format.

However, “atlas bibliography and inventory should not be taken for atlas history” (Akerman 1995, 26). The examination of atlases as potential indicators of larger patterns of economic change within a capitalist world-system requires approaching the bibliographic record from a different direction. That there has been too little understanding of atlases as a genre of scholarship was noted at least as far back as 1909

by Philip E. Phillips, creator of the atlas bibliography for the Library of Congress who noted a "paucity of works on the subject" (Phillips 1909: III). As Akerman notes:

> In sum, the greater share of scholarship on old atlases to date has been consistent with the broader tendency in cartohistoric scholarship to emphasize bibliography, biography, and the description of cartographic artifacts rather than the analysis of broader patterns in their formal evolution or relation to society at large (Akerman 1991: 29-30).

The structuring of scholarship in the history of cartography without an identifiable theoretical sense was criticized over twenty years ago as "lacking a major hypothesis or some other conscious structuring principle" which "…fails to advance the growth of understanding about the nature of cartographic development and of the place of maps in history" (Blakemore and Harley 1980: 36). As described in the previous chapter, the predominant theoretical hypotheses are the use of cartography by the emergent early modern nation-state and the hermeneutic post-modern dissection of maps as carriers of symbolic power relations. World-system theory in the theoretical scholarship in the history of cartography is used for the first time in this dissertation.

To perform a world-systems analysis on early modern atlas production requires development of a dataset for analysis. Multiple sources were investigated that had to be re-structured to permit temporal analyses. Prior to the analysis of the atlases themselves, it is useful to provide some background into the early modern context from which atlases were published and to have a working vocabulary for terms used in the following sections of this chapter. Definitional parameters need to be established for how the datasets were created and subsequently analyzed. The following section focuses on the attempts to provide a definition of an atlas and its composition. Next, the sole recent work on the properties of atlases as they may be understood by the contemporary researcher is mined

for the analytical attributes necessary for placing atlases in their broader context as instruments of knowledge. An assessment of the bibliographic sources available and used in this study will demonstrate how the structural morphology of atlases provides historians with divisible knowledge bases for understanding the geographic conceptions operative in the early modern world-system. Finally the patterns of production and the contents of the atlases published in Amsterdam, Paris and London are compared from the holdings of the British Library Map Library and the US Library of Congress.

Definition of an Atlas

What constitutes an atlas or differentiates an atlas from a topographical description or itinerary or book? What is the difference between a book of maps and a book with maps? Phillip Lee Phillips, the first director of the Map Division of the Library of Congress, did not define an atlas nor offer any descriptive attributes in his listing of the atlases in the Library, the first volume of which was published in 1909. No archival bibliography of atlases was prepared for more than a half century until Cornelis Koeman's *Atlantes Neerlandici* (Koeman 1967). The *Atlantes Neerlandici* is a global inventory of printed early modern Dutch atlases held by libraries, individuals and institutions. Koeman describes the difficulty of excluding printed works that contained maps in his introduction but admits that categorical limits were "ill-defined", particularly in regards to pilot guides and maritime atlases (Koeman 1967). Mireille Pastoureau's bibliography of sixteenth and seventeenth century French atlases published in Paris fails to provide a definition at all – one is to assume that if an entry is found, then it must match the author's definition (Pastoureau 1984). The most complete set of traits distinguishing an atlas from other geographical works was developed by Akerman:

> In sum, atlases are finite works drawn up in order to describe a geographical area, to illustrate geographical patterns or processes, or to make some point requiring cartographic explication. They differ fundamentally from most other forms of cartography in that the content or meaning of any one atlas map is subordinate to, and shaped in large measure by its apparent and conceptual relationships to its cohorts in the set. The sum of these relationships, the structure of an atlas, should be a major focus of any historical account of atlas-making and atlas use. (Akerman 1991: 11-12)

Van der Krogt asserted that "an atlas is defined as a book with maps, which meets the following characteristics" and such characteristics make clear that an atlas is "a work in which maps are the main medium of information, where the accompanying texts repeat or complete the same information in words":

> a collection of printed maps in book form or bound similar to a book with a printed title page; in cases where text is included, the publisher's intention to give the dominance of graphic elements (particularly maps, plans or town views) over textual elements, must be clear, either from the title (expressed by the word "atlas" or not) or from the concept of the work; the rough uniformity of map format, design, and presentation throughout the work; and the standardization (generally), from copy to copy in each edition, of composition and arrangement of atlas components. (Van der Krogt 2007)

Rodney Shirley in his great collation and descriptive bibliography of the 3200 atlases in the British Library used a simpler and more inclusive definition. Refusing to exclude texts solely using maps as illustrations and citing "the wider current interest in associating commentary text with cartographical illustrations, the Maps in the Atlases of the British Library includes "books of geography, history, travel and other works…if they contain at least nine maps" (Shirley 2004, 1). Such a reference to a minimum of nine maps permits the inclusion of Patrick Gordon's *Geographical Grammar* described in a later chapter.

Unfortunately there exists no master list of published early modern atlases. With only two of the three major archives having produced relatively complete descriptive

bibliographies, estimates for production in the early modern period must rely on what is known to have survived in archives.

> There is at present no direct way of calculating the production of atlases by various Western countries during he early modern period. The size of press runs of only a few titles are known or estimated with any certainty, so one is reduced to counting titles either from existing bibliographies or inventories. It would be preferable, perhaps to summarize data from bibliographies, but at present bibliographical data is spotty (Akerman 1991: 302).

Since much of the collation of early modern atlases in this research has been conducted from published atlas bibliographies, the definitions of an atlas used by each of the compilers will inform the inclusion of printed works in each bibliography. In later sections, the winnowing of the bibliographic listings to create a narrowed subset of world and maritime atlases for examination is explained.

Attributes of Atlases

Akerman provides the most precise and articulate description of the "prescriptive formal attributes" for atlases (Akerman 1991: 97 – 101). These attributes include map dominance, the composition of maps within an atlas, the stylistic integrity of the maps as a bound set and the coherence of the set of maps as a whole.

Map dominance

Map dominance is the characteristic that seems to require an intuitive assessment of a publication to determine whether the meaning and value of the work is established by the informational content of the maps. The roles played by any additional material bound with the maps such as text, diagrams, tables or drawings is judged to be subordinate to the importance of the maps themselves. However, atlas bibliographies invariably contain examples of works that by their importance or longevity are typically included such as Guthrie's Geographical Grammar (Guthrie 1770), a book of over three

hundred pages of text with no edition containing more than twenty-four small maps.. The compositional attributes of an atlas are based upon the presumption that the maps contained within an atlas are consciously assembled by the atlas editor such they draw “a unique portrait of contemporary geographic perceptions and ideas.” (Akerman 1991: 75).

The first printed atlases from Venice and Rome are termed *atlas factice* or ‘atlases made to order’. The traditional examples are the atlases assembled by Lafreri in the sixteenth century by which a volume of maps from multiple sources, with multiple styles, in short whatever maps were available from the existing stock were simply bound into a single volume. Such atlases reflect an individual’s taste and interest but are impossible to study for their coherence because of the complete variability between buyers. There are no editions of *atlas factice* or evolution of contents since each was unique. Such atlases were assembled, not composed. The norm sought for historical consistency is in those atlases designed by an editor or publisher that adhere to a common composition. For atlases to be studied as a historical phenomenon there needs to be standardization and consistency between editions, a standardization of the maps included and a consistent graphic style.

Stylistic integrity

The maps in an atlas should appear to be from the same set with consistent “size, format, symbolization, lettering and color” to look like a single unit (Akerman 1991: 99 – 100). Stylistic integrity promotes a level of trust in the reader by communicating an informational narrative between and among the maps. The Lafreri *atlas factice* contained maps at different scales, formats and engraved in different styles thus affecting their stylistic integrity.

Modes of coherence

The mode of coherence of an atlas is the intentional composition that controls the design of the maps included. Coherence as a published unit of cartographic information and knowledge seems to be another intuitive assessment of an atlas's contents. The narrative qualities of an atlas are also promoted by its coherence - an atlas is an intentional document in which maps are the primary communications device and these communicative qualities are consciously composed and arranged by the author. A single edition of an atlas has a coherence that can only be assessed after the fact as an interpretation of the editor's intentions

Structural morphology

As Akerman notes, it is difficult to assess the intentions of an atlas publisher long after the fact. The researcher must rely on the analysis of atlas structure to discover some of the motivations for creating an atlas. It may then be possible to understand the conceptual geography of a society as illuminated by an atlas' structural morphology, taking the atlas as a model of the shape and logic of the perceived world or some part of it. Different than the modes of coherence, analyzing structural morphology does not assess the relative conformity for atlas maps to structural rules but reveals the way in which the rules are utilized to argue and instruct (Akerman 1991: 77).

The structural morphologies for different kinds of atlases have not been explicitly addressed in the history of cartography. Nor has the impact of specific cartographic production centers' products been understood within the larger framework of map and atlas types. The maps contained in one hundred fifty early modern terrestrial world atlases published in Amsterdam, Paris and London were collated and analyzed for their

structural morphologies. The comparative morphologies of different atlases permit comparisons and interpretation at a meta-level for understanding potential differences in the structuring of the world by the primary economic competitors of the early modern period. As will be described in subsequent chapters, world, regional and maritime atlases published at different time periods from Amsterdam, Paris and London and intended for different audiences show both differences and similarities. Were the terrestrial world atlases published in Paris during the reign of Louis XIV morphologically different from the terrestrial world atlases published in Amsterdam and London in the same period? The differences are not as great as might have been expected. Each of the early modern production centers published maps in atlases that were unique to their individual situation. These atlases proved attractive to the marketplace and long print runs and multiple editions were printed and sold. The maritime atlases from sixteenth century Amsterdam set the precedent in their structural morphology that dominated all maritime atlas publication for more than a century. The great Cassini survey of sixteenth and seventeenth century France established a structural morphology for how a nation-state could map itself and against which all other countries' national surveys have subsequently been compared. The county and road atlases published in sixteenth-century London were a unique form of cartographic communication that would not be duplicated by any other early modern country for more than a century.

This research began in the bibliographic collation of world, regional and maritime atlases for their structural morphologies. What emerged from this analysis was a new set of definitions from a world-systems theoretical standpoint in which the nation-state model could be set aside and the primary centers for cartographic production viewed

through a different lens – the lens of economic core, semi-periphery and periphery. The structural morphology of early modern atlases published in Amsterdam, Paris and London presents multiple sets of geographic perceptions and perceived structures to the world. The predominant scholarship in the history of cartography has given precedence to the cartographic portrayal of the emergent early modern nation-state. Another geographic perception never before presented is the perception of the world's geography as a marketplace of economic opportunity. But this alternative morphological interpretation was not easily gained due to the bibliographic orientation of archival documentation.

Types of atlas maps

The maps found in early modern terrestrial atlases vary in their method of geographic coverage. Akerman identifies three types of terrestrial atlas coverage: cellular, regional and hybrid. A cellular map is one of individual equally-sized and equally-scaled units representing a larger geographic area. Cellular maps covering a specific region can be placed edge to edge to create one large map without overlap between the individual cellular units. The first world maps created by Gerhard Mercator in the mid-seventeenth century were cellular maps intended to be glued onto the wall. Cellular map atlases were published in Amsterdam and London but the primary historical example is the Cassini surveys of France. The US Geological Survey topographic series at 1:24,000 is a contemporary example of cellular map coverage: if the borders of each map for the state of Texas are trimmed and the maps taped edge-to-edge, a cellular coverage is created in which no information is duplicated on two maps.

Regional maps cover a single region such as a continent, a country, a county or province. Scale varies depending upon what 'region' is depicted but a regional map is of "a territory that has been defined and unified by some human or physical characteristics" (Akerman 1991: 364). The difference between a cellular map series and a regional map series is that the cellular maps all share a consistent scale. Regional map series may vary in scale in order to print all of a province or county on one sheet. Sometimes different regions of the same country would be printed at different scales for publication convenience. Saxton's atlas of English counties had varying scales for each county and when several of the smaller counties were printed together on the same sheet, viewers were confused (Morgan 1978).

Hybrid atlas maps are a combination of cellular and regional map coverage and are the most common form of map found in early modern terrestrial atlases. Akerman categorizes hybrid maps as either maps of regions where two or more are named or where a large region is divided into "pieces with no established regional identity" with his example being northern Germany and southern South America in the early modern period (Akerman 1991: 366). To depict an entire geographic unit as it was then conceptualized required several hybrid maps. The core atlases fall into this category. Speed's Theater of the Empire of Great Britain begins with a small-scale map of England and Wales followed by maps of the English counties.

The types of maps to be created and engraved for an atlas was a choice made by the author of that atlas and dependent upon the factors of cost, availability of information atlas format and the intended structural morphology. An observable and often-repeated pattern in early modern atlases is the duplication of the best maps available regardless of

their source. Copying the most accurate and up-to-date cartographic information was a common practice among the cartographic community with copyright protection and monopoly rights relatively rare privileges granted by royal authority. As will be evident in later discussion, publishers in Amsterdam, Paris and London were not reluctant to buy, use and copy each other's cartographic products if their competitors' work was available to them and represented improved offerings to attract customers. The collations of early modern atlases by scholars provides the researcher with many examples of Dutch maps published in French and English atlases, of English maps printed in French and Dutch atlases, of French maps copied by the Dutch and English.

Technical Characteristics and Nomenclature for Early Modern Atlases

This research confines itself to printed atlases published in Amsterdam, Paris and London between 1500 and 1800. The technical process of printing dictated a consistency of production that is shared by all of these atlases. All of them were printed from engraved copper plates on paper whose largest size was 600 millimeters by 700 millimeters. Rarely were atlas sheets printed at this maximum size due to expense and difficulties in maintaining quality control for such a large engraving. The cost of copper for printing at that size was not considered economical and the vulnerability of plates and necessity for storage between print runs also militated against atlases that size.

Due to the limitations of paper manufacture, the largest sheet of paper that could be printed was approximately 600 millimeters by 700 millimeters. As will be described below, this production size limit established the formats for all early modern atlases in terms of what proportion of the printable sheet size was actually printed. The terminology used to describe the sizes of atlases divides the sizes into four basic formats:

folio, quarto, octavo and duodecimo. Folio is roughly half the size of the maximum paper manufactured. The proportions would vary as to height and width of an atlas map sheet so that folio atlases are variously described as ‘tall’, ‘very large’, ‘oblong’, and ‘elephant’. Quarto atlases were approximately one quarter of the maximum sheet size with a similar set of adjectives applied; ‘tall’, ‘oblong’ and ‘rectangular’. Octavo-format atlases were approximately one eighth of the maximum sheet size and described as ‘small octavo’ or ‘oblong octavo’. The oblong descriptor refers to the map sheets oriented with the long edge parallel to the bottom of the maps. Duodecimo atlases, the smallest format, were one-twelfth of a manufactured paper sheet and could be ‘tall’ or ‘oblong’. Examples of the range of dimensions for each format size are given in Table 1 based upon a listing of atlases described by Shirley (2004).

Table 1. Nomenclature for atlas map sheet sizes in millimeters (adapted from Shirley, 2004)

FOLIO	TALL FOLIO	ELEPHANT FOLIO
335 x 230	655 x 320	650 X 585
450 x 325	700 x 350	
385 x 260	470 x 300	OBLONG FOLIO
335 x 355		235 x 340 460 x 580
420 x 310		280 x 385 295 x 420
370 x 280		180 x 435 295 x 385
		430 x 530 240 x 410

VERY LARGE / LARGE FOLIO		
555 x 400	610 x 485	595 x 425
560 x 430	655 x 320	625 x 450
610 x 430	620 x 420	555 x 435

QUARTO	TALL QUARTO	OBLONG QUARTO
235 x 340	295 X 195	200 x 360 200 x 280
280 x 385		220 x 335 155 x190
180 x 435		195 x 170 205 x 300
		200 x 280 165 x 120
		235 x 330 135 x 205

OCTAVO	SMALL OCTAVO	RECTANGULAR OCTAVO
190 x 140	150 x 130	145 x 165
180 x 125	120 x 85	195 x 150
165 x 115	140 x 100	175 x 150
190 x 130		175 x 140
200 x 130	OBLONG OCTAVO	145 x 180
210 x 130	170 X 210	165 x 140
175 x 110	100 x 160	
215 x 140	95 x 160	TALL OCTAVO
	165 x 115	210 X 100

DUODECIMO		TALL DUODECIMO
115 x 85	115 x 110	180 x 100
135 x 110	135 x 90	
130 x 140	125 x 90	OBLONG DUODECISMO
115 x 95	130 x 85	155 X 190

Bibliographic Resources

Bibliotheque Nationale, Paris

The most comprehensive bibliographic work on early modern French atlases, *Les Atlas Francais XVI – XVII siecles* published in 1984 by Mirielle Pastoureau, is organized alphabetically by author name. The atlas descriptions are indexed at the end of the volume chronologically by publication year, by geographical subject area and topical subject area. These indexes enable cross-referencing to specific works described in the main text listings. The thirty authors represented as publishing atlases in France in the sixteenth and seventeenth centuries are actually represented by published works beginning in 1488 (von Breidenbach) through 1817 (R. Beaugard). The time span from the title of the work expands the publication dates through the eighteenth and into the nineteenth centuries as subsequent editions of seventeenth century atlases are listed.

An analysis of the topical subject area index reveals a pattern of keywords typical to traditional cartographic history. The alphabetically-arranged Map Subject Index contains 65 main subject areas keyed to either a page number or a specific image reproduced as an illustration. Certain index listings have sub-headings such as the eighty-seven different dedicatory references to the patrons of particular atlases. Under "Portraits" are forty-one subheadings referencing individuals whose portraits are depicted on an atlas map. Several personages have more than one portrait within a single atlas so the forty-one individuals listed in the index are portrayed in sixty-five portraits. Other potential subject areas receive scant attention; a single index entry under "Commerce" references the atlas in which the map may be found but without any description of the map. The index classifications with the greatest number of subheadings are:

"Dedicataires (sauf le roi)" (87), "Portraits" (65), "Habitants" (55), "Souverains" (24), "Enseignes" (20) and "Allegories" (18). This is an index focused on symbols of royal favor and personal and political characterization of patronage. To evaluate the number of atlases produced in France in a particular year or during a particular time span between 1688 and 1817 would require re-organizing the chronological index of authors' publications by hand. However, *Les Atlas Francais* is a nationalist bibliography because only French atlas makers are documented. No mention is made of atlases of non-French origin that may be held in the Bibliotheque Nationale (BN) archives and therefore it is not possible to analyze the archive for comparative totals of atlases from all places of publication. There has not been an updated edition of the Pastoureau publication so there may or may not be additional atlases that have been discovered in or have been acquired for the BN collection. Assessment of atlas production for the rest of Europe is not feasible from the single Bibliotheque Nationale atlas bibliography.

Cornelis Koeman's *Atlantes neerlandici*

Koeman created his bibliography of Dutch atlases with a unique goal: to document the whereabouts of every edition of every early modern Dutch atlas up to the nineteenth century. This documentation included contemporary facsimiles of previously-published Dutch atlases as well. Koeman was succeeded in this project by Peter Van der Krogt at the University of Utrecht. The standards of documentation are the most complete for any historic atlas bibliography in the world and established a quality and completeness to which all subsequent bibliographies in the history of cartography must aspire. Just as Phillip L. Phillips's life work was the documentation of the atlases in the Library of Congress, Koeman and now Van der Krogt dedicated themselves to

identifying every historic Dutch atlas printed up to 1880 that may now reside in any library or archive in the world. According to Van der Krogt's website, over ten thousand Dutch atlases have been located in more than seven hundred fifty libraries worldwide (http://cartography.geog.uu.nl/research/atlantes.html).

To analyze the structural morphology of early modern Dutch atlases, it is not necessary to collate every edition of every Dutch atlas between 1500 and 1800. The multiple editions of a particular atlas have been collated in the bibliography with the titles of each edition's maps that typically indicate that map's geographic coverage. The detail provided by Koeman and Van der Krogt permits careful comparisons between specific editions to identify changes in plates as well as alterations and additions on individual maps. For researchers interested in the identification of every change in the map plates for different editions or in creating a specific genealogy for an individual map, this bibliography is recommended. For my research, the *Atlantes neerlandici* is used to identify the patterns of coverage in early modern Dutch atlases in terms of their portrayal of zones of economic interest. This analysis of the structural morphology of Dutch terrestrial world atlases describes the emergence of the capitalist world system from the point of view of Amsterdam and its market of atlas publishers.

Abraham Ortelius' *Teatrum orbis terrarum*

Another format for cartographic bibliography organized biographically is Robert Karrow's *Mapmakers of the Sixteenth Century* (Karrow 1993). Karrow extended the scholarship on the Ortelius' author list from the 1570 Antwerp edition of the *Teatrum Orbis Terrarum* (TOT). The book is organized as an extensive set of individual contributor biographies with a meticulously researched bibliography of their known

cartographic publications and scholarly careers. The arrangement of authors is, once again, alphabetical with no analysis of the remarkable geographical distribution of authors contributing to the first modern atlas. The larger roles that mapping played in the social, political and economic structure of the period is instanced within the individual biographical and bibliographical descriptions with no speculations as to broader patterns or implications for map making and cartographic history. Collation of the different editions of the TOT provides a basis for understanding the structural morphology of the first true atlas (Van den Broucke 1996).

On-line map collections

The availability of on-line image databanks from historical cartographic collections varies widely and is a sufficiently broad subject to deserve a separate study. Both public and private collections are learning the advantages of having their map holdings more visible and the number of sites featuring high-quality digital images is increasing rapidly. The most extensive on-line archive may be the collection of David Rumsey with more than 12,000 individual maps and atlases; the goal by this private collector is to put his entire collection into remotely-viewable format (http://www.davidrumsey.com). The number of Web-based archives is increasing as part of the efforts by state, university and local libraries, museums and archives to make their historical cartographic holdings more accessible to the public as well as to researchers. In particular, historical museums are mounting exhibits of maps contemporary to period artifacts displayed (Library of Congress American Memory exhibit, http://lcweb2.loc.gov/ammem/gmdhtml/armhtml/). Historians of cartography maintain an internet portal to archival collections, scholarship and other resources pertaining to the

history of cartography that include many library and archival collections that have mounted parts of their cartographic collections on-line (http://www.maphistory.com).

U.S. Library of Congress

An historical treatment and description of the map and atlas collection of the Library of Congress was published in 1975 while Walter W. Ristow was chief of the Geography and Map Division. Long out of print, *The Geography and Map Division: a guide to its collections and services* (1975) remains the most complete history of the collection, the political processes and individuals responsible for the archive's evolution. An on-line historical and political description of the collection based largely upon the 1975 publication is provided at the Library of Congress website (http://www.loc.gov). The Library of Congress claims to be "the largest and most comprehensive cartographic collection in the world, numbering over 4.6 million maps, including 60,000 atlases, 6,000 reference works, numerous globes and three-dimensional plastic relief models, and a large number of cartographic materials in other formats, including electronic." (2005 http://www.loc.gov/rr/geogmap/gmhist.html) The continued acquisition of individual maps and private collections either by donation or Congressionally-approved purchase reinforce the stature of the Library of Congress Geography and Map Division archive as a primary source for scholarship in the history of cartography. There is, as might be expected, a focus on maps of America, but this bias also means that maps by any map-making source of repute are included in the collection. The analyses performed by Akerman on the Phillips and LeGear bibliographic listing of the atlases in the Library of Congress (Akerman 1991) will be compared to the results of my own analyses of the British Library Map Library.

Between 1909 and 1974 the atlases of the Library of Congress were catalogued by Phillip L. Phillips and Clara Egli LeGear in *The Atlases in the Library of Congress*. The eight volumes were published as a periodic series detailing the atlases acquired by the Library over that sixty-six year period. Each volume is prefaced by a summary of significant acquisitions. The atlas listings are divided into nine topical categories: world, maritime, regional, urban, historical, road and travelers, war and military, itinerary and isolarii (island). The definitions for what defines an atlas and explanations for how individual atlases were assigned to a particular topical category are not described by Phillips in any of the volumes. Since Phillips and Le Gear were the first to sort and catalog the cartographic collection in the Library of Congress, their published atlas classification system remains the organizational foundation for the archive. The individual atlases within each topical area are listed chronologically by date of publication. Phillips and Le Gear improved their descriptive contents in successive editions of their catalogue eventually to include the place of publication, year, language and a listing of the individual maps in each atlas. The individual map descriptions within each atlas include the map scale, title, dimensions and geographic coverage of each map. Since 1974 the bibliographic descriptions of atlases in the Library of Congress have been entered as part of the on-line library catalog. However, the individual maps are no longer identified within each atlas. This listing remained the most in-depth description of atlases and their individual maps for any archive until the 2004 publication by Rodney Shirley of *Maps in the Atlases of the British Library*.

The analytic approach for my study is inspired by the 1991 work by Akerman analyzing Phillips and LeGear's bibliographic listings of the atlases in the Library of

Congress. Akerman identified 569 atlases printed between 1476 and 1800 and analyzed these to demonstrate the political obsessions of eighteenth century France for the acquisition of territory within Europe (Akerman 1991, 77). The calculated numbers of Library of Congress atlases arranged in topical divisions and by place of publication and period form his original dataset. His results provide an assessment of an atlas archive that can be compared to my analyses of the atlases in the British Library Map Library.

British Library Map Library

The British Museum library was founded in 1753 on three core collections, the Sloane, Cotton and Harley archives (Wallis 1973). The Sloane manuscript, book and specimen collection came into Crown possession in that year and was incorporated into the British Museum. The second founding collection was the library of the Elizabethan antiquary, Sir Robert Cotton. Before his death in 1641, Cotton gathered many of the manuscripts and papers from the monasteries dissolved by Henry VIII as well as a portion of the working papers from William Cecil, Lord Burghley, Queen Elizabeth's treasurer. Robert and Edward Harley, the first and second Earls of Oxford (1661-1724 and 1689-1741, respectively) assembled the third collection. These three primarily manuscript collections expanded to include printed maps and atlases with the addition of the royal King and Queen library by George II and, in the nineteenth century, the library of King George III. The British Museum Library cartographic collection expanded to become a separate archive, today known as the British Library Map Library (BLML). This archive is one of the most complete repositories of historical cartographic materials in the world. For a more detailed history of the map library and its collections see Skelton (1956) and Wallis (1973).

The publication in the last decade of two major bibliographies cataloguing the BLML map and atlas collection has increased the ability of scholars to conduct substantive research. These bibliographic descriptions of the holdings for the British Library Map Library are in both printed format (Shirley 2004) and digital formats (British Library Map Library CD-ROM 1998; Shirley 2004;). These two resources provide the quantitative foundation for analyzing atlas production and publication during my period of interest. The query process is described in detail in the following sections.

Creating an Atlas Dataset for Analysis

The hypothesis posed in Chapter I guided the search for and development of comparative datasets for analysis: the analysis of early modern atlas publication rates and geographic coverage in the works published in The Netherlands, France and England. The publication of atlases in early modern Europe was not simply a function of where mapmakers were located. As Eisenstein notes, the development of printing operations and book publishing involved a network of human expertise as well as mechanical technology (Eisenstein 1979, 687-689). The generation of cartographic information, its production and subsequent publication required a community of engravers, geographers, publishers, printers and other skills. Such a convergence of personnel and technology, of software and hardware, occurred only in a few select regions. Akerman, in reviewing the printed histories of cartography, notes the limited number of map publication centers within western Europe:

> Not surprisingly, atlas-making in the Western context was limited to those regions with the most vigorous economies, the best developed printing industries, and the larger pools of academicians, engineers, and artisans. Scandinavia, Iberia, Muscovy, Poland, and the Balkans turned out isolated printed maps in the sixteenth and seventeenth centuries, but they could not muster the combination of resources in the arts, science, economics, and political culture needed to sustain

> the production of large numbers of printed maps atlas-making required. Any study of atlas-making up to 1800 is therefore confined to the output of five European regions: Italy, Germany, Great Britain, the Low Countries and France (Akerman 1991, 298).

He narrows this geographic distribution even further by identifying the specific cities whose cartographic publications represent the preserved evidence in map archives have a clear dominance:

> The distribution of the atlas trade may be more accurately be seen as confined to particular urban centers between 1570 and 1800, chiefly: Antwerp, then Amsterdam in the Low Countries; Paris in France….; London in Britain; Venice & Rome in Italy; and Cologne, Nuremberg, Augsburg and Vienna in Germany (Akerman 1994, 470).

For the purposes of this research into the competitive mapping strategies and production of cartographic materials in the competing early modern European states, atlases were classified by date and place of publication. Analytic results from attempting to re-classify the atlas listings from the two primary bibliographic guides to the British Library Map Library are described in detail in the following sections.

British Library Map Library CD-ROM, 1998

This publication brought together British Library catalogue records generated between 1844 and 1997. The catalogue entries were converted to digital form but since they were not re-catalogued, the entries from different periods vary in bibliographic format. Beginning in the 1980s Anglo-American Cataloguing Rules (AACR2) were followed but many of the earlier records are not so extensive. Queries of this catalogue of over 190,000 records utilize a search engine keyed to text searches. Records are classified by thirteen fields. Queries can be made by a single field or a combination of all thirteen fields. Four of the thirteen fields were used.

Searches narrow the resulting numbers of records by querying for a combination of specific terms within the individual record descriptions. The four fields utilized in the database queries were: “Place/Region Covered”, “Time Period”, “Format” and “Place of Publication”. Since the objective was to identify and classify all atlases by year of publication in specific cities, the remaining nine query fields were not used. The specific search criteria within each query field used are described below.

For “Place/Area Covered” the search term used was the English word “World”. The word for ‘world’ in other languages were also queried, including Welt (German), monde (French) and mondiale (Italian). Even though many atlases were published in those three languages, there are no instances in the record descriptions of those terms being used for ‘world’ as descriptors in this category. This may be due to the English origin of the BLML classification scheme since foreign terms for ‘world’ occur in the titles of some maps.

“Year” queries were based upon the division of the period 1476 to 1800 into thirteen equal 25-year segments or century quartiles. This division replicates the century quartiles utilized by Akerman in his analysis of the Library of Congress atlases. It may be argued that a 25-year period is too long or an arbitrary time span. A pragmatic advantage to the 25-year period is to keep the display of results within a reasonable number of segments while still permitting the visualization of trends. Another criticism of this segmentation may be that the beginning and ending dates of each century quartile can obscure the publication pattern over time for a particular work. For example if an atlas was published initially at the end of one quartile (for example 1526 – 1575) but the majority of subsequent editions fell primarily into the next quartile (e.g. 1576 – 1600) the

resultant totals for both periods could potentially obscure any significance for the publication span of that atlas.. While these may be legitimate criticisms, the methodological consistency applied to the analysis of the British Library Map Library holdings enables subsequent comparisons to the results of the same methodology applied previously to the Library of Congress.

"Format" queries specify the physical form of the item – in this study the simple term "Atlases" was utilized. No non-English terms for atlas were identified within the record headings listed under the "Format" field.

"Place of Publication" proved to be the broadest of all the search terms because of the range of different spellings in different languages of the names for each of the primary atlas publication centers. Table 2 lists the different names for the places known to have published atlases in western Europe during this period. "Place of Publication" queries focused on the city names rather than the country. The cities identified as publication centers by Akerman were queried and the resulting records separated into five country categories as seen in Table 2. The locations are organized by country for simplicity with the recognition that some cities would have been part of one or another country during the early modern period. Using city name in queries reduced the chance for missing an atlas not identifiable as belonging to a particular country. It was discovered that the numerical limit of terms that can be searched at one time is twenty and in several instances, such as for Antwerp and Amsterdam, particular spellings for the city had to be eliminated from the query string by individually investigating whether they were part of a record for an item other than a printed atlas. A fifth category for "Place of Publication" (not shown in Table 2) was "Other" to contain all printed atlases in the

BLML that met the publication date criteria but not any of the place names for the five countries.

Table 2. "Place of origin" search terms (BLML CD-ROM 1998)

HOLLAND:	**FRANCE:**	**ENGLAND:**	**GERMANY**:	**ITALY:**
Antwerpen	Pariggi	Londen	Augsburg	Rome
Antwerp	Parigi	Londini	Augsbourg	Roma
Antwerpiae	Paris	Londom	Augspurg	Romae
Antwerpiensis	Parisiis	London	Augspereg	Venice
Antverpioe	Parisijs	Londre	Augspourg	Venise
Antverpia	Parisprinted	Londres	Augsberg	Venedig
Antverpen	Pariz		Cologne	Venezia
Antuerp			Koln	Venetia
Antuerpia			Nuremberg	Venetiis
Antuerpiae			Nuremburg	Venetius
Amsterdam:			Nurmberg	
Amsteldam			Nurnberg	
Amsteldami			Vienne	
Amstellodami			Viennae	
Amsterdam			Vienna	
Amsterdami			Vienae	
Amsterodami			Wien	
Amsterlodami			Wienn	
Amsterdum				
Amstaedami				
Amstedlodami				
Amsteerdam				
Amsteladanna				
Amsteladomi				
Amstelaedami				
Amsteaedmi				

The first set of queries sought to identify century quartile atlas quantities for total atlas production in the leading centers of cartographic production. The search criteria held constant in each query were for "Place/Area Covered" (World) and "Format" (Atlas). "Place of Publication" queries consolidated the cities within national boundaries.

"Year" was divided into thirteen century quartiles beginning with 1476 to 1500 and ending with 1776 to 1800. The results are shown in Table 3.

Table 3. Initial query results for "World Atlases" (BLML CD-ROM 1998)

CENTURY QUARTILE	HOLLAND	PARIS	LONDON	GERMANY	ITALY	TOTALS
1476 - 1500	0	1	1	2	3	7
1501 - 1525	0	0	1	1	2	4
1526 - 1550	0	1	0	2	3	6
1551 - 1575	14	0	1	2	5	22
1576 - 1600	25	0	0	4	0	29
1601 - 1625	30	1	2	1	3	37
1626 - 1650	32	4	11	0	1	48
1651 - 1675	37	7	12	0	2	58
1676 - 1700	34	9	23	1	7	74
1701 - 1725	15	8	13	4	0	40
1726 - 1750	13	5	21	9	0	48
1751 - 1775	2	17	23	2	2	46
1776 - 1800	13	15	34	2	1	65
1801 - 1825	1	12	51	3	0	67
1826 - 1850	4	28	99	1	1	133
TOTALS	220	108	292	34	30	684

The query results are a simple totaling of numbers of atlases for each time period produced in each of the production centers listed based upon the numbers of atlases indicated by the software to be present. A total of 684 world atlases published between 1476 and 1800 were indicated to be in the collection of the British Library Map Library. However, closer examination of individual records within each query result revealed a series of erroneous classifications resulting in grossly inaccurate totals for the number of

world atlases and the individual country production figures. The dates for atlas publication were not uniquely classified and the inclusion of atlases with multiple publication dates from first through last editions skewed the results for every century quartile. The most common error was the instances in which the first date of an atlas's publication, whether the actual artifact was original or a facsimile published later, caused that atlas to be included in the quartile not only for that date but all subsequent editions. Dates of publication for an atlas within any century quartile would result in the inclusion of all editions of that atlas occurring both before and after the queried century quartile. The results for each country contained errors ranging from 69 per cent for the total English world atlases (292 shown instead of the subsequent 173 resulting from a later, more accurate query) to ten per cent error for Italian world atlases (33 shown instead of 30). A second source of error for the first round of queries was this author's failure to recognize the multiplicity of names in different languages for cities that were cartographic production centers (the list in Table 2). Individual examination of each set of century quartile queries by place of publication also revealed the necessity for an atlas by atlas elimination of duplicate records due to inaccurate dating.

The second round of queries expanded the results by using the broader set of location names from Table 2. However, review of each individual atlas record per century quartile revealed more inconsistencies in assigned dates for atlas publication. Dates were recorded in text formats there were evidently not recognizable by the text search software. This introduced more errors in the classification of atlases by century quartile.

A third round of queries was made in which the results for each place and time period were ‘cut and pasted’ into a document and the sixty pages of results printed. A visual examination of the hardcopy document identified not only incorrectly dated atlases but also the duplicate copies of the same atlas edition. Duplicate copies had to be distinguished from multiple editions of the same atlas based upon interpretation of the record descriptions given. Duplicates were identified as accurately as possible and eliminated from the results. Facsimile editions were also identified and removed from the results. The final results are represented in Table 4 and represent the most accurate totals likely to be achievable from the CD-ROM. Evidently this digital catalogue has been known to be a flawed set of consolidated records and has not been re-issued since 1998. While the British Library Map Library is to be commended for its attempt at making available 190,000 records of its cartographic holdings, the flaws inherent to a consolidation rather than a thorough re-cataloguing of a century and a half of bibliographic records become evident during a rigorous search process of the catalogue. The total number of atlases was reduced from 684 to 484, a reduction of almost thirty per cent. Such a high level of error makes the validity of any research relying upon the 1998 CD-ROM highly suspect.

Table 4. Adjusted final totals for "World Atlases" (BLML CD-ROM 1998)

CENTURY QUARTILE	HOLLAND	PARIS	LONDON	GERMANY	ITALY	TOTALS
1476 - 1500	0	0	0	0	2	2
1501 - 1525	0	1	0	0	2	3
1526 - 1550	0	1	0	2	2	5
1551 - 1575	14	0	0	0	5	19
1576 - 1600	22	0	0	3	7	32
1601 - 1625	30	1	3	1	0	35
1626 - 1650	17	2	6	0	0	25
1651 - 1675	32	5	18	0	2	57
1676 - 1700	31	6	23	1	8	69
1701 - 1725	19	12	15	4	1	51
1726 - 1750	12	3	14	8	0	37
1751 - 1775	1	15	15	2	1	34
1776 - 1800	8	15	31	2	2	58
1801 - 1825	1	6	48	1	1	57
TOTALS	187	67	173	24	33	484

Rodney Shirley: *Maps in the Atlases of the British Library*

The 2004 publication of Rodney Shirley's *Maps in the Atlases of the British Library* (MABL) was the culmination of fifteen years' archival investigation and recording. As he discovered through those years, the 2000 atlases believed by library staff to be held in the collection rose to more than 3000. Published as a two-volume set, MABL classifies 2980 atlases and town books into five topical categories: terrestrial ("T"), maritime ("M"), general ("G"), celestial ("C") and manuscript ("MS"). All were

published between ca. 850 and 1800 CE. Within each topical category the atlases are arranged alphabetically by author using a three- to six-letter acronym of the author's name. Each atlas has a unique acronym within its topical category and is only listed within one category. The title code listing for each atlas author is given a number following the name acronym. For example the two atlases published by John Adair are listed by the unique identifiers of "M-ADA-1a" and "M-ADA-1b". "M" designates them as maritime atlases. "ADA" is the unique identifier for John Adair and "-1a" and "-1b" denotes that "1a" is the first edition published in 1703 and "-1b" is a subsequent edition. "-1b" has the same title and year in the title page but evidently was updated because the second edition's date is given as "1703, [c. 1736]". First editions of an atlas are listed first with subsequent editions following, each with their own identifier. If John Adair had published other – different - maritime atlases in addition to his *Description of the Seacoast and Islands of Scotland*, those atlases would have been assigned identifiers of "M-ADA-2a", "M-ADA-3a" and so on. Subsequent editions of "M-ADA-2A" would have been coded as "M-ADA-2b", "M-ADA-2c" and so forth. Sorting through the individual publications requires noting whether there are subsequent editions or multiple copies of the same work held in the collection. A CD-Rom titled Atlas Index accompanies the two-volume work with search capabilities querying either atlases or individual maps contained within the atlases.

The user interface to the Atlas Index enables queries of seven types of information for each atlas record:

"Principal atlas-makers or book authors"

"Other personal names eg surveyors, map-makers, engravers etc

"Geographical Area of Map"

"Exact Year"

"Before" (a specified year)

"After" (a specified year)

"Atlas Title"

For each query, results appear in three windows with records in alphabetical order by their topical atlas code and then alphabetically by name acronym. For example, all maritime atlases are grouped together after the Celestial and General atlases but before Manuscript and Terrestrial atlases. This order of query results is the same as the organization of the entries in the printed volumes. The user interface for the Atlas Index has some limitations. The "Principal Atlas-makers" window permits only four author names to be visible at one time and scrolling is required to view the remainder. The "Other Personal Names" window permits only six names to be visible and the "Geographical Area of Map" allows eight entries to be visible. The reasoning behind the sizing and presentation of the data in these windows is unclear. "Date of Publication" can be searched by either the exact year or by a date range entered as "before" a certain year and "after" a certain year. The process for identifying the century quartile totals for all atlases and the world and maritime atlases specifically in the British Library collection is described in the following sections. The results obtained for the initial set of queries are shown in Table 5.

Table 5. Total printed atlases published 1476 to 1800 corrected for overlapping "YEAR" search terms (Shirley 2004)

	1ST QUERY	# INCORRECT	% ERROR	2ND QUERY
1476 – 1500	28	0	0	28
1501 – 1525	23	1	5	22
1526 – 1550	52	2	4	50
1551 – 1575	89	5	6	84
1576 – 1600	155	4	3	151
1601 – 1625	217	11	5	206
1626 – 1650	216	14	6	202
1651 – 1675	265	22	9	243
1676 – 1700	336	16	5	320
1701 – 1725	349	25	8	324
1726 – 1750	341	17	5	324
1751 – 1775	485	44	10	441
1776 – 1800	638	32	5	606
TOTALS	3194	192	Avg 6.4	3001

"Principal Atlas-makers or Book Authors" searches involve scrolling through an alphabetical list of full author names, viewing only four single-line author reference listings at a time. There is no search function specifically by author. Selecting one author, "ADAIR, John", from the list causes two new windows to appear. One window lists the atlases in MABL published by Adair with the unique record codes assigned to each; in this example only two published atlases are listed. "M-ADA-1a" is the record for Adair's *The Description of the Sea-Coast and Islands of Scotland* published 1703. In a second window entitled "Map, Number, Title" appears a list of six individual maps with shortened titles such as "1. A true and exact Hydrographical description of…" To ascertain the exact full title of a map requires consultation of the "M-ADA-1a" entry on

page 1062 in Volume 2. The second atlas record listed for John Adair has the same title and a slightly different record code, “M-ADA-1b”, with the date(s) of publication given as “1703 [c1736]”. The three individual maps in this edition are numbered 7 through 9. There is no indication on the screen whether maps numbered 1 through 6 from the previous edition are found in that volume also. What the researcher learns is that a record code ending in “-1b” denotes a later edition with, in this case, the addition of three maps numbered 7, 8 and 9.

“Other personal names eg surveyors, map-makers, engravers, etc” encourages a serendipitous scanning of names and, if the six-line window listing these persons could be utilized with any further functionality, potential associations of expertise between atlas-makers and skilled personnel might be possible. The alphabetical listing of other personal names does not allow any cross-listings between atlases other than a list of any work in which a person’s name appears.

“Geographical area of map” is an alphabetical listing of place names appearing in the map titles of any of the 56,000 maps contained in the British Library’s three thousand atlases. The query results are displayed in two windows; the upper window lists the atlases by topical and author acronym identifier, the lower window displays individual map titles when a single atlas is highlighted. Printing the result of the query captures the information about the atlas highlighted and its individual maps by title.

“Before” and “After” year date queries proved to be the most problematic search mechanism. While “Exact Year” of publication is simply that, the “Before” and “After” year search terms produce less reliable results. The two search windows are in an illogical visually-reversed order with the “Before” window actually placed to the left of

the “After” year query window. The meaning of the two terms is not conventional since it was discovered that any year specified was not exclusive; results of year ranges included any works published in both the “Before” and “After” years. Guidance on this definitional problem is not provided in any supporting documentation. The entire dataset had been searched by century quartile when this unfortunate flaw was discovered. The error rate of queries in each 25-year segment varied between three and ten per cent with an average erroneous misassignment of atlases of 6.4 percent. The total number of atlases in MABL published between 1476 through 1800 was initially displayed to be 3194. This included duplicative listings for 192 atlases. When the erroneous results due to flawed date range parameters were removed, the total number of atlases dropped to 3001 as shown in Table 5.

The reasons for the high error rate in assigning correct dates may be from the uncertain dating of the atlases that is not an uncommon difficulty for historic materials. Since many atlas publication dates were uncertain or unknown (Shirley 2004: 12) their coding format in the records was variable. For Shirley, the only certain date of publication was if the year of publication could be taken from the atlas title page. These are recorded simply as the year; for example, 1703. However, if the exact publication date could not be found within the atlas, if there was some question about the date recorded or if a particular atlas might actually have been a later printing of a previous edition with a duplicated cover page then the date was recorded in a variety of formats such as: “1703 (c 1736)”, “(before 1736)”, “ca. 1703” or “1703 or later”. The use of descriptors of uncertainty such as ‘circa’, ‘after’ and ‘before’ combined with the inconsistent use of parentheses evidently creates problems for the search engine. This

array of different date codes also affected the results for century quartiles because the alternative date formats might or might not be detected according to the search engine's parameters. An individual review of each atlas record in the printed volumes was required to identify dating errors created by date of publication format inconsistencies.

An unfortunate characteristic of the MABL Atlas Index is the inability to digitally document query results by transferring them into a different format. This means each century quartile listing of atlases, the largest totaling 311, required hand-recording the resultant records onto paper lists by topical atlas category. The product of this step was all printed atlases classified by country of origin and century quartile. The results are shown in Table 6. The temporal production of atlases is visible in Figure 1.

Table 6. Printed atlases by country 1476 to 1800 (Shirley 2004)

CENTURY QUARTILES	Dutch	French	English	German	Italian	OTHER	TOTALS
1476 - 1500	0	0	0	2	7	0	9
1501 - 1525	0	3	0	0	3	0	6
1526 - 1550	0	2	0	1	7	12	22
1551 - 1575	13	2	0	4	19	13	51
1576 - 1600	41	3	2	21	16	8	91
1601 - 1625	55	9	13	15	11	3	106
1626 - 1650	44	19	16	3	9	2	93
1651 - 1675	70	32	23	2	12	2	141
1676 - 1700	85	24	67	21	23	0	220
1701 - 1725	79	23	71	16	15	5	209
1726 - 1750	33	17	86	26	4	8	174
1751 - 1775	13	73	117	16	6	9	234
1776 - 1800	23	67	211	20	9	36	366
	456	274	606	147	141	98	1722

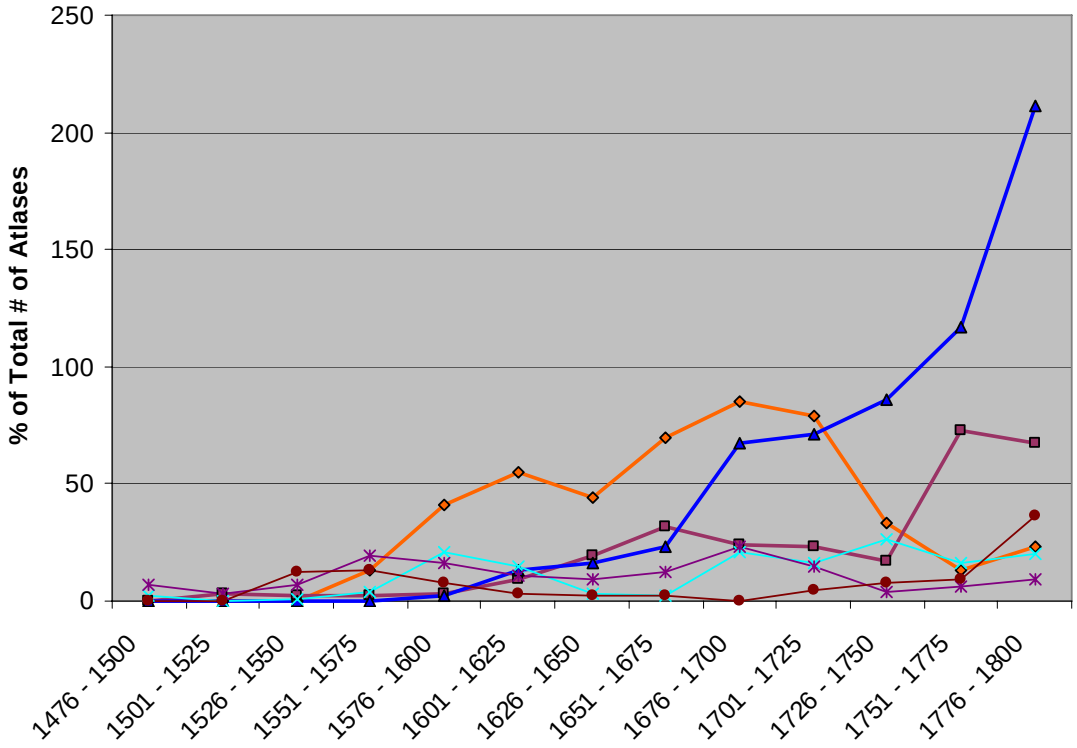

Figure 1. British Library printed atlases by country 1476 to 1800 by century quartile (Shirley 2004)

The topical atlas categories of "Terrestrial" and "Maritime" are of greatest relevance to this study for potential indicators of the relationship between atlas production and economic leadership. Subsequent analyses of British Library Map Library atlas records were limited to these two categories. "Maritime" atlases are a relatively well-defined type of atlas and are treated as a separate category. However, the "Terrestrial" atlas category is too broad to provide insight into the different types of atlases that may have been published. World and regional atlases in particular have been demonstrated by Akerman to provide insight into the geographical emphases employed by Britain, the Low Countries and France in the seventeenth and eighteenth century competition for markets and trade (Akerman 1995: 151). The classification scheme

utilized here to classify specific types of “Terrestrial” atlases was adopted from the only other topical atlas classification scheme utilized in a major bibliographical listing: the schema employed by Phillips and LeGear for *The Atlases in the Library of Congress (1909 – 1974*). Phillips and LeGear utilized a general topical classification that categorized all atlases either already owned or acquired by the Library of Congress Map Division during the first seventy-five years of the twentieth century. The nine topical categories are given in Figure 2. Unfortunately there is no documentation for how Phillips developed the categories and while the placement of atlases into their respective category may be debated, it will be assumed that individual atlas contents provide reasonable clarity for their assignment. The volumes of Phillips and Phillips and LeGear were consulted to verify atlas characteristics of the individual classifications.

Shirley’s “Terrestrial” topical category contained the greatest number of atlases, totaling 1357. The nine topical classifications of Phillips and LeGear and the five classifications for the British Library are shown in Figure 2. British Library atlas descriptions were evaluated from the individual records in the printed volumes and each atlas assigned to one of the nine topical categories. The original atlas titles recorded and classified in century quartiles by Akerman are not published as a separate list in his research findings. Therefore, a sampling of the Phillips and LeGear topical classifications for selected Library of Congress atlases were cross-checked with the sub-classifications of the British Library “Terrestrial atlases” for accuracy.

1. Terrestrial
   - New classifications made for atlases in the Terrestrial category as:
   - General (world topographical)
   - Regional (topographical)
   - Urban
   - Road and travelers
   - Itinerary
   - Isolarii
2. Maritime
3. Celestial - exclude
4. General
   - New classifications made for atlases in the General category as:
   - Historical
   - Exploration (road and travelers)
   - Military campaigns
   - Gazetteers, etc.
5. Manuscript - excluded

Figure 2. Classification scheme for *Maps in the Atlases of the British Library* (Shirley 2004: viii)

To create the possibility of comparing two of the greatest atlas collections in the world, a re-classification of atlases from MABL was made to approximate the topical divisions created by Phillips and LeGear for the Library of Congress that was used by Akerman (1991). The original topical categories for the Library of Congress are:

1. General world topographical
2. Regional topographical
3. Maritime
4. Urban
5. Historical
6. Road and travelers
7. War
8. Itinerary (explorers' accounts)
9. Isolarii

A third round of analyses eliminated multiple copies of the same terrestrial and maritime atlas editions. These results are detailed by topical atlas categories in Appendix A. A total of 1633 printed terrestrial atlases and 323 printed maritime atlases are held in the British Library Map Library as found in *The Maps in the Atlases of the British Library* (2004). The number and titles of the 56,000 individual maps in the atlases are the actual intended use for the Shirley publication. However, in order to identify the maps in the British Library Map Library a complete listing of the atlases had to be made and this listing became the dataset of records that could be analyzed and eventually compared with previous scholarly work.

Terrestrial atlases were re-classified into seven categories: world, regional, urban, travelers, war and military, itinerary and isolarii atlases. "General" atlases also were evaluated to ascertain whether some should be classified as historic or itinerary atlases but none were identified as matching the definitional characteristics of world, regional or maritime atlas. Manuscript atlases were excluded from consideration because only printed atlases are in the purvey of this study and because there was no comparable set of manuscript atlases in Akerman's analysis. Celestial atlases were excluded by the same justifications.

All of the printed atlases in the British Library Map Library published during the period 1476 to 1800 are categorized through time by century quartiles. The topical classification of the 1,956 terrestrial and maritime atlases was then coded according to their place of publication. Six countries of origin were used to subdivide the topical atlases: Britain, the Low Countries, France, Italy, Germany and 'Other'. The results were

then compared to Akerman's classification of the printed atlas holdings of the Library of Congress.

Comparability of MABL Dataset with Other Atlas Collations

When Phillips published the first two volumes of The Atlases in the Library of Congress in 1909, there were few comparable listings of map archive holdings from other libraries with which to compare his work. He lamented the status of bibliographic documentation of atlases:

> That atlases have not received the consideration in bibliography due to their importance in literature and as contributions to knowledge is shown by the paucity of works on the subject. No exhaustive study of them has been attempted, and the available sources consist merely of a few monographs and some scattered information to be found only after much research in many out of the way places. (Phillips 1909: III)

There were no other archival bibliographies by which the Library of Congress atlas collection could be evaluated: "As no library has published a complete description of its atlas collection, it is impossible to state authoritatively how the collection in the Library of Congress compares in size and importance with others" (Phillips 1909: V).

The situation has not changed substantially in the century since Phillips wrote his introduction. Only the British Library Map Library has attempted a similar descriptive atlas bibliography and the work by Shirley (2005) was a fifteen year effort. Akerman's analysis of Phillips and LeGear provides the only archival assessment of atlas content and coverage for a major atlas archive prior to this research. That analysis does allow some comparisons between the contents of the Library of Congress and the British Library Map Library. In terms of total atlas holdings (with duplicate copies removed) Appendix A indicates that the relative percentages of atlases of different publication origins are surprisingly similar in the two archives. The charts also give a sense of the

trends in publication for different kinds of atlases. The world and maritime atlases included in the British Library analysis are considered for this research to be the most important. Chapters IV and V will analyze collations of world atlases and maritime atlases respectively as reflective of both the emergent view of the 'world' and the view of the seaborne networks in maritime atlases.

Akerman (1994) classified the total atlas holdings of the Library of Congress in two ways: the first classification counted the number of atlases within each of the nine topical atlas types. These atlases were then classified by century quartile. Second, he identified the place of publication for each atlas so that they were assigned to one of the five major mapmaking regions of early modern Europe. Table 6 permits direct comparison of the topical atlas holdings in each of eight categories (excluding manuscript atlases) for the two archives.

Table 7. Topical printed atlas holdings for British Library and US Library of Congress (Akerman 1991; Shirley 2004)

Printed Topical Atlases	British Library		Library of Congress	
World	530	31%	569	49%
Regional	504	17%	210	12%
Urban	111	5%	74	5%
Historic	84	4%	45	3%
Road/Trav/Itinerary	110	5%	38	3%
War/Military	28	1%	22	2%
Isolarii	28	1%	13	1%
Maritime	325	16%	202	15%
TOTALS	1720	80%	1173	88%

The Library of Congress contains thirty-nine more world atlases than the British Library. However, for regional and maritime atlases the British library contains significantly more atlases than its American counterpart. There are sixty per cent, or 294 more, regional atlases and forty per cent, 123 more, maritime atlases in the British Library than in the Library of Congress. The Library of Congress contains approximately half the number of historic atlases and only a third the number of road/travel/itinerary atlases than the British Library. These differences are difficult to account for; it may be the respective collecting histories of two institutions, the nature of their respective founding collections, the predilection of curators for specific acquisitions, availability of funds to make acquisitions or a number of other reasons. The two institutions, along with the Bibliotheque Nationale of Paris, represent the three largest and most extensive map and atlas archives in the world (Akerman 1991, 302).

What can be investigated with the two archive datasets are the differences in their topical atlas holdings for century quartiles classified by publication origins as shown in Table 7 and Figure 3 (See also Appendix A). Future research could include comparisons and investigation of the topical categories that are not as relevant to my world-system model but subsequent chapters will focus on core atlases, world atlases that defined the periphery and maritime atlases of the trade networks.

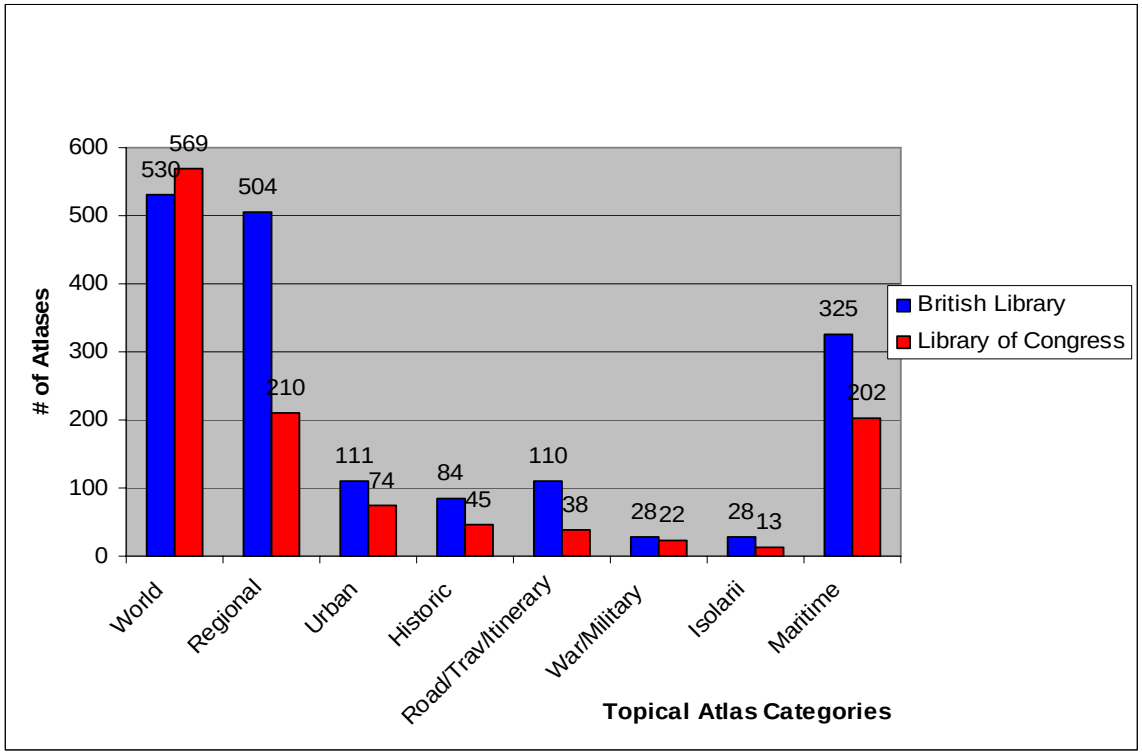

Figure 3. Topical printed atlas holdings for British Library and US Library of Congress

CHAPTER III

CARTOGRAPHIC SELF-DEFINITION OF THE CORE

> Core-cum-periphery and periphery-cum-core form and develop always and only in relation to one another, by definition…One may thus speak of a state's being 'in' the core or 'in' the periphery and, even, as 'moving' over time from 'core status' to 'semiperipheral status', or vice versa. Although figures of speech, such formulations are virtually indispensable when analysis is at the level of examining frequency distributions of characteristics among or over sets of countries cross-sectionally, or sequences of such distributions longitudinally, as in comparative studies of natural societies. (Hopkins and Wallerstein 1982: 46-47)

The extents of 'core' and 'periphery' are not adequately defined geographically by either Wallerstein or Braudel. Wallerstein and Hopkins utilize a Marxist definition for the paired opposites based upon labor relations (Hopkins and Wallerstein 1982: 46). Braudel seeks to define 'core' and 'periphery' through a series of localized examples pertaining to the primary early modern economic competitors in the capitalist world-system, the Netherlands, France and Britain (Braudel 1992: Ch. 1). Such inadequate definitions may be excused as the result of the jumbled borders and ill-formed statehood conditions of early modern European nations. Where there could be a greater geographic specificity based upon original maps produced in the early modern period, the scholarship of the historians of cartography has failed to utilize any part of world-system theory to elucidate specific 'core' and 'periphery' definitions.

The predominance of scholarship in the history of cartography also reflects the difficulty of somehow sorting between the expansion of the European capitalist world-economy and the role of the respective states within which early capitalists operated. Hopkins and Wallerstein describe this duality as "the economic core *regions* in relation to the economic peripheral regions" and "the dominant *states* in relation to the dominated

states" (Hopkins and Wallerstein 1982: 58) (Emphasis in original). With the poorly constructed 'geographies of capitalism' to date, it is simpler to study mapmaking as originating from particular countries intent upon refining their state functions. A history of cartography originating from economic centers motivated to create maps that portrayed economic arenas of interest and also served as instruments of state administration has not been attempted.

The center of European economic activity and growth shifted from the Mediterranean and Venice to northwestern Europe during the fifteenth century. The Baltic and North Sea commercial networks of Hanseatic cities, the rising Flemish cloth industry centered around Antwerp and the growing herring fisheries in the North Sea created a zone of commerce whose extent was far broader than the historic Mediterrean zone. When Portugal was absorbed into the Spanish Crown in 1588, the northern Netherlands and especially Amsterdam, was already active in the northwestern trade networks. With the loss of Antwerp to imperial Habsburg ambitions, expertise, money and commercial opportunities shifted north to the provinces of Holland and Zeeland where such a contribution to trade was welcomed and relatively quickly expanded to the dominant trading position that was to make the seventeenth century the Dutch Golden Age.

As the prominent participants and power players in the emergence of the capitalist world-system, the Netherlands, France and Britain each created cartographic definitions of themselves between 1500 and 1800. This self-definition process, proceeding unequally and differently in each country, produced maps and atlases as cartographic evidence that illustrates conceptual differences in the meaning of national boundaries and

the three countries' respective economic histories. As an interdisciplinary analysis this chapter will provide an alternative narration to what is conventionally termed the evolution of 'national mapping' by the three states. The historical evidence of early modern atlases is the armature upon which a different structuring for how the three countries both viewed themselves in cartographic self-portraits as well as their territorial 'relatives', neighbors and enemies. The persistent misuse, or perhaps more succinctly, poorly-defined concepts of 'core' and 'periphery' in world-system analysis cannot be corrected without understanding that such terms have a dual historical significance for the 'state' in whatever form it took at the time and for a capitalist world-economy creating its own economic geography cartographically in early modern Europe (Wallerstein 1989: 146). Maps were useful both for state administration and control as well as for business and trade. This duality never stays balanced, however, just as history never balances its scales but always tips in one direction or another for a group in power.

Individual Geographic Contexts

Several important concepts beyond the core/periphery labor relationship need to be addressed that recognize that each country evolved upon its own unique geography. Uniquely individual geographic conditions in each country affected both the processes of state-building and the form and timing of economic processes for their participation in the world-economy. Basic differences in geographic area between the Netherlands, France and Britain had genuine structural impacts upon economic development and the nature and growth of internal and external trade (Wallerstein 1989:148-150). The difference in areal size between the countries also had implications for the mapping of each state. The functions of the nation-state as outlined by Tilly are a useful but abstract

set of characteristics by which to measure some rate of 'progress' towards achieving statehood. All of these qualifications should be understood as spatially-dependent processes operating within the unique geographic conditions of each country (Tilly 1975; 1989).

Within the nation-state model, a number of 'functions' of the state have been developed that can also be said to be 'functions' of a core within the capitalist world-economy model. Those polities which were unable to exercise these functions could not function as a state. The focus on geopolitical frameworks of control and administration in early modern Europe posits five characteristics for a state: 1) securing the immediate periphery; 2) controlling commodity flows; 3) regulatory controls; 4) securing the semiperiphery and 5) the ability to wage war (adapted from Tilly 1975; 1989). Maps produced by early modern states have been extensively examined as as political instruments integral to state functions (Buisseret 1992; Kain and Baigent 1992). The five administrative and control functions of a nation-state can all be considered to have a cartographic dimension. But while maps are recognized today as effective and efficient tools for administration, early modern state functions were initially implemented without accurate maps or even any maps at all. An extensive literature analyzing the development and use of maps for state administrative purposes has covered most of what Wallerstein might term 'official' uses of cartography (Buisseret 1992; Kain and Baigent 1992; Akerman 1994; Delano-Smith and Kain 1999). However, such was not the situation in the early sixteenth century: treaties described boundaries between political entities without the aid of a map. These written descriptions, a *proces-verbal*, were generated by

lawyers and not until nearly the end of the seventeenth century was a cartographic definition added in the form of lines on a map (Buisseret 1984:1).

The specific geographic contexts of the Netherlands, France and Britain created distinctly different challenges for securing their respective national boundaries. These boundaries could be said to represent the first definitions of an economic 'core' and an associated 'periphery' although this would be, according to Wallerstein, a misplacement of meaning. It must be considered that the control of commodity flows, regulatory control, and the ability to wage war are administrative functions served at some level of governmental organization. The securing of the immediate periphery and semi-periphery in economic competition was sometimes aligned with administrative state goals but could also be simply the actions of an independent group of capitalists seeking to manipulate conditions within a state. The structural morphologies of atlases produced in Amsterdam, Paris and London demonstrate different contexts. For example, the establishment of secure borders for the United Provinces within which a well-developed commercial and trade infrastructure could operate relatively independent of state interference was a very different situation for mapping than the century-long ambition of France to extend her territorial boundaries. England and Wales are part of an island – where land ended, the sea began and such a natural edge became the obvious boundary along which to secure the limits of the English state. The political definition of an early modern state's boundaries already documented by the historians of cartography needs to be re-examined for how the same mapping served to define economic cores at the same time. This section will analyze the specific geographies of the competing countries in early modern

Europe to explain how the differences in size, resources and transportation networks played major roles in development of capitalist systems within and across state borders.

Prior to 1697, legal and custom rights formed the traditional definition for determining international borders. The Treaty of Riswijck, 1697, "seems first to have been formally accepted as a proper basis for an international frontier" by the portrayal of a geographical line on a map rather than one reflecting legal rights (Barber 1997: 82). This use of a linear boundary to depict a political frontier took place a century after the publication of the first printed atlases. The role of maps to chart "a changing perception of sovereignty and territory" grew as part of the Renaissance use of medium and large-scale maps for administration of territory (Barber 1997: 76, 82). Confusion over sovereignty along the northeastern border of France at the beginning of the sixteenth century resulted in the questions posed to local inhabitants concerning their traditional fealty and allegiances being supplemented by a survey by royal engineers who drew a line on the maps to present to Henri IV. Prior to these 1620 surveys, even Ortelius' *Theatrum Orbis Terrarum* maps of this region showed the frontier as a vaguely-drawn dashed line (Buisseret 1984: 12).

The question posed in the definition of a world-system core is whether there is an actual cartographic depiction by which a particular core can be seen as present or emerging during the early modern period? What would be the motivations for an economic core to map itself? While the advantages of good maps would seem obvious to us as contemporary observers, the role of maps in early modern Europe was only beginning to be accepted and promoted. Maps at the largest scale for local administration and the smallest scale to depict the great discoveries on other continents can be found to

demonstrate the growing recognition that maps portrayed certain information and a context for trade most effectively. The nation-state model for cartographic history presents the creation of a 'national' map, map series or national atlas as important initial evidence for the emergence of the nation-state. France 'wins' this argument as the first early modern polity to map itself through the national Cassini surveys of the eighteenth century. The first national maps and atlases produced within a country are denoted as important qualifying steps in state evolution. But could these same maps also be considered as documenting the economic history of a region? Were some mapping efforts focused on nation-state definition while others were created primarily as economic tools? In our modern era of nation-states with well-defined borders, we are most apt to seek out the earliest expression of those borders as evidence confirming the present geopolitical character of our world. Just as the previous chapter assessed the publication of atlases from a particular cartographic production center as indicative of economic leadership, the cartographic self-portraits produced by a country may be analyzed, especially in a temporal series, to observe that country's changing geographic visage over time, to present the maturing of a state's geographic self-definition. But whereas a single cartographic self-portrait can reveal no more than a snapshot of political edges and areas, a series of self-portraits over a three-hundred year period as revealed in the atlases produced within a country of itself provides a sense of change and maturing, and can provide clues to the real dimensions of the early modern European world economy.

The relative areas of the European countries portrayed in atlas maps are significant in terms of the information conveyed because the countries were not remotely similar in geographic dimension. A set of maps of individual European countries printed

on the same size sheets of paper, such as in John Speed's *Prospect of the Most Famous Parts of the World* of 1676 (450mm x 345mm) depicts the United Provinces on one folio atlas page (Map No. 11), France on another atlas page (Map No. 10) and Great Britain on another (Map No. 22). But each map is at a very different scale and therefore conveys distinctly different information about that country. The level of detail that can be portrayed is not the same. There may be map content differences due to the quality of the engraving since the fineness of line will vary from engraver to engraver but the informational content is dependent more upon the scale of the map and its cartographic composition than its engraving.

The comparative areas of France, the Netherlands and England/Great Britain establish a critical difference for their mapping. Modern France is over 211,000 square miles in comparison to the Netherlands of approximately 16,000 square miles and all of Great Britain at around 115,000 square miles. Through the medieval and early modern periods, France was the largest country in Europe in area, population and number of cities. The Netherlands is less than eight percent the size of France and just larger than a quarter the size of England and Wales combined. For most of the seventeenth century, England and Wales were the 'core' of the English Isles with just over a quarter the size of France in land area. The small size of the United Provinces was noted in the seventeenth century by its neighbors as belying the strength of its economic power (Braudel 1992: 177). The importance of the relative size and therefore resources available to each of these three countries becomes evident in their respective mapping traditions and in the kinds of atlases each produced between 1500 and 1800.

Those who used maps of their own country were also not necessarily educated about differences in cartographic scale. The Privy Council responsibilities for taxation apportionment to pay for military and other expenses under Elizabeth's reign used Saxton's atlas of English counties came into use during debates. However, Saxton mapped Pembrokeshire on its own atlas sheet while the other four Welsh counties were crowded onto a single sheet. The councilors misread the relative scales on the two sheets and assumed the area of Pembrokeshire to be equal to that of the other four and subsequently allocated a heavier tax burden on the former (Morgan 1978: 139).

The geographic size of the respective early modern European nation-states influenced the scale of maps that could be drawn and what method of survey and observation could be applied. The typical size of early modern atlas maps was discussed in a previous chapter but it is relevant to emphasize that early modern maps of a 'core' always have a relative scale and that the size of the typical sheet of manufactured paper determined, to some extent, the scale at which maps were drawn. The different kinds of coverage by any individual map of a geographic region, whether cellular, regional or hybrid, has been described as well. It is important to keep in mind that three different folio atlases of the United Provinces, French provinces and English counties will communicate different levels of geographic information. The original areal extent differs in each state for a particular sub-region and therefore a map of Guelderland in the United Provinces may be at a scale of 1:40,000 while a map of L'Isle de France will be at quadruple that scale, 1:120,000 with a map of the English County Kent at 1:80,000. The geographic detail and information that can be expressed varies tremendously but is most noticeable in the differences between the Netherlands and English cartography on one

hand and French cartography on the other. This difference also reflects important distinctions in the geographic character of each of these early nation-states.

Capital Core Cities and Trade Potential

The proximity of cities to water-borne transport was critical to their development as trade centers during the early modern period. The positioning of cities to take advantage of both river transport for agricultural products from an internal hinterland and an accessible sea port was an important natural advantage. The cost of water-borne goods, particularly high-bulk low-value agricultural and mineral products, was much lower by canal, barge and ship than by overland transport (Braudel 1979:424; Willan 1965:119). Amsterdam, Paris and London each enjoyed unique situations that offered or restricted opportunities to become early entrepots for commodities. London and Amsterdam both had accessible harbors to the sea, London on the Thames and Amsterdam on the Zuider Zee, that promoted both internal and external shipments of agricultural commodities and goods. Paris was too far inland to be able to take advantage of seaborne trade opportunities so by its position on the Seine in the agricultural heartland created its own 'watershed' of influence. The extensive network of supply routes and communications lines used to "provision Paris" required a central control function by the core city (Braudel 1992: 38; Kaplan 1984). The development of canals and waterways in central and northern France became the focus of an internal transportation system that "emphasized the pyramidal, hierarchical nature of French urban networks, grounded in an inland, agrarian economy and supporting a well-developed, centralized state bureaucracy" by the eighteenth century (Konvitz 1990: 9). Paris was the administrative core of France towards which the infrastructure of trade could be bent but it was not

geographically positioned to become a world-system core city because of its isolation in the rich Continental heartland.

The natural endowments of Amsterdam and London encouraged participation by these cities in the network of trade along the western European coast. The proximity of London and Amsterdam to the north-south flow of commodities from the Baltic to the Iberian peninsula enabled those cities to participate directly in that trade. The first maritime atlas, published by Lucas Jansz. Waghener in Leiden in 1580, charted navigation for the coastlines from the Baltic through the North Sea to the coasts of Spain and Portugal. The ability of head ports situated along these coastlines to become part of the circuit and network of European trade establishes the context for our discussion and assessment of the role of cartography in trade and commerce. While economic historians have sought to analyze the available records in detail, a broader understanding of the role of geography and the expression of that geography in the maps of the period helps explain the character of the cartography practiced in each core at the same time that each core was taking on a commercial role within the trade network.

A description of geographic characteristics for a world-system core must expand beyond Wallerstein's political and social frameworks. The first three rules in real estate are location, location, location. Cities that grew from their position at the confluence of navigable rivers with the coastal trade were best-positioned in ancient and early modern trade opportunities just as today. Amsterdam succeeded Antwerp as the primary Netherlands' entrepot but Amsterdam was already active in the coastal trade north and south through the English Channel. While Antwerp was positioned on the Scheldt River, Amsterdam occupied a protected bay position in the Zuider Zee, a port whose access

required careful piloting through the sand banks of Texel and other barrier islands into the inland sea. When Antwerp was incorporated into the Hapsburg possessions, much of the trade from the Oosterschelde and Westerschelde of Zeeland, head ports to the Rhine and network of rivers through the Dutch maritime region, shifted northward a few miles to s'Gravenhage and Rotterdam in South Holland, ports closer to the new trade center of Amsterdam. Amsterdam was already in the early sixteenth century a nexus to the flow of goods down the Rhine, Maas and German river ports and coastwise movement of goods north and south along the western European coast. Political changes affecting Antwerp accellerated Amsterdam's emergence within only a few decades as the first European entrepot to rival the fading influence of Venice in the Mediterranean.

In England a similar geographic advantage pertained. The port of London on the Thames had, from ancient times, been positioned at the head of the tide and its river-borne trade a well-entrenched five hundred years old. This situation permitted coastal vessels serving English ports to meet ocean-going ships plying the western European coasts. In contrast with the other two cities, Paris was situated far up the Seine whose tidal surge stopped at Rouen, and the passage of goods unloaded at Le Havre required several days' barge travel to arrive in the city depending upon the season. Paris thus became the internal center for the country, creating its own market for goods that were drawn towards the French capital.

In terms of the core-periphery definitions, Amsterdam and London both enjoyed a positional advantage as nexus to their respective 'hinterlands' and to the burgeoning coastal and overseas maritime commerce. Traders, sailors, goods and ideas passed through these cities as part of the seaborne travel along the circuit between the Baltic and

the Mediterranean, between Scandinavia and the Iberian peninsula and in the short sail between London and Amsterdam. If the dynamic of core-cum-periphery, periphery-cum-core is applied in the first instance to the core capital cities in early modern Europe, London and Amsterdam are seen to enjoy distinct natural advantages compared to Paris, advantages of geographic location but equally important, the advantages of location for receipt of ideas, news and information. Regardless of whether the 'edges' or limits to the Dutch or English state boundaries had been secured politically, the two cities had already taken roles in the world-system as trade entrepots. The cities were the gate valves through which flowed entire 'watersheds' of internally-generated agricultural commodities. Amsterdam and London were the putative control points between their respective internal or 'semi-core' regions. As capitalist core cities they also influenced or controlled most imports and exports to the 'periphery'. They both were positioned within a day's sail of the Atlantic basin and the winds that could carry a ship in thirty to forty days to the Caribbean or South and North America. Paris with its internal position had a very different set of roles to play in the emergence of early modern France because the city was not a head port nor positioned naturally along the original peripheral trade network of the western European coastline.

Dutch Core

The Dutch mapping of their own core stems from its physiographic character – twenty-seven per cent of the country is below sea level and well over half the country would be inundated "if there were no dunes and dikes to protect it against storms at sea and high water levels of the three major rivers, Rhine, Maas and Schelde" which combine to form a huge delta (De Vries 1993: 43). The Netherlands occupy a strategically

important location at the outflow of the Rhine with proximity to the English Channel - an attractive pivot point for France, Germany and the middle European nations during the past 300 years. So mapping of the Dutch core has always been focused on water management to be able to build cities, town and arable polders for agriculture and defense utilizing inundation as a major defense tactic.

The United Provinces was the second 'core' in Europe that relied upon maritime trade in combination with inland trade. Venice provided a first prototype with its shipyards and dominance of the trade network of goods from the middle and far East that reached the Mediterranean basin. With the breaking of the Venetian monopoly of the spice trade by the Portuguese and subsequent relinquishing of that trade to the Dutch by the end of the fifteenth century, Antwerp then Amsterdam emerged as strategic commercial entrepots. The nature of mapping the Dutch Republic's 'core' is distinctive from the cartographic histories of other parts of Europe or from the United Provinces' primary rivals, France and England. The mapping of the Dutch core is, in this instance, an exception to the general rule that cartographic products are typically generalized from the large scale to the small scale such that information 'drops out' in some way between a nine-sheet wall map and a pocket-sized atlas publication. The early modern 'core' of the northern Netherlands was a band roughly parallel to the coast of alluvial "clay and peat soils of the maritime region…penetrated by a tangle of small rivers and a profusion of sea arms and lakes, giving the region an amphibious character…" (De Vries and van der Woude 1997: 11) The dynamic physiography of the Dutch landscape, the many small cities and towns, the intertwined rivers, channels and canals in such a relatively small region along with the continued efforts to control and stabilize this geography meant that

its maps were at a very large scale compared to the maps produced of other parts of Europe at this time. Recognition of geography as an important 'historical structure' acquires a specific uniqueness in Dutch history because its "geography is a 'structure' of unusual plasticity." (De Vries 1981: 10) The Netherlands were only about 175 km wide east to west from the English Channel to the edges of Germany with the most intensively urbanized band representing approximately half that width stretching less than three hundred miles north to south. Mapping most often occurred at a surveyor's scale of 1:300,000 or larger throughout nearly all of Dutch history. The first maps in the Netherlands were drawn in association with ascertaining fishing rights, property rights and responsibilities. The St. Elizabeth's Day flood in September, 1421, inundated over two hundred square kilometers such that "property, administrative and jurisdiction boundaries vanished completely, but the rights and obligations did not" (de Vries 1993: 23). By the time the first full series of maps of all the provinces were commissioned for Spanish Habsburg military rulers seeking to absorb the Low Countries into the kingdom in the early sixteenth century, surveying and the creation of maps had been established in the Netherlands for nearly a hundred years.

The increase in 'map consciousness' that arose in Europe in the sixteenth century was evident in The Netherlands as well. The expansion of the European world view related to the great discoveries in North and South America generated a greater interest in maps and this interest promoted tremendous growth in both the quest to publish geographic information as well as the skills and crafts required to engrave and publish maps and atlases. The character of the Dutch landscape and the attempts by its inhabitants to control the flooding, routes of waterways and reclamation of arable land

had already focused Dutch engineers and mapmakers on the creation of accurate surveys. Improvements to waterways and creation of dikes and polders had been on-going since the medieval period. These engineering works were designed as well to promote trade and to encourage the shipment of goods via an efficient waterborne transportation network.

> The motivation was not so much to serve the modest needs of the local economy as to attract traffic passing between the more important economic centers of Brabant and Flanders (via the rivers Schelde and Zeinn), the Rhineland, and the Hanseatic towns of the North Sea and Baltic coast. With the medieval preference for coastal trade, these inland routes and protected waterways provided attractive circuits for goods passing from the Baltic, down the Rhine, through northern France and Flanders to other European regions as well as to the coast. (De Vries and van der Woude 1997: 14)

The reference to "more important economic centers" belies the uniqueness of the Holland and Utrecht provincial situation as a network of urban settlements with local and interjurisdictional administrative ties oriented toward water management by embanking, drainage and canals. Local drainage and polder boards established in the early middle ages were consolidated into larger regional authorities by the Counts of Holland in the thirteen century. These "robust associations of free farmers and property owners" had organized themselves in locally independent governing councils called *waterschappen* financed through proportional assessments paid by local land owners (De Vries 1973: 13) The local water boards were consolidated into regional councils (*hoogheemraadschappen*) such that by 1300 provincial *hoogheemraadschappen* covered each of the provinces of Rijnland, Schieland, Delfland and Amstelland. The provincial drainage and polder boards required localized land surveys to determine appropriate assessments of land owners. While such surveys remained as manuscript maps held in

board offices, the northern Dutch provinces were the first to have detailed local maps and these were *not* commissioned by a 'state' administration.

By 1543 the Habsburg emperor, Charles V, was attempting to govern the set of Dutch provinces lumped into the centuries' long territorial acquisitions by the Dukes of Burgundy. After 1555 seven of the northern Dutch provinces rose in revolt and a resistance to the Spanish monarchy through the Eighty Years War until the Treaty of Westphalia in 1648. The needs of the Habsburg military commanders for maps of the provinces during the war prompted commissioning of two sets of surveys that were engraved and printed.

Early in the sixteenth century, the University of Leuven in the southern Netherlands became a center for the diffusion of mathematical knowledge and the practical application of geometry in surveying. Gemma Frisius (real name Jamme van Dokkum; Crone 1978: 227), a teacher at Leuven, published the first book on trigonometric surveying using triangulation. Referencing the area around Brussels and Antwerp as an example, Frisius demonstrated a simple and economical method of drawing scale maps of a region using one measured base line and two positional observations for each place. The intersection of lines of observation on the base line allowed more correct location of places than any previous surveying method. (Delano-Smith and Kain 1999:59)

Jacob Van Deventer (ca. 1500-1575) learned surveying at Leuven and applied triangulation in mapping the Dutch provinces and towns. First was a manuscript map of the Duchy of Brabant in 1536 under commission of the provincial council. The local councils of Holland, Gelderland, Friesland and Zeeland then commissioned maps of their

respective provinces. By 1545 all of the northern Netherlands had been surveyed and mapped by Deventer and the maps printed, probably in Mechelen (De Vries 1993: 28). These provincial wall maps, three of them originally woodcuts, the other two copper engravings, were printed again in several sheets at an approximate scale of 1:180,000 in Antwerp around 1558-59. In addition, engraved reductions at 1:400,000 were published by map dealers in Rome and Venice and in woodcuts by Sebastian Munster in his *Cosmographia* (1600). Ortelius and de Jode re-engraved them for their own publications beginning in 1570 and these Deventer maps "continued to determine the map image of some Dutch provinces well into the seventeenth century." (De Vries 1993:30). The quality of Deventer's work was recognized by his contemporaries. A handwritten notation by Ludovico Guicciardini on the back of a town plan of Deventer in a 1567 edition of *Descrittione del tutti Paesi Bassi* labels Deventer "grandissimo geografo". He is called the "father of Dutch cartography" by Dr. F. Wider (De Vries 1993: 28).

Between 1555 and 1575 Deventer mapped 260 towns in the Netherlands under commission by Philip II. Averaging twelve towns per year for twenty years, the Dutch town plans in *De Stadtsplattegronden* are all drawn at a consistent scale (~ 1:7,500) with north at the top. Two hundred twenty of these early Dutch town plans have survived and form "an unique and inestimable source for the urban historical geography" of the Netherlands. The town plans were intended to portray useful military information to Philip and his military commanders about the rebellious Dutch towns (De Vries 1993: 30).

King Philip II also commissioned another set of maps of the Netherlands by Christiaan Sgroten (c. 1530-c.1604). These "maps of the towns and dominions of the

King of Spain, of the limits and boundaries" were for use by the Duke of Alva who was preparing a punitive expedition against the rebellious provinces in 1568. Sgroten completed a set of thirty-eight maps in 1573. Sixteen of the large-sized manuscript maps relate to the Netherlands, seven at an approximate scale of 1:120,000, the remainder scaled approximately at 1:230,000 (De Vries 1993: 31). Sgroten produced a handsome but inaccurate set of maps surveyed quickly in precarious wartime conditions. Subsequent revisions took another twenty years and a presentation copy was not sent to the king in Spain until 1592. Sgroten's maps borrowed stylized pictures of ships and colorful grotesques literally cut from Ortelius atlas maps. In contrast, Deventer's maps and town plans appear very plain and functional. The Sgroten maps depict topography, roads and shipping channels, polders and arable land. Another Dutch map maker working under Spanish royal commissions was Joost Jansz. Bilhamer (1541-1590). Bilhamer made two citadel designs for Amsterdam for Alva and drew the siege encirclement of Leiden in 1574. Maps of the northern district of Holland in 1571 that was ultimately attacked in 1573 and 1574 with sieges of Haarlem, Leiden and Alkmaar were first printed in 1575, a year after the Spanish were defeated at Alkmaar "but the Spanish commander would undoubtedly have received the manuscript original in time." (De Vries 1993:32). By 1577, Bilhamer had changed employers and was working for Dutch Republic. The capture and sacking of Antwerp by Spanish troops in 1585 began a diaspora of Calvinists, many of whom moved to the northern Netherlands. Between 1585 and 1622, Amsterdam grew from 30,000 to 105,000, one third of whom were 'southerners' (Taylor 1994:33).

The Dutch mapping of their own core accelerated during the first half of the seventeenth century as a response to military needs for better city fortifications. Under the orders of Prince Maurice, Stadtholder of Orange, Anthonis Anthonisz prepared a series of siege plans that expanded breastworks and cannon defenses of the medieval ramparts protecting provincial towns. The level of detail required in a survey for utilizing water in the defense works is exemplified in a 1622 plan for Bergen op Zoom in which four ground elevations were depicted: 1) flooded at high tide, 2) permanently inundated, 3) marsh and 4) high ground. In this case, Maurice was highly successful in his tactics since the Spanish troops were drawn into a drained polder then nearly drowned when water was released. Victories in the war from such fortification improvements based upon detailed topographic surveys helped lead to the 1648 Treaty of Westphalia and partition of the country into the United Provinces of the north and the Spanish Netherlands of the south. Of the ongoing warfare itself, large wall maps in six or nine sheets were engraved and published in Amsterdam to depict sieges and communicate the status of the war (Van der Krogt 1993: 130). This focus on fortified towns in maps and birds-eye views presented by early Dutch engravers continued to be a popular focus for French atlases throughout the seventeenth and eighteenth centuries. The market for atlases of cities, fortifications and military instructions was satisfied by French military atlases by Manesson-Mallet and Nicholas de Fer and Dutch publishers such as Frederick de Wit.

Maps of the Dutch core in regional atlases

The Low Countries were portrayed in the first modern atlas, Abraham Ortelius' *Theatrum Orbis Terrarum* (TOT) beginning in 1570. Ortelius reduced and re-engraved

Deventer's manuscript wall maps to match the other maps in the TOT. The high quality re-engraved reductions from Deventer were used to depict the Netherlands in all of the thirty-one TOT editions through 1630. The Netherlands was shown in four maps:

1. *Gelriae, Cliviae* (372mm x 503mm) scale = 1:400,000
2. *Zelandicarum* (335mm x 465mm) scale = 1:400,000
3. *Hollandiae* (354mm x 482mm) scale = 1:400,000
4. *Oost ende West Vriesland* (343mm x 508mm) scale = 1:400,000

Gerhard Mercator, originator of the term 'atlas', the map maker who first applied a new mathematical projection and author of the most famous world atlases, established another precedent for the depiction of The Netherlands in atlas maps. Mercator and his atlases have been well-documented by scholars as well as in the popular literature (Keuning 1947a; Koeman 1967). My focus in this section will be Mercator's depiction of the Netherlands beginning with the publication of his major *Atlas sive cosmographicae meditations de fabrica mundi et fabricati figura* (hereafter referred to as *Atlas*) published between 1585 and 1595. Prior to the 1585 Atlas a unique atlas evidently compiled by Mercator himself between 1570-1572 for his patron Werner von Gymnich used Ortelius' four maps of the Netherlands as part of a larger world atlas (Shirley 2004: I: 678). The initial volume of the three parts, issued 1585 – 1595, contains fifty-one maps including nine of the Netherlands, sixteen of France and twenty-six of Germany. The nine maps of the Netherlands are:

17 Belgii Inferioris Tabula (Zeelant) (345 x 445) 1:1.5 mill
18 Flandria Comitatus, Vlaenderen (320 x 465) 1:450,000
19 Brabantia, Gulick Et Cleve (345 x 460) 1:500,000
20 Hollandia Comitatus Utrecht (345 x 450) 1:600,000
21 Zelandia Comitatus, Et Hollandiae pars Meridionalis (340 x 480) 1:300,000 (in another version titled: Zeelandt Comitatus. Et Hollandiae pars Meridionalis)
22 Geldria Ducatus Compectens Zutphaniam Comitatum, & Overissel Dominium (350 x 460) 1:400,000
23 Artesia Comitatus (350 x 445) 1:400,000

24 Hannonia Comitatus Cui adjiungitur Namurcensis Comitatus (345 x 460) 1:400,000
25 Lutzenburg Ducatus, Et Trevirensis Provincia (Trier & Lutzenburg) (365 x 465) 1:500,000

These nine maps were also published separately in Duisburg in 1585 with their own title page as *Belgii Inferioris Geographicae tabule* with an index and three pages of text. A comment by Koeman states: "Apparently, nine maps is the minimum size of the atlas of the Seventeen Provinces" and subsequent collation of Netherland atlases confirms this assertion (Koeman II: 289). This atlas was followed in 1603 by a "special Dutch atlas" consisting of nineteen maps from Ortelius' *Teatrum* published by Vrients. According to van der Krogt, the "first national atlas" of the Netherlands was engraved by Abraham Goos in 1616 using Zacharias Heyns' 1599 *Epitome* of Ortelius' folio atlas in octavo format (120mm x 175mm) (Van der Krogt 1993: 117). The Goos atlas maps in *Nieuw Nederlandtsch Caertboeck* were the same size as the Mercator – Hondius *Atlas Minor*, a pocket atlas-sized publication. J.J. Brouwer re-issued twenty-three of the Goos Dutch core maps in an atlas of sixty-seven maps in 1672 entitled *Caert en Stede-Boexken Van Nederlandt, Vertoonende de XVII Provintien in 't geheel en besonder Als oock Derselver Principaele Steden, soo als die hedendaechs in haer Fortificatien gesien worden*. The twenty-three Goos maps were reprinted for the last time in 1685 by Hendrick Doncker indicating a publication life for the plates of nearly sixty years.

A folio atlas of the Netherlands, *Germania Inferior*, was engraved and issued by Pieter van den Keere in 1617 containing twenty-five maps and extensive text. However, such folio atlases of the Netherlands were evidently less marketable than smaller format atlases (Van der Krogt 1993: 117). An oblong quarto atlas (160mm x 230mm) was published by Jacob Aertsz. Colom in 1635 titled *De Vyerighe Colom*. Published both in

French and Dutch, *De Vyerighe Colom* contained fifty maps of the seven United Provinces as well as maps of the lands of the Dukes of Brabant, foresters and Counts of Flanders (Van der Krogt 1993:117). This pocket atlas was popular enough to be republished in 1650 and again in 1660.

One of the most highly regarded publications specifically portraying the Netherlands are the two volumes of Joan Blaeu's townbook of the Dutch Republic and the Spanish Netherlands from 1649 (Koeman 1997: 92). Refusing to copy Braun and Hogenberg's plates from the *Civitates*, Blaeu engraved the most contemporary plans he could solicit from one hundred ten Dutch towns into a standard format over a nine-year period. It was planned that both volumes would have the same number of plans, half of the Republic and half from the Spanish Netherlands. The first edition came out in 1649 before details of the Treaty of Westphalia had been concluded with the result that twenty-six maps in the Spanish volume should have been included in the Republic volume and five from the Republic should have been in the Spanish volume. The second edition corrected these errors but the two parts were no longer the same size. Volume One of the United Provinces, *Novum ac magnum theatrum urbium Belgicae liberae ac foederatae,* contained 134 sheets and Volume Two for the Spanish Netherlands, *Novum ac magnum theatrum urbium Belgicae regiae,* had ninety-two plans (Van der Krogt 1993: 114-115).

As can be noted from the atlas editions, a quality set of atlas maps portraying the Netherlands would be re-issued in various formats by succeeding publishers for decades. *De Verighe Colom* was re-published in 1650 and 1660 and finally by Colom's son-in-law, Pieter van Alphen, in 1691. The Mercator atlas plates of the Netherlands were published then updated and re-engraved by Jodocus Hondius and Jans Janssonius in

numerous atlases up until 1659. The folio atlas plates of Pieter van der Keere's 1623 *Germania Inferior* were purchased by Claes Jansz. Visscher (1587-1652) and re-published in 1634 under a new title *viz. Belgium Sive Germania Inferior* with the addition of maps of sieges and maps with ornamental borders. Visscher's son, Nicolaes I (1618-1672) used the plates again in 1663 for another atlas entitled *nieuwe verbeterde caerten van het Hertogdom Brabant, Graafschap Vlaanderen end Zeelandt in't groot ende kleyn* published in Amsterdam.

The plates for the townbooks of Janssonius and Blaeu were sold at auction in 1674 and acquired by Frederick de Wit in the mid-1690's. These were supplemented with de Wit's own plans to total 128 and published as *Theatrum Ichnographicum Omnium et Praecipuorum Oppidorum Belgicarum XVII Provinciarum* in Amsterdam after 1697. De Wit also published a separate atlas of the Netherlands in several editions during the last decades of the seventeenth century entitled *Nieut Kaert-boeck, vande XVII Nederlandse Provincie…in 20 Kaerten.* An interesting edition of the *Nieut Kaer-Boeck* in the British Library has a manuscript English title written in: *A Collection of all the remarkable Towns Cittys & Forts in the seaven united Provinces, with an exact Mapp of the same Togeather with Cittys of London & Parris & the two strong Towns of Luxenburg & Strasbourg Being Al of them exactly taken by the Command of the States*. (Shirley 2004: I: 1042) This collection may have been tailored to the English atlas market but the contents are seventy-two Dutch town plans, one plan of London, one of Paris and one of Strasbourg.

An important eighteenth-century map publisher in the southern Netherlands was Eugene Henri Fricx who published *Table des cartes des Pays Bas et des Frontieres de*

France, avec unrecueil des plans des villes, sieges et batailles donnees entre les hauts allies et la France from Brussels in 1712. The seventy-three maps comprise one large folio volume (510mm x 360 mm). The first twenty-four maps in the atlas are cellular maps at a scale of 1:115,000 that can be combined to form a single topographical map of the southern Netherlands. Fricx worked from military maps prepared by French engineers and their quality can be inferred since they were subsequently copied in Paris, Augsburg and Amsterdam as well as published separately (Koeman I:109).

Jan de Lat, a bookseller in Deventer from the mid 1730's through 1750 published a very useful pocket atlas for the United Provinces in twenty-three maps. The maps of *Nieuw en Beknopt Kaart-Boekje, vertoonende de XVII. Nederlandse Provintien* are tall octavo (190mm x 80mm - folded in four). The detailed 1:500,000 individual maps are indexed by a general map divided into numbered rectangles. After its initial Dutch publication, five more editions in French and Dutch were published from 1741 to 1770.

Reis- en Hand-Atlas van Vlaanderen, Braband en aanleggende Landschappen. Inhoudende all de Steden, Forten, Kasteelen, onderhoorige Dorpen, Kloosters, Kapellen, Gehuchten, Bosschen, Bergen, Moerassen, groote en kleine Rivieren en Zandbanken langs de Vlaamsche Kusten was published by W.A. Baalde in Amsterdm in 1770. The thirty-eight quarto maps (250 mm x 200 mm) are identically scaled at 1:150,000 and indexed to a general map at 1:950,000 scale divided into numbered rectangles. The Fricx, de Lat and Baalde atlases are small enough to be portable and contain both a map of the entire Dutch core as well as more detailed maps of each section of the Dutch core. Such atlases should be considered comparable to the contemporary urban map atlases available for large U.S. cities, a very efficient format of atlas used for transport and

shipping of goods. Such atlases were marketable Amsterdam and the highly-urbanized and interconnected core of the United Provinces nearly two centuries ago.

Polder atlases

As noted above, surveys of property, canals and polders began very early in the Netherlands. These surveys, in some instances, became maps such as the provincial wall maps prepared by Deventer. The drainage boards, both the local *waterschappen* and the regional *hoogheamraadschappen*, utilized accurate surveys for management and for taxation of property owners to pay for maintenance of dikes and channels. While many of these drainage board maps were engraved and printed in multiple copies and editions, they were not necessarily bound and published as atlases. The engraving and printing expertise of commercial publishers in Amsterdam was used to take the manuscript surveys and turn them into copperplate printable form. (Kain and Baigent 1992: 19) These printed maps were then distributed to drainage board members, land owners and even used for promotion of new drainage schemes and land reclamation projects to attract land buyers (Kain and Baigent 1992: 19-23). An example polder atlas published in eighteenth century Amsterdam is the 1765 atlas of the Schieland polder district (Ristow 1974). The publishing firm of Rainer and Josua Ottens assembled a very beautiful fully hand-painted polder atlas whose land parcels were labeled with owners' names (Ottens 1750).

Conclusions to Dutch core

As the smallest 'large' polity in early modern Europe, the Netherlands was mapped earlier than its neighbors. Compelled by the necessity to engineer the drainage for land reclamation and to control flooding, detailed local surveys were produced in the

sixteenth century. The advent of surveying techniques by triangulation at Leuven University trained several generations of surveyors and military engineers. Students from other European countries including the Englishman John Dee who came to Leuven in the late 1540s to study and there became acquainted with Ortelius, Mercator and Gemma Frisius. Dee was responsible for the first translation from Latin of Euclid's geometrical principles in 1570. The expertise of Dutch engineers was sought by other European countries and the principles of surveying by triangulation and mathematics was diffused in practical applications by such men.

The small size of the Netherlands in geographic area meant that a complete and relatively-detailed cartography was available not only for local water board management but also for utilizing the polders and dike system for defense. The canals were utilized in a barge network for transporting both goods and people from the late sixteenth century and by the middle of the next century a complete network connected Amsterdam, Utrecht and Groningen. The *trekvaart* passenger system and the *beurtveer* system for freight created the most complete transportation network in Europe prior to the advent of the railroads in the nineteenth century (De Vries and van der Woude 1997: 192). The small *Caertboeks* of cellular maps by de Wit, Fricx and Baalde are the cartographic keys to understanding that the Dutch core was geographically united early and that the transport system was created to capture and promote transport of agricultural commodities as well as people. A predictable schedule and regulated rates for shipping indicates a core whose organization and transportation infrastructure was dedicated to the efficient and profitable movement of goods.

The influence of Amsterdam upon the character of the province of Holland and the Netherlands as a whole has prompted some historians to question whether Amsterdam was the last great city-state on the model of Venice or the first "economically dominant territorial state" (Taylor 1994:36). Whether one prefers to emphasize the similarities of Amsterdam to the physical scale of Venice or focus on the characteristics of the Netherlands for their performance in meeting the requirements of the nation-state, Amsterdam represents the first polity whose physical infrastructure was developed into an efficient network of capitalist transportation.

The French Core

The Isle de France and Paris are the core of France. The primacy of Paris, the Isle de France and the Paris basin was acknowledged in early modern France:

> a royal cell, the Ile-de-France, and its male nucleus, Paris, both possessed of a voracious appetite and accomplishing, at whatever cost, a genetic programme which was to lead to the French 'hexagon'. "The Paris basin represents over a quarter of the present-day territory of Fran ce; it is its largest single plain, the richest and perhaps the most varied,…Of the *generalite* of Paris (which represented a large area of the Paris basin) it was said in the seventeenth century that 'the whole of its territory is useful for something; since where wheat and other grains do not grow, there is wine; and where there is neither grain nor wine, there are fruits, pastures, woods, forests and walnut-trees (Braudel 1988: 302-303).

On the strategic positioning of Paris from the viewpoint of a colonizing spirit, for that great surge outwards in colonization that The Netherlands and then England were to make in the sixteenth and seventeenth centuries, partly by necessity in reaching the limits of their naturally-available resources:

> It is true that Paris is well situated, near the major traffic routes of the Seine and its tributraries, the Yonne, the Marne and the Oise: an unending stream of grain, wood, casks of wine, boats carrying monumental loads of hay, free-floating logs, all arrived at the city's quaysides. But the French capital had one major disadvantage: it was landlocked. The fact that it lay far inland was to prove of

> great consequence: it drew the rest of France inwards too – unless that is, we are to conclude that France chose this option, which remained so long in the balance, and imagined, wished or accepted itself to be an inland unit...And yet on its western coastline, facing the ocean on which the destiny of the modern world would be decided, France had many advantages: it had sea-ports, sea-going peoples and populations whose poverty might have made them willing to try anything…but the royal government itself saw the world through continental eyes…if 'Holland' (that is the Low Countries) and England spent less on their armies, it was because England was protected by the sea and Holland by its small size and its rings of fortresses. France was obliged to pay the price for its immense size and its land hunger, a sort of peasant craving which nothing could satisfy. (Braudel 1988:306-307, 310).

While Akerman indicates that Paris was one of the centers of cartographic production in early modern Europe, Wallerstein and Braudel never claim an economic hegemony for France. If the publication of maps was one of the important contributions of creating a new geography for the capitalist world-system then how could Paris not have become a core capital (Mukerji 1984: 30)? Braudel spends much time describing the material framework of the French economy without ever claiming an economic hegemony for his homeland or its capital city. Wallerstein states flatly that there have only been three economic hegemons in the world system and they are Holland, Britain and the United States (Wallerstein 1974: 38). Paris was the indisputable cultural center for Europe beginning in the late sixteenth century and continued to be a world capital for style and fashion. However, achieving 'cultural hegemony' is not equivalent to achieving dominance as a capitalist core city within the world system.

A primacy for French cartography beginning in the late 1600's has been acceded by the historians of cartography. "The seventeenth century witnessed the emergence of France – in particular, Paris - as the centre of the map trade in continental Europe." (Pedley 1981: 33) and "…from the time of Sanson in the second half of the 17th century

till the latter part of the 18th French geographical conceptions were dominant, the centre of map production shifting from the Low Countries to France." (Tooley: 1978: 40) The emergence of French cartographic leadership is ascribed to the rise of scientific geography and the support of the French monarch for mapping of the entire country. Archival evidence reinforces such a position in the publication of magnificently bound atlas volumes composed of maps created by the French geographic scientists working from written accounts, travelers' descriptions and thoughtful compilation of carefully studied previous maps. These geographic scientists, labeled *geographe du cabinet* for their scholarly and intellectual approach to cartography, prepared maps to be engraved by skilled craftsmen and printed on rich paper. Significantly these cartographers and geographers were primarily supported by royal patronage and pensioned by the crown as *geographe du roi*, a title held for life that carried with it an assurance of financial security. Such privileged positions were in contrast to the Dutch cartographers and map publishers who could only hope to receive stadtholder permission to publish map plates for a certain period and whose income had to be earned from sales of maps and atlases. English map makers and atlas publishers were likewise rarely supported financially by the Crown and the title "geographer to His Majesty" carried no salary or pension and might at best serve as a reassuring advertisement to potential customers of the quality of their maps.

It is in this context of social and scientific privilege that the story of France mapping its core should be understood. The details of the two surveys, the first lasting from 1661 to its publication in 1744 and the second from 1747 through 1815, have been thoroughly described elsewhere (Brown 1950; Konvitz 1987: 1–31; Petto 2007). The

decades-long process of establishing baselines for triangulation and careful survey of the entire country should be considered in the geographic context of France in the late 1600s. The ascension of Louis XIV to the throne in 1661 initiated a century-long quest to establish an identity for the French nation-state. The national surveys took place within the rubric of French nation-state emergence and, when finally published, were the most accurate surveys of an early modern state ever accomplished. Konvitz describes the initial conceptualization of France cartographically as a necessity for defining the French core on a map. "The first problem the French confronted in mapping their own country was to determine its length, breadth, and shape as accurately as possible, according to the science of geodesy." (Konvitz 1987: 2) This "problem" does not appear to have been the first priority for France's aggressively-commercial rivals, the Netherlands and England. Since the early Middle Ages, the Dutch rightly considered their first tasks to be control and protection of land from tides and the flood-prone rivers that braided the terrain. Workable maps were required for this and spurred Dutch mathematics and surveying. The English occupied an island where the definition of the kingdom's edge was obvious – where the land ended, the sea began. The first 'national' atlas of England and Wales had already been published in 1579, more than a century prior to the French national survey. The first 'national' atlas of The Netherlands had been published by 1616 using reduced-scale maps from Mercator's *Atlas*.

The first French 'national' atlas was not published until the late 1600s. But this delineation of the French core was insufficient to the dynastic ambitions of Louis XIV and Colbert. A bigger, better, more accurate national map was required. The challenge was to map a country more than three times the size of England and Wales and twelve

times the size of The Netherlands and to map it from its outside edges inward inward to Paris, the heart of power. This process lasted through the entire eighteenth century and into the next; a triangulated survey of an early modern nation-state that is remarkable in the history of early modern European mapping. The complexities and ultimate success of the Cassini surveys prompted historians of cartography to set the French upon a small throne of extraordinary achievement as the best exemplar for dedication by a state to the conceptual priority of mapping itself thoroughly and completely. The obstacles of size, the evident necessity for relying on state support for such a monumental task, the development of an entire administration to create the survey and the assembly and maintenance of a staff to engrave and publish the maps are unprecedented in early modern Europe cartographic history. Historians of cartography are correct in applauding the sustained effort, financial support and scientific expertise required to map a country roughly twice the area of Colorado with the technology available. But they have miscalculated the significance of accomplishing an inwardly-focused national mapping project during a period when The Netherlands and Britain developed adequate core atlases and proceeded to push their economic competition onto a global scale by creating atlases that documented the expanding knowledge base of trade opportunities.

The paradigm of two Frances, one a territorial sovereignty united under Louis XIV's political ambitions and another poised to take advantage of the Mediterranean and Atlantic coastal trade networks, can also be observed in the mapping of the French core (Fox 1971; Fox 1989). The potential development of France as an early modern core whose transportation network promoted both internal and external trade was influenced strongly by the nature of its core mapping efforts. At the same time as the Netherlands

was publishing pilot guides and maritime atlases for ships navigating the globe, the French mapping efforts were focused on territorial definition. The transportation needs for a 'republic of commerce' as exemplified by the Dutch *trekvaart* barge system was subordinated to an 'agricultural kingdom' organized to serve the capital city of Paris, an inland and inward focus (Fox 1989:334).

The first sketches for France's cartographic self-portrait began in the mid-sixteenth century when the design sensibilities of Catherine de Medici were brought to the Loire. Her familiarity with Italian mapmaking traditions encouraged her to commission Nicholas de Nicolay around 1560 to "draw up a general account of France, accompanied by maps of each province" (Buisseret 1992:106). However, religious and civil disturbances in that decade prevented more than three provinces from being mapped: Berry (1594), Bourbonnais (ca. 1576) and probably Lyonnais (1573) (Buisseret 1992: 106). When Ortelius was preparing his great atlas, Nicolay's map of the Calais area was adapted for the 1580 edition of the *Theatrum* and used again by Mercator in 1585.

A master printer and publisher in Tours, Maurice Bougoureau, created what is considered to be the first national atlas of France, *Le Theatre Francois*, in 1594. The twenty maps of the atlas came directly or were copied from Ortelius, Nicolay, Mercator, Jodocus Hondius, Braun and Hogenberg and others published during the previous half century. Little is known about Bouguereau but his map plates came to Jean leClerc who published expanded versions of *Le Theatre Francois* beginning in 1619. It is from leClerc's atlases that Bouguereau's maps are best known. The 1619 leClerc edition of *Le Theatre Francois* contained a folio map of Paris (330 x 411 mm) "L'Isle de France et

lieux circnvoysins" as well as a regional core map entitled "L'isle de France. Parisiensis" that was a copy by Francois de la Guillotiere of an Ortelius map. LeClerc's *Theatre Geographique du Royaume de France* of 1621 continued to add maps of the Parisian core so that three of the forty-five maps focused on Paris, the Isle de France and the newly created "Gouvernement del'Isle de France". *Theatre Geographique du Royaume de France* contains additional foreign maps by Jodocus Hondius. At no time prior to the early eighteenth century was there a depiction of France that did not rely on other countries' cartographic output.

The next series of maps of the French core appeared in the atlases engraved by Melchior Tavernier. Tavernier succeeded to leClerc's plates and re-engraved these, adding many more maps to his five atlas editions published from 1632 to 1643. The 1632 edition of *Theatre Geographique du Royaume de France* expands the coverage of maps beyond the boundaries of France itself and for the first time begins to position the French core and provincial maps within a larger continental context. The sixty-two maps are all copied from original Dutch products by Jodocus Hondius, Petrus Bertius and Cornelis Danckertz. Danckertz was an Amsterdam publisher and supplier of maps to Tavernier for every edition of the *Theatre*. The 1632 edition of *Theatre* contains two maps of the Parisian capital city core: "Gouvernement de l'Isle de France" (No. 8) and "L'Isle de France. Parisiensis agri description" (No. 9). Maps 10 – 37 are of the French provinces. Map 38 is the first to depict the coast at Poittou/Aunis and La Rochelle that portrays the head port and mouth of the Seine, the river entrance eventually leading to Paris. Map No. 39 is of particular interest because of its inset map that portrays what I've termed the "Channel core" for the European economic competitors at this period. The

inset map is entitled “Cotes de France et d’Angleterre” and portrays the northwest coast of France, southern Flanders and the southern English coast up to the mouth of the Thames and westward to London. This inset map depicts the prime trade corridor between England, France and the Low Countries. These same maps of the l’Isle de France and of the French coast at La Rochelle are repeated again in the 1634 and 1637 editions. Such maps would have been of interest to French coastal traders merchants but were officially probably regarded as the ‘edge’ of the kingdom rather than a frontier of commercial opportunity.

Tavernier’s 1637 edition expands to eighty-seven maps due to the inclusion of maps of adjacent frontiers and countries. For the first time, maps of the Low Countries and the Seventeen Provinces appear as well as maps of Germany and Italy. This is an initial mapping of the edges of the ‘realm’. Such ‘frontier’ maps portray the dominion edges that would be a preoccupation for the French cartographers responding to the focus by the state on securing the borders of the country (Buisseret 1984: Akerman 1995). Of interest to our study of the French core, the first map of French post roads is included as well as a map of French rivers. This post road map originated from Tavernier and was published and copied by others through the rest of the seventeenth century although there is no mention of updating or corrections to this map’s multiple portrayals during six decades. The post road map shows the network of overland postal routes converging upon Paris, a depiction significant for graphically demonstrating the importance of that city at least in terms of official expectation and its centrality to the territorial polity of an agricultural kingdom. However, the scale of the map whereby the entire country could be portrayed on a single folio atlas page, makes the network more symbolic in depicting

Parisian dominance of the French core than practical for transport and communication, especially when compared to Dutch core maps. Maps of the Isle de France and the "Gouvernement d'Isle de France" are included among the seventy maps of French provinces arranged in alphabetical order. Tavernier's 1638 and 1643 editions, each with ninety folio maps, contain the same maps described above. The 1643 edition moves the rivers and postal maps to the beginning immediately following the five continental maps of Europe, Asia, Africa and America by Petrus Bertius. A Blaeu map of Paris is included along with the Gouvernment de l'Isle de France and another map of the l'Isle de France.

Tavernier's atlas index has a special division labeled "Frontiere" in which the Low Countries are depicted and a Blaeu map of Flandria and Zeeland Comitatus is added. This is the first instance of greater attention being paid through increased cartographic detail on the 'frontier' to appear in a French atlas under a specific subsection following the main section of French provincial maps. Map No. 106 depicts England, Scotland and Ireland based upon a Sanson map first published in 1640 that is a copy of a map by William Camden and John Speed, English cartographers. Most maps in this edition are from Sanson and Tassin, French cartographers and Hondius and Jansz. Janssonius, Dutch cartographers. The 1632 edition contained solely maps of France and only two maps of external regions, one of Switzerland by French military engineer Gaspar Baudoin and one of Savoy and Piedmont by Maupin. The inclusion of these maps establishes a first instance of the French core mapping its claims to territorial peripheries and, remembering the 'frontier' section of the index, indicates a strong consciousness of uncertain limits to royal authority emanating from Paris.

Christophe Tassin, while only active in the 1630's, published atlases that were reprinted by Tavernier and Michel van Lochom over the next decades and his 1634 atlas of the coasts of France was reprinted by de Fer near the end of the century. The 1634 edition of Tassin's *Cartes generales de toutes les provinces de France* begins with four continental maps followed by thirty-six maps of French provinces. The next five maps are of the Low Countries with the first separate map of Holland that this author has identified as being published from Paris. Atlases published by Tassin in 1633 and 1644 focus only France and Spain or France and 'haute et basse Allemagne'. An atlas with twenty-five maps including profiles and views of French towns was published in 1634. This included four maps of the French core: one of the Isle de France province and three of Paris, its environs and a birds-eye view. The 1644 edition expanded to include 407 maps, plans and views of principal French cities. Tassin's cartographic output seems totally focused on France itself, whether the coastlines, the principal cities or the main rivers. Only the Swiss cantons and upper and lower Germany receive cartographic attention and only one atlas, *Carte general de la geographie royalle* contained a map of Britain, Map No. 6 "Angleterre Ecosse et Hibernie".

The Sanson family of geographers is regarded as the greatest in France during the seventeenth century. The original founder, Nicholas Sanson I, was succeeded by his sons Nicholas II and Guillaume in the business. The map stock was then passed on to a grandson and the father and son firm of Robert de Vaugondys who continued to update and improve the Sanson maps into the mid-eighteenth century. As Pedley asserts "Once authority was established, a geographer's family name might retain enough value to support two or three generations of mapmakers. The continuation of map publication by a

small number of families is a significant feature of French cartography." (Pedley 2005: 31) The focus in this discussion is not the long lineage of Sanson maps but how the different Sanson atlases portrayed France and, for the first time, Europe beyond French borders. Discussion of Sanson's atlas of the Americas from 1657 follows in Chapter IV. The 1658 edition of *Cartes generales de toutes les parties du monde* contained 113 large folio maps of which only fourteen were of France. This is unusual for French atlases that previously had focused almost exclusively on France, her provinces and her immediate boundaries and frontiers. A general map of France is followed by a rivers map and the post map originating with Tavernier, by then two decades old. Maps No. 36 through 46 cover the country with the greatest overlaps occurring around the Parisian and Isle de France core (Akerman 1993: 150: Fig. 7d). This coverage is repeated in subsequent editions of 1665 and 1667 with the 1665 edition including a map of France and her acquisitions in the Low Countries, Germany, Italy and Spain.

The next Sanson atlas to provide extensive coverage of France is *Cartes Particulieres de la France* from 1676. This atlas of 110 maps establishes coverage of the country in ecclesiastical regions with each map title in Latin. This is a portrayal of the country according to the authority of the Catholic church and is a form of cartographic delineation that was of special concern to a number of French geographers. There are also historic maps of ancient Gaul and the presence of Celts. Paris and the Isle de France are not separately identifiable as a core region. The inclusion of all of the Low Countries and parts of Germany indicate that the portrayal of the Catholic church's long-standing divisions of dioceses might serve a justificatory role in the acquisition and 'protection' of

regions resisting imposition of the church's authority backed by royal enforcement power.

Sanson's publication of *Les Cinq Royaumes* in 1644 was a succinct expression of the French imperial view of the world. Each of the five largest kingdoms in early modern Europe – British Isles, Italy, Spain, France and Germany - were portrayed cartographically in the same themes: a general map of the country, a map divided into the peoples, parties or regions, a map of the country since the Roman conquest, the peoples according to Ptolemy and the country as recounted in the itineraries of Antonine. The Antonine itineraries were compiled as a list of distances and routes traversed by the emperor of the Holy Roman Empire at the end of the thirteenth century. The 1644 first edition of *Les Cinqs Royaumes* contained only twenty-five map sheets, five for each realm, with multiple maps on each sheet. The kingdoms were presented in the following order: Britain, Spain, Italy, France and Germany. There were 242 pages of text to accompany the maps. The 1651 edition had expanded to fifty maps, ten for each realm, with the kingdoms in a different order with France coming first followed by Spain, Italy, Germany and finally, Britain. The thematic maps for each remained consistent between the two editions but maps in the second edition were larger and this accounts for the doubling of the number of pages.

Sanson's theme of the royal kingdoms of Europe is indicative of a consistent focus for some French atlases: detailing classical authorities' accounts to justify imperial realization for a state. By citing the descriptions of Ptolemy, Antonine and classical authors, the French atlases built a historical justification and narrative for dynastic pretensions and ambitions. English atlases of the seventeenth century also promoted

dynastic depiction of their rulers but whether such characterizations of fealty were rewarded or acknowledged is not recorded (Harley 1988b). For French map and atlas publishers, the reward for loyalty to the king was frequently a royal appointment resulting in a pension.

Jean Boiseau was publishing in the mid-seventeenth century at about the same time as the Sanson map publishing legacy began. Boiseau's *Theatre des citez* of 1648 contained fifty-six plans and views of European cities. The cities are listed in alphabetical order except that the first view is of Paris. The first twenty-seven views and plan are of French cities in each of the provinces. Antwerp, Brussels and Amsterdam are the next three cities portrayed, followed by a single plan of London and then plans of Italian and other European cities. No cities outside Europe or the northern Mediterranean basin are included.

Boiseau's 1642 *Theatre des Gaules* expanded its scope of coverage both in the number of maps and the geographic regions portrayed. The eighty-six maps begin with a world map and then maps of the five continents by the Dutchman Hondius. Maps Nos. 6 – 10 are of the Isle de France and Paris using the LeClerc/Tavernier 1621 maps once again. The final successor to Melchior Tavernier's map plates was his son-in-law Pierre Mariette who published an edition *of Le Theatre geographique* with sixty maps in 1650 and again in 1653. The first five maps in the atlas are of the world and the four continents. Maps 6 through 42 are of France and its provinces.

Pierre Duval, the nephew of Nicolas Sanson, inherited the map plates from his uncle and produced twelve different atlases between 1654 and 1683. *Les Acquisitions de la France par la paix* of 1659 has twenty-five maps but does not include any separate

maps of Paris or the Isle de France as the French core. His *La Geographie Francois* was published six times between 1659 and and 1691 with thirty-four maps that do include separate maps of the Isle de France and Paris. *Le Monde Chrestien* of 1672 is an early Duval atlas that displays the archbishopric and bishopric divisions of countries throughout the world, including France.

Alexis-Hubert Jaillot was the "most influential figure in map production in France" after the Sansons (Tooley 1978: 41), the "leading French atlas compiler and publisher" in the last quarter of the seventeenth century (Shirley 2004: 579). From this position of prominence in cartographic circles, how did Jaillot's atlas output portray the French core? Inheriting the Sanson stock of maps and plans through a collaboration with Sanson's grandson who had inherited the plates from Mariette, his uncle, Jaillot had them carefully re-engraved at a larger scale and, according to Shirley, these re-engraved Sanson maps formed the greater part of his atlas production. The two major productions were the *Atlas nouveau* and *L'Atlas Francais*.

The *Atlas nouveau* containing forty-five maps was first published from Paris in 1681 with subsequent editions in 1689, 1691 and 1692. The 1689 edition of *Atlas nouveau, Contenant Toutes les Parties du Monde* with eighty maps has five maps of France but no specific map of Paris or the Isle de France. Through a joint publication arrangement with the Dutch publisher Pieter Mortier, the Jaillot atlases continued to be published well into the eighteenth century. The Amsterdam editions of *Atlas nouveau* expanded the number of maps and increased the number of France and Paris specifically. The 1689 edition depicts the country of France in five maps but none specifically of the Isle de France or Paris. Twelve of the ninety-nine maps in the 1692 edition were of

France with two specifically devoted to “le gouvernement general de l’Isle de France ou la generalite de Paris”. This is an expansion of the forty-six maps in the first 1681 edition which had only three maps of France: a general map and maps of Franche Comte and the Lorraine. The 1689 Mortier Amsterdam edition of 111 maps again expanded the cartographic portrayal of France to seventeen with two of the Isle de France (Map Nos. 40 and 41) and one of Paris itself (Map No. 42). Twelve maps portray the northern French provinces. The presence of these maps is indicative of an interest in both the region of the great tax farms as well as the uneasy northern border provinces and immediate neighbors. An undated Dutch edition of 168 maps contains twenty-two maps of France including three of the Isle de France and one of Paris.

The role of Mortier in publishing Jaillot’s cartographic output is described by Shirley as a ‘collaboration’ but Pastoureau labels the Mortier editions of Jaillot as “contrefacon hollandaise” or “Dutch counterfeits” (Pastoureau 1984). The reason for this label is unclear but may be a nationalist attitude on Pastoureau’s part to distinguish between Paris-printed Jaillot atlases as ‘pure’ and Amsterdam-printed Jaillot maps in Mortier’s atlases as ‘counterfeit’. Since the number of maps in the Mortier editions increased and the number of atlas editions was also larger, it would appear that the Amsterdam editions enjoyed greater commercial success and may have been available to a wider market of prospective buyers.

L’Atlas Francais was published by Jaillot from Paris in editions of 1695, 1698 and 1700. The full title of the atlas indicates a continually expanding geographic coverage: *Atlas francois contenant les cartes geographiques dans lesquelles sont tres exactement remarquez les empires, monarchies royaumes et estats de l’Europe, de l’Asie,*

de l'Afrique et de l'Amerique (Jaillot 1700). This large folio atlas (552 mm x 428 mm) increased in the number of maps from one hundred in the first 1695 edition to 121 and 174 in the second and third 1695 editions, 135 in 1698 and finally 186 in the 1704 edition. Each edition begins with a world map and general maps of Europe, Africa, South America and North America. The two American maps note the possessions of the European powers (Castilians, English, Swedish/Danish, Dutch and English). A map of New France was included in each edition. Maps of France and its provinces constitute between twenty-five and sixty-four per cent of the contents of each atlas.

The order of maps in each edition of Jaillot's *Atlas Francais* is consistent except for one edition (1695 with 121 maps): a world map, maps of Africa, Asia and North and South America with a map of New France at the end of the 'world section'. Immediately following is a map of Great Britain. The maps of France commence immediately following the map of Britain and comprise the first section of each edition. After the maps of France are maps of the Spanish Netherlands and the United Provinces then maps of Germany, Italy, Spain and other European regions. In six of the atlases, maps of Scandinavia, Denmark, White Russia (or Moscovy) immediately follow the British Isles. In three of the atlases is an additional map of Poland. Taking the order of maps as a route for the narrative in which one would understand the geography presented also parallels the order of the early Dutch maritime atlases. One follows the German or North Sea from the coast of the United Provinces through the Danish Sound into the Baltic Sea (Schilder 1997: 62, Fig. 4). The order of maps in the Jaillot / Mortier atlases and copied again by Nicholas de Fer is described in a summary map trace for Europe (Akerman 1991: 442, Fig 4.14).

The Cassini survey of France

The most famous mapmakers of the French state are the four generations of an Italian family originally brought to France for their mapping expertise, the Cassinis. Visiting originally by invitation of Colbert to become a member of the Academy of Science in 1665, Jean-Dominique Cassini had attracted attention from his published work on the longitude problem. He arrived in 1669 and within five years had become a citizen and married. Initially there was no intention to create a national atlas of the country – the first priority was to determine the geographical dimensions of the kingdom itself. Not until 1679 was a map of France proposed whose accuracy would be based upon the best astronomical observations. The mapping process began by establishing a set of triangulations that centered on Paris and extended north, south, east and west to the edges of the realm. As cited above, the intent for the French national survey was first to establish the limits of the realm then to create a series of triangulations that extended from a Paris meridian to the limits of the realm. Unprecedented in terms of accuracy goals, the Cassini surveys were to take more than a century and engage four generations of the family.

Once the extent of the realm had been measured from the baseline triangulation running through Paris, Cassini proposed to map the entire country at a consistent scale. France was divided into a grid of 116 segments that would each be a separate cellular map sheet. The time and expense required to produce this many maps altered the original intention to survey the realm. Instead, a series of eighteen maps were produced whose triangulations became the basis for more detailed later surveys. The eighteen sheets published between 1738 and 1744 concentrated the triangulations on coastlines, river

valleys and the plains since “a smaller edition cost less and took less time to produce, and it was adequate for the needs of engineers” (Konvitz 1987: 15-16). Royal engineers had been charged to study the transportation infrastructure and to design roads, bridges, canals and other public works that would facilitate transport of goods to Paris. Each of the eighteen sheets had tables on the right and left margins that gave latitude, longitude and distance from Paris for every place on that sheet. The engineers were expected to use the triangulations provided in the 1744 national survey map to build public works whose surveyed location would nest within the larger national survey grid.

Five years after the first survey was completed, a second, more detailed survey was initiated. During a military campaign in the Austrian Netherlands, French engineers attempted to survey the right bank of the Scheldt from Audenarde to Termond and of the Deudre to Alos at a scale of 1:14,000. But discrepancies between the survey teams’ maps spurred a request for Cassini III to provide baselines. Cassini III measured two bases and two chains of triangles joined at a third base between Ghent and Brugges. The surveys from this triangulation resulted in highly accurate maps being produced. When Louis XV reviewed his troops in the region, he compared several of Cassini’s maps to the actual terrain and was so impressed that he ordered a map of the entire country at the same level of detail (Konvitz 1987: 22).

The surveying and mapping effort finally completed in 1815 covered all of France at a 1:86,400 scale. This scale of approximately one-twelfth of an inch on the map equals six hundred feet on the ground or one map inch equal to 7200 feet - still not to the scale of Ogilby’s strip road maps (one inch equals one mile) but half the scale of the Netherlands’ provincial surveys (1:180,000) of only two hundred years prior. Completed

by the fourth generation of the Cassini family, the Cassini Map of France was the most extensive and most exact national survey of an early modern country. Based upon scientifically measured baselines, the French core map series was abstract in its grid rather than based upon any administrative unit and each map sheet was engraved and printed to the highest standards of the early modern era. The Cassini Map of France is appropriately lauded by historians of cartography for its role in creating an accurate cartographic identity for the largest nation-state in Europe. But the scholarship is almost completely focused on the purposes of mapping as a function of the state. The Cassini maps of the French core have been assigned an importance that has eliminated alternative theoretical assessments for early modern cartography from an economic history or economic geography perspective. All other attempts by other countries, particularly the Netherlands and England, to create a core atlas have been compared to the Cassini national French survey.

Within a territorial or state model by which the mapping of a polity's core would be a critical milestone for the consolidation of administrative authority, the Cassini maps exemplify an inward orientation towards the seat of central authority. This is observed in the order in which the maps of different regions were printed and published between 1750 and 1815 (Konvitz 1987). During the first decade of publication (1750-1760), maps were of Paris and its immediate core region were published. Choosing to publish the capital city core and the northern agricultural provinces of Colbert's original great tax farms confirms the centralizing influence of the French state in creating its cartographic identity first. The first publication series includes the coastlines of La Manche, the English Channel and the northern borders with the Spanish Netherlands and illustrates the

preoccupation of Paris with its two competitive neighbors, England and the United Provinces. The second decade brought the northeast provinces into the national map grid and then all the provinces south and west of the original core provinces. Interestingly, the Brittany peninsula and the coastline opposite Bordeaux were the last to be mapped from 1789 to 1815. These were the commercial ports closest to the Atlantic peripheral trade from the Baltic and is indicative of how, in the competition within France between the coastal trading interests and the Parisian ruling elite, the commercial outliers were incorporated into the national cartographic identity more than a half century after the capital city and its immediate semi-core.

Conclusions to the French core

The ability of France to map its core was limited until state-sponsored surveys began in the late seventeenth century under Louis XIV. France was still not considered to be a unified state until the eighteenth century and the uncertainties of the core's edges are reflected in the French obsession with its northern frontiers through the seventeenth and eighteenth centuries. When the great national survey effort began, the mathematical center to baselines and triangulations was always Paris and this spatial hierarchy of central authority can be observed even in the order of surveying and mapping for the second Cassini mapping project over a century later.

The efforts of Colbert to promote the image and identity of Louis XIV as the greatest ruler in Europe included supporting cartographic expertise by royal subsidy, a technique of control that was never attempted in the Netherlands or Britain. One of the advantages to royal subsidies for French cartographers and geographers was, at least until the middle of the eighteenth century, a release from the pressures of producing map

products and atlases that were marketable outside a selected elite clientele. French atlases were almost exclusively produced in folio format in limited editions and the prices for the magnificent volumes restricted their potential buyers to a small group of nobility. An indication of how favor was curried among their potential clients by French atlas publishers can be illustrated by the contents of one of the indexes in Pastoureau's cartobibliography of sixteenth and seventeenth century French atlases. The *Index des Sujets*, or Subject Index, on pages 678 - 681 has 165 main subject listings in alphabetical order covering "*les allegories, les animaux, les armoiries, les canaux, les dedicataires, les enseignes, les fleuves, les genealogies, les guerres, les habitants, les lieux d'edition, les portraits et les traits*." The two largest subject categories are *les dedicataires* (dedications of an atlas) and *les portraits* (engraved portraits of persons in an atlas). There are eighty-seven atlas dedications to individual nobility for their patronage. Portraits of forty-one nobles can be found in sixty-five different atlases. There is no comparable listing of dedications or portraits for Dutch or English atlases although the presence or absence of royal patronage has become a popular Post-Modern preoccupation in the interpretation of historic maps. These two categories in Pastoureau's bibliography contain twice as many entries as any other subject category in the index, an indication that the dedicatory fealty expressed by the publisher to his noble patrons and the portrayal of royal and noble patrons were visible and customary features in French atlases. Such overt expressions of gratitude and acknowledgment are an expected dimension for French society in this period. Certainly Dutch and English map makers and atlas publishers also included acknowledgment of patronage and sought favor from their rulers but this

characteristic was evidently never sufficiently obsequious and consistent to be catalogued for other countries' atlases.

The English Core

The mapping of the English CORE does not follow the same history as that of the United Provinces or of France. London, the capital city of the world-economy by 1700, gained its leadership position following the wave of Dutch maritime hegemony.

Located at the head of the tidal surge from the North Sea, London was an entrepot even in Roman times, positioned at the nexus of Thames river navigation and the Narrow Sea. The busy coastal trade and cross-Channel transports passing along the eastern coasts of Scotland, England and the western coasts of Germany and The Netherlands gave London a strategic commercial location between inland local markets and coastal shipping. With access to an expanding net of long-distance trade in agricultural commodities, London experienced remarkable growth during the sixteenth century, quadrupling in size from 60,000 in 1534 to nearly 250,000 in 1605. The seventeenth century brought another expansion to 550,000 by 1700 and almost a million by the end of the eighteenth century (Everitt 1991: 514). The southern and eastern coastlines of England had both advantages and disadvantages. A primary advantage from the standpoint of internal communication lay with its complexly indented coastline that promoted coastwise trade of goods from the twenty-one river head ports (Willan 1938: xii). The disadvantages included a vulnerability to invasion from the mainland coasts of Spain, France and western Europe that has preoccupied the English rulers for a millennium. The first maps of England were manuscript surveys prepared for Henry VIII

by Italian engineers and Dutch surveyors commissioned to map coastal and port fortifications (Barber 1992a).

The first atlas printed in England was also the first atlas of the English core: Christopher Saxton's 1579 *An Atlas of England and Wales*. Commissioned by Thomas Seckford, a notable with close ties to Lord Burghley, Queen Elizabeth's chief advisor, the surveying for the maps of English and Welsh counties was accomplished in only three years. Printed on folio paper (550 mm x 510 mm) the fifty-two counties were portrayed on thirty-five atlas sheets. The atlas is a landmark in British cartography and formed the basis for all succeeding county maps for more than a century. County maps were "a 'distinctive cartographic form' for which there was no exact parallel elsewhere in Europe and which was characteristic of English map publication throughout this period" (Morgan 1978: 133). The Saxton atlas has been studied thoroughly by scholars in the history of cartography (Morgan 1978; Delano-Smith and Kain 1999; Skelton 1974). The atlas sheets were also published as a wall map in 1583. Much discussion has revolved around whether Saxton's mapping could be termed an 'official' or state-sponsored effort. Evidently Saxton was paid by Seckford himself and while there are dedications to Seckford and to the queen on each map sheet, there is no indication that any direct financial support was ever provided from royal funds. Official sanction is evident in the pass from the Privy Council of July 1576 that Saxton was to show to justices and local Welsh officials declaring "he was 'appointed [to the survey] by her Matie under signe and signt'" (Skelton 1974: 8). That Seckford bore the costs of the survey was characteristic of Elizabethan governmental practice by which public service expenses were "shouldered or shared by private subjects (merchants, noblemen, courtiers, offices)"

(Skelton 1974: 8). This approach, where private funds were expended for what were obviously public services, continued to be characteristic of English mapmaking and atlas publishing until well into the nineteenth century. William Cecil, Lord Burghley, had Saxton's 1590 county atlas edition bound with Richard Adams' manuscript maps of the sea battles between the English and the Spanish Armada of 1588 – "a form of *atlas factice*" that portrays both the terrestrial mapping of the English core and maps of part of its periphery along the English Channel (Shirley 2004: 892).

Saxton's atlas is cited as "the embodiment of English map-making in later sixteenth-century England. His was not merely the first systematic survey of the kingdom but a huge undertaking, unparalleled in Europe…and dependent on a high degree of organization and financial support" (Delano-Smith and Kain 1999: 70). The maps themselves were not particularly extraordinary in their conception; there are no roads or graticules of latitude and longitude. These are topographical maps depicting hills, rivers, water and vegetation. Settlements are distinguished by symbols that distinguish between a village (small building with a spire) and larger towns (groups of buildings). The value of forest lands is expressed with woods shown as small trees clumped together with some clumps ringed by fences to denote parklands (Saxton 1579).

The portrayal in Saxton's atlas of all the English and Welsh counties embraced the English core and its immediate periphery. The Saxton atlas established the conceptual cartographic framework for the depiction of England for more than two centuries. The county atlas was valuable not only for the de-centralized English political structure but as a commercially-viable cartographic product (Delano-Smith and Kain 1999: 101). Saxton's atlas originally held thirty-five map sheets portraying fifty-two counties, some

of which were drawn on the same sheet. This meant that a consistent scale was not possible for all the maps. The map sheet of Kent, Sussex, Surrey and Middlesex groups together on one map the majority of what would become known in the nineteenth and twentieth centuries as the Home Counties. These counties (London is most of Middlesex County) encircled London and became a 'semi-core' of market garden production serving the city (Everitt 1991: 510).

Several cartographic innovations transformed Saxton's folio atlas in format, utility and accessibility during the seventeenth century. Each reinforced the cartographic depiction and conceptual basis for the English core with London at the center. The first was the publication of *Britannia* in 1607 by William Camden. The original 1607 Latin edition was translated into English in 1610 and smaller versions of Saxton's county maps engraved by Pieter van den Keere were inserted. Van den Keere was a Flemish expatriate in London in the 1590s. These reduced-format county maps were used by William Blaeu in his 1617 edition of *Britannia* published in Amsterdam. Thereafter George Humble, a London publisher, acquired the plates and printed van den Keere's maps in an oblong octavo format as a series of county maps that became known as 'miniature Speed' atlases. This popular name derived from the maps' similarity to those in John Speed's *Theater of the Empire of Great Britain* published in London beginning in 1611 (Van den Keere engraved the maps for both atlases) with reissues up to 1676.

John Norden, a contemporary of Saxton, published a set of innovative triangular distance tables in 1625 titled *Guyde for English Travellers* (Crone 1978: 67). The distance table has been in use since then for communicating distances between towns and is a still a familiar feature on contemporary road maps. Norden was not a successful

commercial publisher but the quality of his county maps was evidently excellent since they were copied by other cartographers (Crone 1978: 66). For the original folio edition of Camden's *Britannia*, Norden engraved maps of the counties around London: Hampshire, Hertfordshire, Kent, Middlesex, Surrey and Sussex and again for Speed's *Theater* in 1610. These counties could be considered as the 'buffer zone' to the London city core and are essentially the "Home Counties" described in contemporary England. Norden's triangular distance tables were published again ten years later by Jacob Florenz van Langeren in *A Direction for the English Traviller* with smaller maps in a rectangular octavo format. Shirley describes van Langeren's atlas as "meeting a popular need" since it was reprinted in nine editions by three different publishers through 1680 (Shirley 2005: 636). What that need may have been is not elucidated by Shirley but its small size and the pragmatic information detailing the distances within the network of English market towns would have made it a useful travel atlas for merchants and businessmen.

The second innovation was the improvement of Saxton's county maps by John Speed published as *The Theatre of the Empire of Great Britain* in 1611. The rather plain Saxton maps were re-engraved, place names were corrected, county towns were drawn as inset plans rather than birds-eye sketches, and leading families and officials in each county were acknowledged by their coats of arms engraved around the maps' edges. The sixty-seven maps included constitute not only the original core of England and Wales but also Scotland, Ireland and the adjoining islands so that core and semi-periphery are present in the same volume. *The Theatre* was published in sixteen editions over the next century and a half not only in London but in Amsterdam by Jodocus Hondius (1616 and 1621) and Johannes Blaeu (1645). From 1627, *The Theatre* was often bound with

Speed's world atlas, *A Prospect of the most Famous Parts of the World*, presenting the purchaser a cartographic view of both the British core and semi-periphery and its long-distance trade periphery (Speed 1676).

A third innovation for mapping the English core originated with John Ogilby's publication of a strip-map road atlas, *Britannia*, in 1675 (Ogilby 1675). A folio atlas of one hundred strip-maps at a scale of one inch to the mile, *Britannia* was a huge volume of three hundred pages weighing more than fifteen pounds (Delano-Smith and Kain 1999: 169). Maps 1 – 54 center on London as the nexus of the road network, Maps 55 – 100 are of the rest of England and Wales. Some roads from London to the coast take more than one page (for example Maps 25 – 28 are "The Road from London to Lands End" with Map 25 beginning in London and Map 28 ending at Lands End). The presence of other urban centers can be noted as the beginning point for other road strip maps. Bristol is the beginning point for strip maps to Banbury (Map 55), West Chester (Maps 56 and 57), Exeter (Map 58), Worcester (Map 59), and Weymouth (Map 60). Other towns have only a single page of strip maps connecting them to another town such as Cambridge to Coventry (Map 61), Dartmouth to Minehead (Map 65) and Monmouth to Llanbeder (Map 77) (Ogilby, 1676). Ogilby's survey was the first measured road survey in England using a 'waywiser' measuring wheel invented by Robert Hooke along with magnetic compass, chain and quadrant (Woodward 1978: 171). He used a scale of one inch to one mile as standard and this became the first consistently-scaled road map atlas. The one map-inch to one mile scale was also slowly adopted over the succeeding decades to be the commonly-accepted scale for road maps.

To ascertain information from each of the counties, Ogilby sent letters to notable families that, in effect, were a questionnaire. The questions evidently were vetted through Robert Hooke, Robert Aubrey and Christopher Wren, Fellows of the Royal Society, to establish a standardized format. A letter from John Aubrey, London, 1673, provides a typical list of the "Queries" sent to persons in each county:

> 1 OF the County in general.
> 2 The several Hundreds, parishes, Villages and Hamlets.
> 3 Peculiars or Privileg'd Places
> 4 Cities, Towns Corporate, Market-Towns and Fair-Towns
> 5 Houses of Nobility and Gentry.
> 6 Castles, Churches, Chappels, Monasteries, Hospitals, Schools, Colleges.
> 7 Mills, Beacons, Bridges, Mountains.
> 8 Chaces, Forrests, Woods, Groves, Parks, Warrens, Commons, Heaths.
> 9 Valleys, Rivers, Brooks, Meres, Ponds.
> 10 Places where Battles have been, Lodges in Forrests, &c.
> 11 Works and Mines of Salt, Lead, Tin, Iron, Coal, Lime, Alabaster, Marble, Free-Stone, Grindstone, Millstone, Silver, Gold, Copper.
> 12 Waters, Springs and Baths, Cold or Hot, Medicinal, Bituminous Petrifying, &c.
> 13 Precincts of Diocesses.
> 14 What Part of the Countrey is Arrable, Pasture, Meadow.
> 15 Roman Ways and Stations, Coyns and Monuments, &c.
> 16 Accidents, Calamities or Casualties.
> 17 Improvements in Husbandry, Housewifery.
> 18 Peculiar Customs or Manners of the Countrey.
> 19 Places of Birth, Education or habitation of Eminent persons, in all Ages.
> [20] Of these, or any of them; Information is desir'd in Writing, either upon certain Knowledge, or other good Authority, directing each Remark to the Number relating to it, and annexing thereto the County and Hundred wherein the remark falls (Norgate 1998).

Ogilby's roads were soon transferred to Saxton's topographical county maps in a more portable format. Robert Morden adapted Speed's county maps in greatly-reduced form to fit the back of playing cards and was the first to add Ogilby's roads to any of the county topographical maps (Shirley 2004: 708). Interestingly the fifty-two English counties permitted a set of playing cards with thirteen cards in each of four suits.

The final evolution of Saxton's county maps in this interpretation involves the reduction of Speed's *Theatre* maps to an octavo format including the addition of Ogilby's roads so that a portable volume of fifty-plus sheets permitted the traveler to carry a handy atlas of the English core's transportation network. While Ogilby's original ambition had been to publish a multiple volume world atlas series, *Britannia* became the enduring publication for its maps of nearly 7,500 miles of primary and secondary cross roads. Such a portrayal of transportation infrastructure was not matched by another early modern country for more than a century. The Dutch core atlases were not oriented towards a road network in the first place but a river and canal system. The *trekvaart* and *buertvaart* canal transport networks remained in manuscript form with the local water boards. The French core atlases could only portray roads at the most general of scales as on Sanson's road map of France of 1662. Ogilby's strip road maps were sufficiently detailed to include distances in miles and leagues along each section, by single and double dots respectively, placed in the parallel lines drawn for the roads. The cross roads and towns as well as land uses for a mile either side of the road were depicted. Hachures were used as a graphic device to indicate whether the road was tending up or down slope. *Britannia* was sufficiently detailed that subsequent contemporary historical research on the English enclosure movement has been able to estimate the presence of enclosed and unenclosed lands in each county based upon analysis of the two-mile swath shown on the strip maps (Woodward 1978: 173).

By the beginning of the eighteenth century, the cartographic depiction of the English core was well-established and consistently depicted: topographic county maps with roads. Woodward describes eighteenth century English cartography as 'mediocre'

(Woodward 1978: 192). Delano-Smith and Kain assert that the Ogilby's *Britannia* was an 'idiosyncratic' form of atlas (Delano-Smith and Kain 1999:78). When compared to the state-sponsored national survey of France that was just beginning during at this time, the *Britannia* may appear to be a poor precursor. However, such a critical evaluation misreads the intent for the strip road map and, to judge by the popularity of the road atlas in light of its many editions over time, its evident utility. The evolution of Saxton's county atlas from folio to octavo format produced a more affordable edition. The combination of the strip road maps with county maps produced a sufficiently accurate core atlas to be of great utility in the commercial movement of goods. This mapping of the core should be understood as the emergence in London for the first time in the history of map making of a map and atlas publication industry whose products were affordable, portable and sufficiently accurate to have widespread utility to an interested public. This product reached a market of potential atlas buyers that had never been exploited by sales of large folio atlases printed on expensive paper and intended for display and to promote noble prestige by ownership. The English atlases may have been derivative and, in some cases, of relatively poor quality in terms of having the latest or most accurate maps. These atlases were, however, affordable to the emergent class of merchants, landowners and tradesmen whose investments in both local and long-distance commercial enterprises were to prove crucial to Britain's emergence as economic hegemon.

That London was the center of the English transportation network and the central orienting location for the maps in Ogilby's *Britannia* is demonstrated in the dedicatory page to Charles II:

> Conformable to Which, Influenc'd by Your Majesty's Approbation and Munificence, I have Attempted to Improve Our Commerce and Correspondency

> at Home, by Registring and Illustrating Your Majesty's High-Ways, Directly and Transversely, as from Shore to Shore, so to the Prescrib'd Limits of the Circumambient Ocean, from this Great Emporium and Prime Center of the Kingdom, Your Royal Metropolis (Ogilby 1675).

From 'shore to shore', the English core and semi-periphery were measured and mapped with the personages identified in each county by their coats-of-arms whose financial backing and commercial interests would continue to develop the capital city's fortunes.

A contemporary rival of Ogilby in both book publishing and atlases, Richard Blome, published a *Britannia* in 1673 in a folio (360x240) format with maps plagiarized from Speed's *Theatre* and with Camden's text. By 1681 an octavo format edition (205mm x 100mm) had been published that was reprinted in 1685 and 1693 under slightly different titles. The plates for this octavo edition came to Thomas Taylor upon Blome's death in 1705 and, after further reduction in size, were republished as *England exactly described* 1715 – 1718. Thomas Bakewell and Elizabeth Bakewell published later editions from the same plates in ca. 1731 and 1750. The popularity of the Taylor / Bakewell editions may stem from their being small enough to fit into a pocket (Shirley 2004).

At the beginning of the eighteenth century, the atlases of English counties were being updated with new plates engraved by another generation of cartographers. Herman Moll revised Morden's maps and added maps of England, Scotland and Ireland. This series was the second part of a volume published as *Twenty Four New and Accurate Maps of …Europe* . Such a publication of both the English county maps and maps of the rest of Europe parallels the customary binding into a single volume of Speed's *Theatre* and *Prospect* of nearly a century before – the portrayal of core and periphery together.

John Senex published an oblong quarto core atlas (200mm x 255mm) in two volumes, the first containing fifty-four strip road maps from London and the second volume forty-six strip-road maps between other English towns. That Senex improved the original Ogilby maps is evidenced by the publication of sixteen editions of *An Actual Survey Of all the principal Roads of England and Wales; Described by One Hundred Maps from Copper Plates* between 1719 and 1780 in London. Other editions were published by Le Rouge in Paris in 1759, by Desnos in Paris in 1766 and a final edition by Sayer and Bennett from London in 1775. The Paris editions are an indication that knowledge of the English road network, the transportation network centered on London, had value in the French atlas market but whether this value was military or economic is not clear. Certainly there was no comparable road atlas available for France until the last quarter of the eighteenth century from the Cassini survey.

Another format for Ogilby's strip maps was published by Emanuel Bowen and John Owen wherein small county maps were followed by successive pages of strip road maps. This octavo format (205mm x 165mm) was also very popular and at least fourteen editions were published from 1720 to 1764. These are sometimes termed "Owen-Bowens" since the title once again used the original association with Ogilby: *Britannia Depicta Or Ogilby Improv'd; Being a Correct Coppy of Mr:Ogilby's Actual Survey of all ye Direct and Principal Cross Roads in England and Wales…And Calculated not only for the direction of the Traveller [as they are] but the general use of the Gentleman and Tradesman.*

Folio-format atlases of English and Welsh counties were published but their editions were far fewer than the octavo and smaller atlases. By the middle of the

eighteenth century there was need to update and improve both the much-amended Saxton county maps as well as Ogilby's road maps since the former was nearly two hundred years old and the latter seventy-five! The need for improved county maps prompted a prize to be offer by the Society of Arts for any county survey whose topographic accuracy could meet the standards of the Society. The prize money offered was insufficient to cover the costs of a quality county survey but local landowners, merchants and investors were evidently willing to subscribe to surveys being undertaken independently (Harley 1965). The London map publishers who brought out editions of road strip maps and county maps included Robert Sayer and John Bennett, Thomas Kitchin, Mostyn John Armstrong and John Cary. All of these editions were either quarto or octavo in format. Some, such as the 1790 *Cary's Traveller's Companion, or a Delineation of the Turnpike Roads of England and Wales; shewing the immediate Rout to every Market and Borough Town throughout the Kingdom* had at least eleven known editions up to 1828 and was in the convenient octavo format (165mm x 140mm). Eight years earlier, Cary had published an octavo atlas, *Cary's Actual Survey of the Great Post Roads between London and Falmouth including a Branch to Weymouth…ascertained, By A. Arrowsmith Land Survey*, that also carried the names of recommended inns on each road map. While such advertising seems conventional to modern readers, it can be taken as an indication that travel along the post roads was at a sufficient volume that innkeepers could take advantage of having their establishments recommended upon the printed map of their neighborhood. It has not been investigated as to whether such establishments paid a subscription or fee to have their businesses advertised. Such travel recommendations

are a now an expected part of every contemporary travel guides in recommending lodging and restaurants.

Conclusions to the English core

Like the Netherlands in terms of its areal extent, the English core of England and Wales could be mapped relatively accurately with the surveying technology available in the sixteenth century. Iterative improvements by succeeding generations over two centuries transformed the Saxton core atlas into a reasonably accurate cartographic product whose utility for economic development was recognized. The Ogilby strip road atlas acknowledges the primacy of London as capital core city by initiating what would be a long tradition of creating a cartographic conception of the English core as a network of roads emanating from the city on the Thames. However only half the Ogilby maps extend from London so that other maps were able to depict the importance of coastal head ports and entrepots linked into a network across the entire core. The emergent nation-state of Britain was given its cartographic identity in 1579 but this identity was 'made over' through the next centuries as a network of transport and movement of goods. The Saxton – Speed – Camden – Ogilby core atlas permutation represents a conceptual embrace of resources within the core and emphasizes the accessibility of those resources from the capital core city as well as from other entrepots.

The cartography of the English core was commercially supported by merchants, businessmen, and landowners as well as nobility. But it was never primarily a state enterprise until the end of the eighteenth century when the Ordnance Survey was initiated under the leadership of William Roy. The market orientation for English atlas publishers is evident in the many subscriptions sold for publication of books and atlases beginning

in the early seventeenth century (Clapp 1931). Both John Ogilby and Richard Blome sold subscriptions for their respective editions of *Britannia*; Blome's list of 812 subscribers begins with Charles II and other nobles but includes a number of London merchants (Clapp 1933: 372). Eighteenth century publishers also featured the lists of subscribers in the beginning pages of their atlases such as John Senex' *A New General Atlas* and Edmund Halley's *Atlas maritimus et commercialis* (Harley 1997: 167-175; Halley 1728).

Summary to Mapping the Core

The mapping of their respective cores by the Netherlands, France and England follow different histories responding to differences in area and intention. The Netherlands, specifically the United Provinces of northern Holland, and England, already transforming itself into the British Isles, were both trading polities whose concern with their internal core was focused on support of a larger commercial outreach. The Dutch and English core atlases were part of a process to increase administrative efficiency and particularly the transportation network by which goods, services and people could be profitably moved. The urban scale to the United Provinces is demonstrated by the development of the passenger and freight canal networks that enable more people and goods to be moved farther and faster than in any other early modern country. The urban scale to the English core is demonstrated in the network depicted in Ogilby's road atlases that centered on London but included the head ports and market towns functioning as both external entrepots to the coastal trade and internal convergence points gathering the increasing industrial production from the English countryside.

France was the largest, most populous country in this period and the challenge of mapping its core became a state function by default and by the mandates established by its monarchs. By vetting the entire national survey process through the Paris-based Academy of Sciences, Colbert centralized the conceptualization of the French core in the emerging scientific attitudes of the French Enlightenment. By supporting the geographers and all the rest of the administration required to survey the entire country, the French crowns succeeding in creating a process oriented towards its own predominance and power. Paris was the core of France and all other portions of the country were secondary except for their ability to enhance, support and satisfy the needs of the capital core city. The order in which the national survey was conducted demonstrates the hierarchy of spatial importance by mapping first Paris and the Isle de France and the agricultural region most important to Paris. The disputed northern frontiers were next with the last being the external trade-oriented coastal regions.

French cartographers and geographers were supported by the state and enjoyed an intellectual leisure for production of maps and atlases that most certainly contributed to making French maps the most well-considered and accurate cartographic products of their age. The absence of pressure to respond to market requirements reduced the necessity for creating marketable map products and permitted Parisian publishers to focus their publication efforts on magnificent folio atlases whose engraving and lavish detail are still admired today. However, the lack of market pressure also seems to have eliminated much of the need by publishers to create products that were affordable to anyone outside the noble elite – the elite cartographers produced atlases for their elite patrons. By contrast the Dutch and English atlas publishers were prolific and catholic in

their production, advertising and printing maps in a range of formats and levels of decoration. Such atlases appear pale and plain compared to the sumptuous French folio atlases.

CHAPTER IV

CORES MAP THE TERRESTRIAL PERIPHERY

World-System Definition of Periphery

The terms core and periphery describe two sets of production processes within the world-economy. Labor relations within a world-system core are characterized by high wages, 'free labor', well-developed technologies and a broad range of production processes creating finished commodity goods. Peripheries typically exhibit low wages, with some form of control over labor costs, such as slavery, primitive technologies and narrowly-focused production of relatively few goods, with, at best, basic processing of raw materials that are then sent to the core (Taylor 1993: 19). This bipolar definition of core existing always and only in relation to 'its' or 'a' periphery provides a convenient theoretical description without sufficiently testing whether differing concepts of 'periphery' or 'peripheries' may be more explicitly defined geographically. This chapter addresses the archival record for cartographic definitions of the periphery as portrayed in early modern European atlases published in Amsterdam, Paris and London. Peripheries overlapped between European competitors. The Spanish periphery included the east coast of North America and English colonies as well as Caribbean islands (Gould 2007). The overlapping claims to territory throughout the Atlantic basin and Caribbean by the Netherlands, France, England and Spain are depicted in the atlas maps of the seventeenth and eighteenth centuries. Treaties and consequent exchanges of land were regular features of maps. The intent to this chapter is to identify the geographic construction of the early modern periphery as depicted in the maps of the world atlases published in Amsterdam, Paris and London.

Long-distance maritime trade in agricultural commodities characterized the commercial networks of the Atlantic basin. The low-value, high-bulk movement of products distinguishes this portion of the world-economy from the high-value, low-bulk trade conducted between Europe and Asia during this period. The United Provinces, France and England all founded trading corporations to explore and exploit the Asian trade but their competition is a different story in the history of cartography. It was in their expansion into the Atlantic and the New World that the transport technologies and software of geographic knowledge necessary for capitalist commerce were first learned and it is in their depiction of the Atlantic trade arena that my research is focused.

Modelski and Thompson, whose research emphasized the emergence of leading sectors in global leadership, predicate their analysis upon the assumption

> that the principal structural change experienced by the global economy in the fifteenth to eighteenth centuries was the construction of the oceanic trading system. Pervasive commercial innovations in the Schumpeterian manner – the development of new sources of supply and new markets and effectiveness of business organizations – centered around the pioneering of new trading routes, reducing of transaction costs, and opening of new markets. (Modelski and Thompson 1996: 71)

Their definition of 'global economy' incorporates political history to a greater extent than Wallerstein's 'world-system' and is, perhaps, closer in theory to Braudel's 'world-economy'. Regardless of definitional differences, Modelski and Thompson correlate the expansion of the trade networks from northwestern Europe with a series of innovations in technology, finance and naval power. Polities possessing these innovations have the greatest subsequent potential for global political leadership. The role of atlases, both terrestrial and maritime, can be classified within the category of innovations as part of the "few activities that are so transformed by innovation that they experience abrupt and

rapid expansion" (Modelski and Thompson 1996: 70). The concurrent publication of atlases and the expanding geographic extent contained within them can provide a basis for establishing not only the expansion of the European economies in a general way but documentation of that expansion in a geographically-explicit narrative.

The theoretical question is whether a single or multiple peripheries characterized the outward expansion of the three leading economies of the United Provinces, France and England? If more than one periphery can be identified in the published atlases, then what are the differences between them and why would such differences exist? World-systems theory would predict that any evidence from historical cartography should demonstrate that there was no single periphery defined in the early modern period. The capital core cities of Amsterdam, Paris and London competed with each other economically for access to commodities and producing atlases that communicated the geography of commodities was part of that competition. The overlap of peripheries between these competitors is evident in the structural morphologies of early modern world atlases.

The initial conditions of the Dutch, French and English capital cities are described in the previous chapter as the mapping impulse outward from a capital city to establish its 'edge', the boundaries defining a zone around the city that becomes dependent upon and in turn supports the core functions – a zone described as the semiperiphery (Taylor 1993: 20). In addressing the concept of periphery, it should not be presumed that each city had the same motivations and needs to expand outward. The political character and resource bases of the Dutch, English and French cores determined the character and timing of their respective expansions outward to incorporate other regions.

Edward Fox made an important contribution to understanding the anomalous position of France in early modern Europe in relation to the creation of a French agricultural monarchy that exhibited different characteristics than other early modern states (Fox 1971). His emphasis in later analysis was that two parallel and distinct communication systems developed that eventually competed with one another; the royal agents of the king worked to carry out the centralized commands in the countryside while along the coasts, port city merchants traded freely and profitably with other merchants and overseas (Fox 1989: 332). Eventually the royal focus on consolidating power and control for the monarchy in Paris left the coastal commercial interests along the Mediterranean and Atlantic seaboards without effective representation in the court life at Versailles. Paris chose to ignore the commercial advantages associated with the trade opportunities on their Mediterranean and Atlantic coasts except as that trade could supply the core with goods not available in France. Merchants and commerce were subservient and 'tainted' activities compared to other roles deemed more suitable for the artistocracy in sixteenth, seventeenth and eighteenth-century French society. The emphasis upon culture, social networks and the personality cult centered around the French kings left the commercial interests by coastal traders far from royal preoccupations.

Wallerstein builds upon Fox's geographic theme of transport and communication within France itself by emphasizing the size and strategic geography of France compared to the other European polities of the period. France occupied "the center of the checkerboard" in early modern Europe with sufficient demographic and natural resources to create and support, at times, both a larger army and a larger navy than any other royal regime (Wallerstein 1989: 151). France had coastlines on both the Mediterranean and the

Atlantic but its core was Paris, an inland capital with a supporting semi-periphery of the Ile de France and the tax farms. The *Cinque Grosses Fermes* created by Colbert in 1664 comprised a duty-free customs union encompassing the cereal-producing plains of northern France. Unique among economic historians, Wallerstein understands geography sufficiently to compare the relative sizes of the United Provinces, France and England and to make the point that France was spatially situated and large enough in area to encourage an orientation towards territorial dominance rather than a strong outward expansion through maritime networks. Both Holland and England had little choice for expansion since neither could compete with the French army in size and their logistical focus turned to overseas expansion (Wallerstein 1991: 151). When describing the early modern competitors' motivation for creating new markets, Wallerstein summarizes the differences:

> If we start with England and the Five Great Farms as comparable units, where could external markets be found and secured? For both there was continental Europe. For England there was Scotland, with the Union of the Crowns of 1603 followed by the more important Union of Parliaments of 1707, and the settler colonies in Ireland and North America. For the Five Great Farms, there was the rest of France. Simply put, the efforts aimed at creating internal economic unification of France…was the social equivalent for the period of the sixteenth to eighteenth centuries of England's creation of Great Britain plus England's settler colonization. It made no sense for France's central government to seek to construct a settler North America before 'absorbing' Languedoc and Brittany (Wallerstein 1989: 150-151).

The implications for both commercial interests and the administrative and diplomatic functions of the French and English states based upon their respective geographical resource bases had long-term significance for each country. The differences between maritime and territorial polities is also reflected in the archival atlas records and careful analysis explains why France becomes 'a special case' from a world-systems perspective

while the United Provinces and England moved with greater speed and a higher level of commitment to creating external trade networks that eventually led to overseas colonies (Hugill 2005: 108). Wallerstein notes the significance of basic resource accessibility in terms of geographic area between England and France for their "basic patterns of foreign trade that motivated the two countries' outward project in very different ways with the explanation that England needed "Europe as a market (for a long time via the United Provinces), and also needed to create its North American colonies" (Wallerstein 1980: 101-103). France was able to sell most of her products internally.

In early modern Europe, one country's periphery was another country's core, or semi-periphery or periphery – the resolution of these differential spatial aspirations was an ongoing set of disagreements not fully settled until the twentieth century. This overlap of cores and peripheries produced more years of warfare than of peace. Whether to prosecute war on land or on sea or both distinguished the adversaries. The United Provinces struggled to maintain its tiny delta landscape as a zone of free trade independent of the ambitions of other powers. France attempted to secure its land borders and within those borders, the provinces that functioned as a periphery to Paris and northern France, including the Dutch Republic during Louis XIV's reign. England had secured its immediate peripheries of Scotland and Ireland by the beginning of the eighteenth century and transformed itself into Great Britain. Dutch expansion as a trading power represents a different process of incorporation than France. The Dutch engaged in a form of hegemonic leadership that sought economic dominance without extensive administrative control of territory or migration of significant numbers of Dutch to overseas colonies. Dutch interests were best served through a series of strategically-

positioned trade entrepots. They were emulated by the English in both the Caribbean and the eastern Atlantic seaboard of North America. This was very different politically and administratively from the territorially-acquisitive French state whose primary ambition was the coercive and administrative control of land on the European continent. French peripheral efforts in Canadian North America and the Caribbean received inconsistent attention and support from Paris.

Two concepts of hegemony emerge from Hugill's reading of Mackinder to distinguish state control over a periphery. A duality of state types coexisted for nearly four hundred years, beginning in the fifteenth and extending through the eighteenth centuries, without too much serious conflict since the two types "occupied mutually almost exclusive geographical spaces" (Hugill 2005: 107). The United Provinces and England cum Great Britain represent maritime trading states whose expansion was developed through seaborne networks linking peripheral entrepots to the core. The peripheries for maritime trading states did not evolve as a singular place but as a network of entrepots, a web of commercial connections, sources for goods and a series of commodity chains that began and ended in the core. Such a network was only possible for core polities positioned as coastal ports with direct access to the sea. France, according to Fox and Hugill, represented a duality of conflicting state models with the territorial polity eventually imposing its ambitions upon the trading interests of coastal merchants operating from the Mediterranean and Atlantic ports. The French core then focused its mapping efforts on the grand survey of state-claimed territory, a continental dedication of resources that left the French mapping of the extra-European periphery to explorers, missionaries and military governors.

Trade networks as periphery

For millennia, the primary commercial networks in Europe encircled the shores of the Mediterranean. Braudel describes the Mediterranean basin as a *Welttheater* or *Weltwirtschaft* that "bestrode the political and cultural frontiers which each in its own way quartered and differentiated the Mediterranean world" (Braudel 1992:22). Dominated by the northern Italian cities of Milan, Genoa, Florence and Venice, trade along the shores and across the sea was well-established for centuries before the emergence of competition from northwestern Europe. Venice became the "Queen of the Adriatic", beginning with its response to the transport needs of the Crusaders to reach the shores of the Levant. Venetian dominance continued as shipbuilding industries expanded and the convoys of Venetian galleys, *galere da mercato,* crossed the Mediterranean on regular trade routes to the north African coast and the Levant. Venice also held the profitable role of primary entrepot for Eastern goods entering the overland transport network across the Alps and extending through the German plain and the Rhineland to the Hanseatic cities and the Baltic coasts (Braudel 1992: 127).

Strong regional trade networks were already highly functional in the Mediterranean and the Baltic long before the appearance of Dutch ships in both those trades in the early sixteenth century. In northwestern Europe the Hanseatic cities had developed an extensive and loosely-organized network of trade that encompassed the Baltic and North Seas and extended as far south as the English Channel. This trading system was both overland and maritime centering first around Brugges, then Antwerp as the primary entrepot between the Hanseatic and Venetian commodity networks (Braudel 1992: 105; Malowist 1959). It is from the base in Antwerp that the history of printed

world atlases in northwestern Europe begins. The publication of Ortelius' *Theatrum* in 1570 and Mercator's *Atlas* in 1585 mark the emergence of the world-system in the late sixteenth century. That two landmarks of atlas publication, both expressing a revolutionary conception of the world's geography were published from the immediate predecessor to the first true capitalist core city, Amsterdam, establishes a baseline for my assertion that the publication of atlases is integral to economic leadership.

Periphery in world atlases

The following sections address the cartographic portrayal of peripheries for each of the competing polities. The atlases are classified into two categories: world atlases and maritime atlases. Both types were produced by the Dutch, French and English but the Dutch were by far the most prolific publishers of world and maritime atlases in the seventeenth century. London publishers surpassed Dutch production of world atlases by the middle of the eighteenth century. Great acclaim is given to the quality and magnificence of eighteenth-century French atlases but such admiration seems to be based upon the evaluation of a few editions rather than the prolific productivity of Amsterdam and London seen from the archival records. Comparison of the structural morphologies of Dutch, French and English world atlases provides more insights into the construction of the early modern world-economy than trying to identify single atlases as 'best', 'most beautiful' or 'most accurate.'

My classification of world atlases follows the definition given by Akerman: a world atlas must contain a world map and maps of at least three of the four world continents (Europe, Africa, Asia, America). The study of atlases for a particular view of the non-European periphery as a geographic conception in early modern Europe is based

upon the recognition that an atlas is an "embodiment of geographical ideas" accessible to the modern researcher in the analysis of atlas structural morphology and "how its variation in different societies and periods reflects changes in geographical ideas and interest."(Akerman 1993: 73). The contents following the first four or five maps in a world atlase require closer examination for the individual atlas or atlas editions' structural morphology. The morphological question posed for early modern atlases published in Amsterdam, Paris and London is whether the atlases display a particular bias towards a particular region (i.e. Europe) or a particular set of countries within that region. For example, how do Dutch, French and English world atlases portray the Atlantic basin and the Americas? Are the coverages similar? Can differences or similarities be identified in terms of how the atlases portray the oceanic trading system? The specific cartographic conception of a polity's periphery as demonstrated in the archival records of atlases is analyzed in the following sections.

Abraham Ortelius' *Teatrum orbis terrarum*

Prior to focusing on individual atlases published in Amsterdam, Paris and London, it is useful to establish a standard or beginning point for world atlases. Abraham Ortelius' *Teatrum orbis terrarum* (TOT) published in 1570 from Antwerp establishes this baseline. The history of how such an atlas came to be compiled has been described elsewhere (Van den Broecke 2006; Van der Krogt 1993). It is useful to note that all versions of the atlas' history agree that the original request came from an Antwerp merchant, Aegidius Hooftman, who "was tired of trying to unroll large sheets of maps and wanted a more convenient format to use" and, according to his factor, Johannes Radermacher, who knew Ortelius,

> He also bought all the Geographical maps that could be had for the sake not only of calculating the distances, the freight of merchandise and the dangers which they were exposed to, but to estimate the daily reports regarding the European wars. But as the unrolling of the large maps of that time proved to be very inconvenient, I suggested to obviate this difficulty by binding as many small maps as could be had together in a book which might easily be handled. Hence the task was entrusted to me, and through me to Ortelius, of obtaining from Italy and France as many maps as could be found, printed on one sheet of paper (Van den Broecke 1996: 14).

The original impetus for creating a book of maps thus clearly came from someone whose interests were in the geographical implications of transport for commodities and the necessity of avoiding wartime conflicts within that transport network. The editions and collation of maps in the TOT have been analyzed and described by Van den Broecke (1996). Van der Krogt estimates that approximately 7300 copies were printed in thirty-one editions from 1570 to 1612. Records from the Christophe Plantin publishing house of paper purchased and used and sales data were used to create this estimate (Van der Krogt 1993). Van der Krogt estimates 1100 of the 7300 copies still survive in archives with an additional five hundred in private hands so approximately twenty percent of all copies of the TOT are still extant!

Ortelius established a number of precedents with the publication of the TOT. One was the effort taken to obtain the best maps available of Europe and other parts of the globe. These were solicited by personal correspondence. Ortelius listed eighty-seven cartographers as contributors to the first edition's fifty-four folio map sheets containing seventy maps (Karrow 1993). The second precedent that distinguished the TOT from the previous *atlas factice* published by the Italian printing firms was that each map was re-engraved onto a new map sheet. This coherence for an atlas's contents exceeded any previous cartographic publication in clarity and consistency – the maps in the TOT are an

intentional set of maps bound into a single book with consistency of style, engraving, coloration and other technical similarities.

Collation of the 7300 copies reveals a subset of maps that appeared in every edition (Van den Broecke 1996). These twenty-five maps are:

5. Africae 376x489 1:28,000,000
6. Angliae, Scotiae & Hiberniae 441x565 1:2,000,000
7. Regni Hispaniae 383 x 505 1:3,500,000
8. Gelriae, Cliviae 372 x 503 1:400,000 [eastern Holland to the Rhine, southern edge is southern end of Zuyder See visible in lower left corner]
9. Zelandicarum 335X465 1:400,000 [has Antwerp on very bottom edge, central middle with all the islands to the west]
10. Hollandiae 354 x 482 1:400,000 [shows Zuyder See and peninsula of Amsterdam, Texel]
11. Oost ende West Vriesland 343X508 1:400,000 [Zuyder See on west edge, covers northeast to Groningen]
12. Saxoniae, Misniae, Thuringiae
13. Franciae-Osnaburgensis
14. Regni Bohemiae
15. Helvetiae
16. Ducatus mediolanensis
17. Pedemontaenae
18. Como-Romani-Fori Iuli
19. Thusciae
20. Regni naepolitani
21. Insularum Aliquot Maris / Mediterranei Descriptio [6 Mediterranean islands on one sheet: Sardinia, Sicily, Corfu, Djerba, Elba & Malta]
22. Graeciae
23. Hungariae
24. Septentionalium Regionum
25. Russiae
26. Tartariae
27. Persici
28. Natoliae-Aegypti-Carthaginis
29. Barbariae et Biledulgerud

Map #2 of England, Scotland and Ireland is the English core and its immediate semiperiphery (Scotland and Ireland) long before political issues between those two countries were resolved. Peninsular Spain also appears in every edition. The greatest number of maps are of the Netherlands (Maps # 4 – 7) and these are at a larger scale than

most of the others. With an original fifty-three maps in the 1570 edition, half of those then appeared in every subsequent edition with the final edition of 1598, the year Ortelius died, of 114 maps out of which fourteen were of non-European areas (Van der Krogt 1993: 91). We may take this twelve percent of external non-European areas to be a comparative morphological baseline for subsequent world atlases to be analyzed. The percentage of periphery maps contained in terrestrial world atlases might be expected to increase as the 'oceanic world system' expands between the late sixteenth century and 1800.

The Periphery in Dutch World Atlases

The second world atlas to be published, from which the term atlas for a 'book of maps' was coined, is by Gerhard Mercator. The extensive scholarly literature on Mercator, the reprints of his atlases and the implications of the Mercator projection on the European conception of the world will not be addressed here. Of specific interest is how Mercator himself began to portray peripheries cartographically. Originally Mercator's plan was to publish a complete cosmography of creation from its ancient origins to the latest discoveries. But the ambition and work required for such a production combined with the scientifically-trained cartographer's desire for geographic perfection delayed publication of the series. The first two volumes of the cosmography were a Ptolemy edition of 1578 and seven years later a "modern geography" of fifty-one maps. The latter were published in a single volume with separate parts for France (*Galliae* sixteen maps), the Netherlands (*Belgii Inferioris Geographicae tabule* nine maps) and Germany (*Germaniae tabule geographicae* twenty-five maps). Mercator's death in 1594 left publication of subsequent volumes to his son Rumold who brought out the first Mercator

atlas that could be classified as a world atlas in 1595. The addition of thirty-four maps minimally allows us to classify his father's original European atlas as a world atlas because the other continents are at least depicted in single maps. The 107 maps of the 1595 edition included maps of Iceland, Great Britain, Scandinavia and the eastern European countries as well as a world map and maps of the other three continents, but maps of Spain and Portugal were missing. Rumold Mercator died in 1599 and the copperplates were sold to Jodocus Hondius in 1604.

The acquisition of the plates by Hondius renewed the publication life of Mercator's *Atlas* with at least eighteen editions published through 1638. An immediate re-issue in 1605 was followed by an enlarged edition of the *Atlas* in 1606. The 144 maps of the 1606 edition broadened Mercator's original European focus with the addition of thirty-seven maps, twenty-six covering regions peripheral to Europe. Six maps of Africa, thirteen of Asia and seven of North America transformed what are now termed Mercator-Hondius atlases into true world atlases. Hondius' sons Jodocus, Jr. and Henricus succeeded their father in publishing and enjoyed a near-monopoly in Dutch atlas production for the first quarter century of the 1600s. The field of atlas development has been described as 'stagnating' during those years with hardly any competition in the field until 1630 (Van der Krogt 1993: 98). Successive Mercator-Hondius editions were numbered but their basic morphology remained nearly constant with the single-volume *Editio Decima* (Tenth Edition) issued in 1628 and 1630 containing 164 maps. The expansion was due to increasing the number of maps of the parts of France and the addition of some new maps by Hondius without removing the older maps that could be considered superceded.

In 1630 the atlas publishing business changed with the entry of two new publishers, Willem Jansz. Blaeu and Johannes Janssonius, brother-in-law to Henricus Hondius. These two were highly competitive with each other in the publication of atlases and this competition prompted an increase in the number of maps in each publisher's edition brought onto the market. The Mercator-Hondius atlas production had been handled through Jodocus Jr.'s focus on the map production itself with management handled by his younger brother Henricus. Jodocus Jr. had forty new maps engraved and was about to publish them in a new atlas when he died. Somehow Willem Blaeu obtained these plates before Henricus and his brother-in-law Johannes Janssonius. The acquisition of forty newly-engraved copperplates modeled upon the famous Mercator's maps enabled Blaeu to enter the world atlas market with more than half of the maps ready to print. Along with his eldest son, Joan Blaeu, Willem published a sixty-map atlas in 1630 with thirty-seven of them printed from the newly-acquired Jodocus Hondius, Jr. plates and twenty-three by Blaeu himself. Henricus Hondius and Johannes Janssonius then allied to begin publishing their own editions of the Atlas, replacing the plates that had gone to Blaeu and bringing out the *Atlantis Maioris Appendix* with eighty maps in 1630.

The competition and publication of new editions by both the Blaeu and Mercator-Hondius-Janssonius publishing houses is a complex history well-told elsewhere (Keuning 1947a; 1948; 1959; Van der Krogt 1993: 100). Within a decade the publication of multiple editions, *addimenta* and appendices enlarged the Janssonius and Blaeu atlases into a series with multiple volumes containing hundreds of maps. Janssonius' *Atlas Novus* of 1638 contained 318 maps in three volumes. Blaeu's *Theatrum orbis terrarium* in the same year held 248 maps in three volumes with separate Dutch, French, Italian and

German-language editions. However the competition had only just begun. By the end of the 1660s, both Janssonius and Blaeu were publishing ten and eleven-volume atlases with nearly six hundred maps in them. At this point the issue had become quantity over quality (Van der Krogt 1993:108). Whole atlases from other publishers were added as supplemental volumes while, at least in Janssonius' situation, the accompanying text lagged behind or was never written to accompany the maps. Willem was succeeded by his son Joan in the business. The *Atlas Major* was subsequently published in five different languages between 1662 and 1672 with each edition containing nine, ten or eleven volumes with from 544 to 605 maps. Surviving copies of these atlases form the showpieces of contemporary map archives but their value and quality reside in the assemblage of nearly six hundred hand-colored maps finely engraved rather than a discriminating selection of geographic topics. "A hundred years after Ortelius' *Theatrum* with fifty-five maps, the first modern atlas in history, the concept of a publication with maps and text had caught to such an extent that a twelve-part monster work with ca. 600 maps could also become a commercial success" (Van der Krogt 1993: 107).

To ascertain how the mapping of the European periphery was depicted in the leading atlases by the primary economic competitor in the seventeenth century, the contents of the atlases themselves were analyzed to determine the frequency of depiction of the periphery. A collation of twenty editions of Mercator's *Atlas* was compiled from descriptions published by scholars (Keuning 1947; Shirley 2004) and analyzed by a series of categories dividing the three leading cartographic cores from their European counterparts. (See Appendix: Mercator-Hondius Atlases) Collated categories of the *Atlas'* morphology include the number of maps in each atlas that depict Asia, Africa and

America (both North and South) as the non-European periphery. For the sixteen editions of the Mercator-Hondius-Janssonius atlases published from 1606 to 1638 that can be classified as true world atlases, the percentage of periphery maps varies from eight to nineteen percent for an average coverage of the non-European periphery of fifteen percent across all editions. The seven editions published with practically no changes between 1606 and 1628 average twenty-six maps of the periphery or nineteen percent of each edition's total. Africa was consistently depicted in six maps, Asia in thirteen and America in seven maps. After the partnership of Hondius with his brother-in-law Janssonius, the composition of the atlas changed in subsequent editions with the increase of the number of maps portraying the American periphery but the number of maps of Asia and Africa remained constant or even declined. The percentage of American peripheral maps increased to an average thirty-six percent of the periphery maps for all sixteen editions.

For the ten Blaeu *Atlas major* editions published between 1629 and 1662, a similar percentage of peripheral geography depicted in maps can be observed. Whereas the total number of maps per edition increased ninety-four percent from the 1630 *Appendix* to the eleven-volume Latin edition of 1662 and the percentage of periphery averages sixteen percent for all ten editions, the percentage of periphery maps for Africa, Asia and America decreased from thirty-two to eleven percent. The number of maps portraying Africa grows from one to four and five through four editions to a maximum of thirteen in the 1662 edition. Asia is portrayed by one then two and three maps up until the mid-1630s when ten maps are used to portray Asia through the remainder of editions. America (North and South) is portrayed in ten to fifteen maps up to the 1662 edition

when twenty-three appear. The consistent numbers of maps by which foreign continents are portrayed may be a function of the number of acceptable well-engraved maps available or the number of maps required to portray subregions of interest. Questions regarding the detailed composition of the maps must remain for future investigation.

The great commercial success and rivalry between the Janssonius and Blaeu publishing houses peaked with the great multiple-volume atlases described above. With the deaths of Janssonius in 1664 and Blaeu in 1673, the great period of Dutch commercial atlas dominance is described as over (Van der Krogt 1993: 108). The declining world atlas production and sales from Amsterdam coincides with the shift in Dutch commercial strategy from the risks of exploring new markets towards conservation of wealth through investment banking. Dutch atlas publishers continued to produce commercially-successful atlases through the rest of the seventeenth and first half of the eighteenth centuries. But many were second or third-generation members of a publishing family utilizing the numerous copperplates and map sheets that had been produced more than a century before (Van der Krogt 1993: 129). The character of Dutch world atlases changed as well in the mid-eighteenth century with the re-emergence of atlases assembled to order. Atlases were either part of a collector's growing multiple volumes in which quantity of maps in one's 'atlas major'was regarded as a measure of distinction or atlases had one hundred maps or less and were known as an 'atlas minor' (Van der Krogt 1993: 130). For the purposes of this analysis, distinguishing an atlas as a world atlas and collating its contents becomes a more careful exercise for the Dutch eighteenth century atlases. The consistency of contents and structural morphologies of the *Geographia* of Ortelius, the Mercator-Hondius-Janssonius atlases and the great Blaeu *Atlas Major* are

simpler to analyze due to the endurance of the copperplates from which they were printed. The proportional representation of the periphery in Ortelius, Mercator and Blaeu remained relatively constant through their history.

The map publishing business of both wall maps and atlases from the last quarter of the seventeenth century until 1800 was primarily in the hands of five families: Nicholaes Visscher I and II, Danckerts, Frederick de Wit, Carel Allard and Petrus Schenk who partnered with his son-in-law Gerard Valk. "They all supplied almost identical products: wall maps and atlas maps. They also all sold atlases, which they compiled from their own and others' maps" (Van der Krogt 1993: 130). By the mid-eighteenth century, atlas publication in Amsterdam came to be dominated by Peter Mortier and later, the partnership of Peter's son Cornelis Mortier and his brother-in-law Johannes Covens. The atlas plates of de Wit and Allard were purchased by Mortier who also partnered with Parisian atlas publishers to print the atlases of Sanson and Delisle. Peter van der Aa was another particularly prolific publisher of atlases in the first part of the eighteenth century in both Leiden and Amsterdam.

Forty-five world atlases from these seven publishing houses along with Hendrik de Leth and Isaak Tirion have been collated for their portrayal of the non-European periphery (Appendix B). These forty-five atlas editions published between 1598 and 1774 contain a total of 6916 maps with an average of 170 maps in a typical atlas. The non-European periphery was classified into three continental subdivisions: Africa, Asia and America (North and South). These three regions accounted for an average of nineteen percent of the maps in Dutch atlases published in the eighteenth century. Of these maps of the periphery, maps of Africa accounted for eighteen percent, of Asia forty-six percent,

and of the Americas thirty-six percent. The higher percentage of Asia periphery maps can perhaps be attributed to the Dutch commercial interests in Asia being of greater interest than the Atlantic basin although if the percentages of Africa and America maps are combined, their total represents just over half of the average periphery maps in Dutch world atlases for most of the eighteenth century. The languages in which these atlases were published has not been collated but a preliminary assessment indicates an almost equal percentage of Dutch and French titles and map labels, far more than the number of English-language Dutch atlases. From this evidence it could be asserted that Dutch atlases were commercially successful not only in The Netherlands but in France as well. The reasons for this may become more clear following the description of French terrestrial atlases during this same period.

Dutch minor atlases

Concurrent with the publication of the grand folio atlases beginning with Ortelius and continuing through the twenty-first century is the publication of reduced-format or 'miniature' or 'minor' or "pocket atlases" (Van der Krogt 1993: 108-112). As described in Chapter II, the printing format for atlas maps was determined by the typical dimensions of paper manufacture. Folio maps were printed upon folio leaves whose average dimensions were 300mm by 700mm. However while such folio atlas maps could be richly adorned with gilt and hand-colored, the cost of these showpiece atlases was well beyond all but the wealthy and noble. In the case of Blaeu's *Atlas Major* "the wealthy patricians of the time had a love of pomp and splendour and the *Atlas Major* amply catered for it" (Van der Krogt 1993: 107). Even individual map sheets were too

expensive for the French engravers who created them! (Pedley 2005: 162-163). Such atlases were certainly too large and too heavy to be portable.

From the first edition in 1570 of Ortelius' *Theatrum orbis terrarium*, atlases were commercially successful. The splendid folio format of the TOT sold very well with four editions alone in the first year of publication. This market success may have been the motivation for the engraver Phillip Galle to reduce the TOT maps to an octavo format (130 x 190 mm) and publish what became known as the *Epitome* in 1576. The original Latin text was re-written as Dutch verse by Peter Heyns, making it accessible to a much broader audience. Originally containing seventy-seven maps (more than the 1570 TOT), new and improved maps were added to the *Epitome* between 1577 and 1601. Its commercial success was sufficient that a competitive version was brought out of Antwerp by Johannes Keerberg in 1601 with new text and newly engraved maps displaying latitude/longitude graticules (Koeman 1967, Vol III: 71). The *Epitome* was a best-seller with twenty-four editions from 1577 to 1609 with text translated into French, Latin, English, and German. Eight more editions with Italian text were printed in Italy between 1598 and 1724. Koeman describes the Epitome as "a 'first' in the history of atlas cartography: the compilation of a description of the world, in digest form and originally in rhyme, in a cheap, simple get-up within the reach of the lower middle class…The attractive oblong book was very well received by the public" (Koeman 1967, Vol III: 131). This reduced-format octavo-sized atlas began what became a long tradition of small printed atlases whose cost was much less than the grand folio atlases typically studied in the history of cartography. The sales and multiple editions for such pocket size atlases demonstrates interest in geographical knowledge among the merchant class whose

investments in trade external to local markets was stimulating a need for information. The prevalence, longevity of profitable publication and other characteristics of reduced-format atlases has never been addressed as a specific typology in the history of cartography and deserves future attention.

Mercator's maps were also reduced in format by Hondius and published with the title *Atlas Minor*. The *Atlas Minor* enjoyed a long success of twenty-two editions over 131 years from the first Latin edition of 1607 to the final French editions in 1735 and 1738. The number of maps in each edition increased from the initial 152 to 283 in the final three editions. The percentage of periphery maps in relation to the total number of maps in each edition declined from thirty-two percent in 1607 to twenty-four percent in 1735 but the different percentages appear more related to the language of the edition than its year. The *Atlas Minor* was printed in Latin (seven editions), French (seven), German (four), Dutch (one), English (three), Russian and even Turkish. The twenty-two editions collated are in the first four languages. The editions with the fewest periphery maps as a percentage of the total were the German editions of 1609, 1630, 1631, and 1651 with fifteen to eighteen percent. The highest percentage of periphery maps were published in the Latin editions, the French editions averaged twenty-four to thirty percent, the English and sole Dutch edition averaged sixteen percent. Among all editions, the Africa periphery maps averaged twenty-three percent, Asia forty percent and America forty percent. The copperplates were sold after 1621 to a London editor who used the maps to illustrate the 1625 edition of *Purchas His Pilgrimes*.

Another reduced-format atlas published shortly after the TOT by an obscure Middelburg printer, Barent Langenes, proved as successful as the *Epitome*, the *Caert-*

Thresoor from 1598 with 169 maps in two parts. While the maps were small, their quality "sets a new standard for minor atlases. The small maps are extremely well-engraved: neat and clear, elegantly composed" (Koeman 1967, Vol III :252). The *Caert-Thresoor* was an affordable complete world atlas in a portable format. Unfortunately Koeman slights the potential audience by asserting "The *Caert-Thresoor* must have been an atlas favored by the citizens of the lowest income" (Koeman 1967,Vol III: 252). Of the 169 maps, a quarter depict non-European periphery with thirteen maps of Africa, nineteen of Asia and eleven of America. These proportions of periphery portrayal are similar to the larger folio atlases collated above for Africa, slightly less for Asia and approximately the same for America (Appendix B).

Publication of the *Caert-Thresoor* was soon taken over by Cornelis Claesz., the leading printer in Amsterdam during this period. Claesz. had the plates re-engraved with latitude/longtitude graticules added and Heyn's Dutch verse replaced by a new Latin text written by Petrus Bertius, brother-in-law to Pieter van den Keere. Bertius was a well-respected scholar of history and religion who moved to Paris and spent the remainder of his life there. The change of text from Dutch verse to Latin prose may have made the Caert-Thresoor more marketable as evidenced by its next transformation. The atlas name was changed to *Tabularum Geographicarm Contractarum*, as which it sold very successfully in ten editions from 1600 to 1650. Purchasers were able to choose between Mercator's *Atlas Minor* and Bertius' *Tabularum Geographicarum* (Koeman Vol I: 258), two world atlases containing between 150 and 200 maps in octavo format (120mm x 200mm).

A consolidation of publishers occurred in the second half of the eighteenth century in Amsterdam with the firm of Covens and Mortier gradually gaining possession of the copperplates for folio and minor atlases. The works from Allard, Danckerts and Schenk eventually ended up in their shop as well as the many miniature atlas plates from Pieter van der Aa. Van der Aa is criticized for his lack of originality by Koeman and insistence upon making maps 'fit' onto small octavo or duodecisimo pages even at the risk of altering the maps' projection (Koeman 1967 Vol I: 16). However, Van der Aa produced, in 1729, the largest multiple volume atlas ever printed at a quarto format. The sixty-six parts published in twenty-seven volumes (Library of Congress) or twenty volumes (Konigreich Bibliothek, Leiden) contained more than three thousand plates, 1546 of which were maps. This is more than twice as many maps as the largest of the Blaeu *Grand Atlas* editions. The firm of Rainer and Josua Ottens were the only real competitors to Covens and Mortier in eighteenth century Amsterdam (Koeman 1967 Vol III: 85). Their atlases were typically one-volume atlases of variable length with maps selected by the buyer. Of note to those seeking maps illustrative of Dutch mapmaking of this period are these Ottens atlases that include examples of nearly every map of Dutch origin at the time: province maps, polder maps, town maps in multiple sheets as well as military plans, pocket atlases and one maritime atlas, Renard's *Atlas de la Navigation*.

The Periphery in French World Atlases

> And yet on its western coastline, facing the ocean on which the destiny of the modern world would be decided, France had many advantages: it had sea-ports, sea-going peoples and populations whose poverty might have made them willing to try anything…but the royal government itself saw the world through continental eyes…if 'Holland' (that is the Low Countries) and England spent less on their armies, it was because England was protected by the sea and Holland by its small size and its rings of fortresses. France was obliged to pay the price for

> its immense size and its land hunger, a sort of peasant craving which nothing could satisfy (Braudel 1988: 310).

Did the rise of cartography of France and the atlas publication industry in Paris not project the new geography of trade into new geographic arenas as occurred in the map making and atlas trade in Amsterdam and London? The mapping of the French core was assigned by Louis XIV to the Academy of Sciences in Paris but the purpose of the king's patronage of cartographic science has been questioned

> We may wonder whether the task that the king entrusted to the Academie – a complete description of the world, including natural history as well as cartography – did not express more the will to dominate the world through knowledge than the more practical desire to expand trade in foreign countries (Pelletier 1998: 42-43).

The need to impose the imperial will upon as much of the world as possible, in part by describing that world completely, is one perspective by which to understand the production of French world atlases.

The motivation for French mapping of the non-European periphery can been regarded as a attempt at imperial outreach beyond the European continent. The history of French cartography is cast in a different light to its competitors in Holland and England. The rise of scientific cartography in which critical evaluation of sources, increasing mathematical accuracy and advances in astronomy were carried over into surveying became the foundations for seventeenth and eighteenth century French mapmaking (Edney 1999). Prior to the accession of Louis XIV to the throne in 1661, French cartographers had published atlases of the French core but few world atlases. From the middle of the seventeenth through the end of the eighteenth centuries, French atlas publishing was concentrated in only a few families; Sanson, Jaillot, Delisle and later, de Fer, Robert de Vaugondy, and D'Anville. Four generations of the Cassini family

dedicated themselves almost exclusively to mapping of the French core in the two great national surveys, now known as the Cassini surveys. The archival maps and atlases of these families are a cartographic legacy of such quality of engraving, size, adornment and accuracy that their frequent copying by Dutch and English publishers in the early modern period is easily understood.

Mapmakers in France were known as geographers (*geographes*) and their education was different from most Dutch and English mapmakers. Education in history, the classics, mathematics and surveying in the Jesuit schools was the preferred preparation for civil careers and most of the known French geographers of the Enlightenment were educated in this tradition (Pedley 2005: 26-34). The practice of mapmaking as part of a geographer's activities was so different from other countries that the French *geographes de cabinet* were admired for their education and compilation skills (Pedley 2005: 13). A *geographe de cabinet* was not a field surveyor but a compiler of information, both cartographic and written, in a critical process of review. Their challenge was not in the origination of new field survey data but in the resolution of "every point of view, whatever its source" in a rational debate that should "always, if adequately conducted, have a conclusive outcome" (Edney 1999: 170). Inherent to the Enlightenment epistemology of the encyclopedic geographic archive was the need for geographers to review, sift and critically evaluate all prior knowledge, both written and cartographic, to ascertain the most accurate compilation of geographic information to depict in maps (Edney 1999: 170-171). The eighteenth-century geographers whose atlases are analyzed here hardly left Paris or traveled externally since their task was in the library "relying instead on a network of correspondents and their own reading and

gathering of materials to create their maps" (Pedley 2005: 26). The resulting maps established a higher standard for information accuracy during a compilation process that compared, analyzed and evaluated multiple sources. Memoires recorded justifications for the geographer's decisions and became brochures that accompanied a map or were published in the *Journal des Scavans* (Pedley 2005: 31). Such memoires created a additional archive to French mapmaking history and these records are a rich source for scholars. The legacy period of French mapmaking and atlas publication begins with Nicolas Sanson (1600-1667) whose studies of ancient history may have prompted the consistent inclusion into his atlases of maps of the ancient world, a practice continued by his successors in publishing atlases. Sanson produced the first French world atlas in 1658 (folio 450mm x 340mm) with one hundred thirteen maps. Eight are of Africa, twelve of Asia and twelve of North and South America. Two years previously he published an eighteen-map atlas of Africa, *L'Afrique* and in 1657 an atlas of America, *L'Amerique*, with fifteen maps, with both atlases in quarto format. It is unclear whether those quarto maps were incorporated into the *Cartes generales de toutes les parties du monde* of 1658 in folio format (450mm 340mm). The Sanson map oeuvre continued to be published by his sons, who also associated with Alexis Hubert Jaillot and Sanson's nephew Pierre Duval. Jaillot's cartographic legacy has been documented elsewhere (Fordham 1929: 32-33; Pedley 2005; Pastoureau 1980) but several salient features for this study need to be emphasized.

Evidently it was under Jaillot's direction that the large folio atlases began to be produced from Sanson's original maps with additional maps added. The Sanson maps were re-engraved on a larger scale to create folio atlases with full hand coloring and gold

illumination described as “the finest specimens extant of this decorative art” (Fordham 1929: 36). Jaillot’s chief work, *L’Atlas Nouveau*, was published in six editions from 1681 through 1696. The first edition is titled *Atlas nouveau contenant toutes les parties du monde ou sont exactement remarques les Empires, Monarchies Royaumes, Estats Republiques & Peuples qui si touvent a present. Presente a Monseigneur le Dauphin* in large folio format (637mm x 500mm) with forty-six maps and nineteen geographic tables. The four editions through 1690 include only six maps of the non-European periphery as continental maps of Asia, Africa and North and South America despite the claims of the title to being a ‘world’ atlas. Of particular interest, considering that this atlas is dedicated to the dauphin who would be expected to have interest in the European periphery is the detail on the two North and South American maps indicating the various possessions of the European polities: # 5 “L’Amerique septentrionale divisee en ses principales parties scavoir les Terres Arctiques, le Canada ou Nouvelle France, le Mexique ou Nouvelle Espagne, le Nouveau Mexique, les isles de Terre Neuve, de Californie, et Antilles ou sont distingues les uns des autres les estats comme ils sont possedes presentement par le Francois, Castillans, Anglois, Suedois, Danois, et par les Estats Generaux des Provinces Unies ou Hollande“ with eight different scales on the map. Map # 6 is a similar map with European possessions color-coded with multiple scales.

The 1692 Paris edition by Jaillot was printed also in Amsterdam in the same year by Peter Mortier as *Atlas Royal a l’Usage de Monsieur le Duc de Bourgogne.* Mortier somehow was able to have all the original Jaillot maps re-engraved and added another fifty-three maps to bring the edition total to ninety-nine. Eighteen geographic tables,

fifty-four alphabetical tables and one hundred eighty-four plans and views on twenty-seven pages enlarged the atlas to two volumes. A separate map # 294 was dedicated to the duke of Burgundy, "Nova Canadae sive Novae Franciae in America septentrionali tabula, ad usum serenissimi Burgundiae ducis" based upon, presumably, Samuel Champlain's 1612 map "Carte Geographique de la Nouvelle France." Champlain's map of the North American French periphery had been re-issued in 1632 showing the latest discoveries and continued to be the basis for maps of New France through the end of the seventeenth century (Heidenreich 1981: 74). Mortier also published Sanson's *Atlas du voyageur* from Amsterdam in 1708 in a smaller portable format that ran to six editions, far more than were ever published in Paris.

The second major atlas of Sanson that would also be re-engraved and published in ten editions from 1695 through 1719 was *L'Atlas Francais*. Essentially a French core atlas, *L'Atlas Francais* editions had one-third of its maps depicting France, two-thirds maps of other parts of Europe and maps of Nouvelle France consistently included in each edition along with continental maps of North and South America. Such an inclusion of a portion (albeit geographically extensive) of French claims for the Great Lakes region is also a characteristic that will be later described for English core atlases in which North American possessions in the Caribbean and the eastern coast of North America are added to the contents of an English county atlas. The Great Lakes maps and later, maps of the Mississippi and Louisiana, appear in French core atlases as the cartographic incorporation of periphery with core.

The successor to Jaillot but an originator of his own maps was Claude Delisle (1644-1720) and his four sons. The eldest son, Guillaume, published the *Atlas de*

Geographie around 1700 with editions in 1707, 1709 and 1719. Guillaume Delisle has been called the 'first scientific cartographer' due to his precocious beginnings in drawing maps at age nine and membership in the Academie Royale des Sciences by age twenty-seven (Pedley 2005: 31). The *Atlas de Geographie* was re-issued from Amsterdam in 1740 by Covens and Mortier as the *Atlas Nouveau* as well as an Italian edition in Venice. The eight editions of the *Atlas de Geographie* or *Atlas Nouveau* between 1725 and 1732 were folio format ranging between thirty-seven and 197 maps per edition. Portrayal of the non-European periphery averaged twenty-seven percent for all the editions with fifty-five percent of the periphery maps portraying North and South America in eight to thirty maps per edition. The 1741 Covens and Mortier Amsterdam edition of the *Atlas Nouveau* with 114 folio maps (570mm x 440mm) portrays the periphery in twenty-three maps of which four are of Africa, six of Asia and thirteen of North and South America (. Map # 88 "Carte d'Amerique dressee pour l'Usage du Roy par G. Dle,…1739" depicts the entire Atlantic basin while maps 89 through 105 cover both continents. Map # 91 "Carte Particuliere de l'Amerique Septentrionale" is a compressed version of Henry Popple's "A Map of the British Empire in America with the French, Spanish and Hollandish Settlements adjacent thereto by Henry Popple" published as a cellular map atlas in London in 1733 (Popple 1733). Map # 92 "Nouvelle Carte Particuliere de l'Amerique ou sont exactement marquees, une Partie de la Baye d'Hudson, le Pays des Kilistinons, la source de la Grande Riviere de Mississipi, le Pays des Illinois, &c." is another composite of about four of Popple's maps depicting Hudson Bay, the Great Lakes and the course of the Mississippi River, regions under dispute between Britain and France during the first half of the eighteenth century (Rich 1954). The 'Paris' set of

Delisle map plates were passed to Philippe Buache, Guillaume's son-in-law, who continued to publish atlases from the plates into the last quarter of the eighteenth century.

Nicholas de Fer (1646-1720) was a prolific Parisian cartographer, engraver and publisher whose output included more than six hundred maps with a rich rococo style. De Fer's primary body of work was focused on the French core but he published a world atlas in five volumes from 1700 – 1705 entitled *L'Atlas Curieux*. This was a quarto atlas (265mm x 364mm) containing one hundred eighty-three maps plus prints, some town plans and views of gardens. His *Suite de l'Atlas Curieux* published 1714-1716 expanded upon this original set. Collation of *L'Atlas Curieus* requires working through dozens of maps, prints and views whose order seems jumbled in contrast to the more orderly organization of the Sanson/Jaillot or Delisle atlases. As for portrayal of the non-European periphery, De Fer's atlases cannot be calculated in the same manner as the previous authors' works because the multiple volumes are divided relatively arbitrarily into geographic areas. In the complete one-volume edition of one hundred twelve maps published in 1703, the percentage of periphery maps was twelve percent as was a one-volume re-issue in 1748. Included in *L'Atlas Curieux* are city plans such as Plate # 22 "Plan des Villes, Forts, Port, Rade et Environs de Carthagene Situee dans l'Amerique Meridionale". Another edition entitled *Cartes & descriptions generale & particulieres pour l'Intelligence des Affairs du temps, au Sujet de la Sucession de la couronne d'Espagne en Europe en Asie, Afrique et Amerique* depicts North and South America in the maps numbered 14 through 19 (De Fer 1702).

Phillippe Buache, son-in-law of G. Delisle, J.P.P. D'Anville and the father and son firm of Robert de Vaugondy were the leading French publishers of world atlases in

the last half of the eighteenth century. Rigobert Bonne, Jean Lattre and Robert Janvier were cartographers and active publishers of world atlases composed of maps not original to them. D'Anville was a true *geographe de cabinet* whose interests in the Orient resulted in an atlas of China, *Nouvel Atlas de la Chine*, with forty-two maps in 1757 and a world atlas *Atlas General* in 1740 in which he primarily corrected the previous errors of Sanson and Delisle (D'Anville 1740). Buache compiled highly-regarded maps from meticulous study and comparison of others' work but most of them were published in atlases by Covens and Mortier in Amsterdam rather than in atlases by Buache himself.

The Robert de Vaugondy firm used material acquired from Sanson's grandson, Pierre Moulard Sanson, in 1757 and supplemented this stock with their own maps. The Sanson maps appeared in their final much-reworked state in the atlases of the two Robert de Vaugondys. The *Atlas universel* was published both as a folio atlas and a quarto atlas by subscriptions from more than one thousand persons, including Madame Pompidour (Fordham 1929: 37; Pedley 1979) with either 103 or 108 maps per edition. The five extra maps in the expanded version depicted the post-roads of European countries (Italy, Spain, Germany, Britain and France). This inclusion could be considered to emulate in conceptual organization the early 1644 Sanson atlas *Les Cinq Royaumes* which had five maps of each of those same polities. By 1757 each of those countries had a transportation infrastructure for their core that could be summarized in a single map. However, the most accurate road map was that of Britain since it was based upon the detailed information from Ogilby's strip road atlas at a scale of one inch to one mile. The French map is actually the updated 'post road' map from the early seventeenth century by Tavernier. The sources of the Spanish, German and Italian road network maps are

unknown to this author. The *Atlas universel* had seventeen maps of the periphery; eight for Asia, two for Africa and seven for North and South America. The Atlantic periphery has a North American continental map, # 97 with Map # 98 portraying Canada and the Great Lakes. Map #99, "Possessions angloises en Amerique, & cours de l'Ohio a new map:…Partie de l'Amerique Septentrionale qui comprend le Cours de l'Ohio, La Nouvelle Angleterre, La Nouvelle York, Le New Jersey, La pensylvanie, Le Maryland, La virginie, La Caroline", shows English possessions of the eastern Atlantic seaboard from New England to the Carolinas. The coverage extends westward to the Ohio River basin west of the Allegheny Mountains with the Illinois and Mississippi Rivers on the western edge. An inset map portrays the Carolina coastline southward into Florida. Map # 100 "Virginia and Maryland" is a larger scale map of Delaware Bay and Chesapeake Bay with meticulous labeling of settlements and rivers but no fathom markings in the bays themselves. No claims of French possession are made on this map in contrast to the earlier maps in Sanson, De Fer and Delisle that touted French claims in North America which is remarkable since this was the time of the Seven Years or French and Indian War during which France would lose control over much of her North American possessions. Maps # 102 of "Isles Antilles" and # 103 "Isles de S. Domingue & de la Martinique" in the Caribbean portray what little territory may still be legitimately called a French periphery.

A summary statistical assessment of forty-four French world atlases published by four geographers (Sanson, Jaillot, De Fer and Delisle) from 1658 to 1755 was analyzed for their structural morphology in portraying the non-European periphery (Appendix B). The atlases averaged ninety-four maps apiece with the smallest being De Fer's *Atlas*

curieux volumes with only twenty-four in Volume 1. The largest atlas was also De Fer's *Suite de la Atlas Curieux Part 2* of 1716 with 249 maps. The forty-four atlases contain a total of 4143 maps published in Paris over a hundred years. The atlas maps portraying the periphery averaged thirteen per cent of the editions with Africa maps comprising twenty percent, Asia twenty-six percent and America forty-six percent.

The Periphery in English World Atlases

The English core was defined as early as 1579 by Saxton's atlas of English counties as England and Wales, the south end of an island with its southeastern coastline only a few days' sail from the eastern shores of The Netherlands and northwestern France. The closest terrestrial peripheries for the English core were the northern end of the island, Scotland, and the nearest large island, Ireland. The mapping of these two territories was the first step to ensuring that resources, particularly agricultural commodities, were accessible to the needs and wishes of London.

Incorporation of Ireland

A map of Ireland was included in Ortelius' TOT and a preliminary attempt at surveying the Irish periphery was made in 1585 as part of the Munster plantation under Elizabeth. The application of a rectangular spatial organization for rural land soon became difficult due to differences in terrain from the abstract mathematical model of square seigneuries. However the lessons learned by the military surveyors working among a hostile local population and trying to apply a cadastral mapping process to a highly variable terrain provided experience that would later be applied to the surveying of colonial settlements in North America and the Caribbean (Kain and Baigent 1992: 336). The first official survey of Ireland was conducted during the English civil war of the mid-

seventeenth century as 20,000 men under Oliver Cromwell sought to crush Irish resistance after the 1641 Ulster uprising. Part of Cromwell's policy towards the Irish rebellion was to encourage the Protestant re-settlement of lands formerly owned by Catholics (Swift 1999). To resettle rebellious Catholic land owners west of the Shannon River and finish reallocating the eastern land to Protestant immigrants, a good set of maps incorporating a comprehensive survey was needed. This task fell to William Petty, surgeon-general to the army. Between 1655 and 1659, the survey engaged more than one thousand men, forty clerks and "a small army of surveyors and undermeasurers" (Tooley 1972: 93). The forfeited towns and a classification of land suitability (cultivable, bog, mountain or wood) were recorded (Kain and Baigent 1992: 335). The entire set of survey drawings were deposited with the Crown by 1657. Known as the Down Survey, the maps were drawn by parishes at a scale of three or six inches to the mile (1:21,120 or 1:10,560). The manuscript maps were finally engraved in 1673 by Dutch engravers in Amsterdam. The official *Hibernia delineatio* was not printed in England until 1685, nearly forty years after their original completion in manuscript. Containing thirty-six maps, the atlas included a general map, maps of the four provinces and thirty-one county maps. This large folio format (705mm x 555mm) is similar to the previously-established model for the atlas of counties in the English core. Petty's Down Survey was copied and used by both English and foreign mapmakers through the end of the eighteenth century. Re-engraved by Francis Lamb into an oblong octavo format in 1689, *A Geographicall Description of the Kingdom of Ireland* enjoyed successful re-issues in 1695, 1720, and the addition of roads by Thomas Bowles in the 1728 edition. Shirley records twenty-eight editions of the oblong octavo edition from 1690 through 1773. Seven editions were

published in Amsterdam, one in Germany, three in Paris and seventeen in London by all of the leading active atlas publishers in each of those countries. The demand for such an Irish atlas indicates strong interest in the country by many outside of England – perhaps an example of overlapping peripheries?

Tooley refers to Petty's *Hibernia delineatio* as "the most important event in the seventeenth century" cartographically. It may deserve such recognition because the Down Survey should be considered only the second early modern example of a core mapping its immediate periphery in a process of incorporation even as resistance to that incorporation continued. On the continent, the sixteenth century attempts by the Habsburgs to subdue and incorporate the Netherlands was the first attempt to incorporate by cartographic delineation but was ultimately only successful in securing half of the Low Countries to the Spanish crown.

Commercial publishers continued to produce maps of Ireland and by the last quarter of the eighteenth century a strip road atlas was published by George Taylor and Andrew Skinner in both Dublin and London. Taylor & Skinner's *Maps of the Roads of Ireland* contained 289 pages of individual road maps drawn in two strips, typically with mileage distances at the top of the page. This atlas shows the application of the same technique for depicting the transportation network in what was now the Irish semiperiphery as had been done for the original English core around London a century earlier by Ogilby.

Incorporation of Scotland

The first atlas of Scotland was printed in Amsterdam in 1654 by Joan Blaeu as Volume Five of his *Teatrum orbis terrarium sive Atlas novus*. The manuscript map

surveys by Timothy Pont around 1603 were preserved by the Scotsman Robert Gordon who sent the drawings to Amsterdam. Blaeu had the best of these engraved and the thirty-nine maps and a general map became the largest single source for any set of maps in the Blaeu oeuvre. The manuscript maps sent back to Gordon form part of the collection of the National Library of Scotland and represent Scotland mapping itself at the time of the consolidation of the English and Scottish crowns under James VI of Scotland, James I of England. The deeply incised coastline of Scotland and its many islands were of great interest to mariners in England and from the Continent. The 'proper' shape of the country was not resolved until the later eighteenth century but from the first map engraved by Sanson using Gordon as his source, general maps of Scotland appeared in nearly every terrestrial world atlas published in Antwerp, Amsterdam, Paris and London, an indication that the English core's ability to incorporate its terrestrial periphery was not a foregone conclusion to the rest of Europe. The Sanson map was the basis for subsequent atlas publishers over the next century with the detailed estate surveys of John Adair and other eighteenth century Scottish surveyors gradually improving the cartographic quality in selected regions.

Unlike the Downs Survey of Ireland that dictated relocation and reallocation of properties for a periphery whose status remained "effectively a British colony" well into the eighteenth century (Swift 1999:12), no formal English surveys of Scotland were made until the English army's difficulties in deploying troops during the Jacobite rebellion of 1745-46. The army's lack of reliable maps with accurate topographic detail plagued troop movements and strategy up to and during the battle of Culloden and the Highland clans' uprising. Both sides in the conflict were using the most accurate map available, at

a scale of one inch to thirteen and a half miles and produced by John Elphinstone in 1745. Under the supervision of William Roy, the Royal Engineers undertook to create "a large scale map of the Highlands and construction of a system of roads enabling the country to be controlled by a system of small armed patrols" (Gardiner 1977: 440). From 1747 to 1750, six parties of military engineers mapped the Highlands each summer with the calculations and field notes compiled in Edinburgh each winter to create a fair copy. To this was added a survey of southern Scotland between 1752 and 1755, all drawings finally set to a scale of 1:36,000. This survey remained in the Crown's possession and was unavailable to cartographers and, therefore, not engraved or printed into the nineteenth century so little improvement to the core's map of Scotland occurred. The Roy-led military survey was of great strategic importance but was not followed by the typical county survey process that might be considered the natural progression in the English mapping of its territorial polity and periphery. With the reluctant incorporation of the Scottish clans, Scotland became a true semi-periphery within the Wallersteinian world-system definition. The number of surveyors increased in Scotland beginning in the 1730s as the English model of enclosure and agricultural consolidation began to transform the Scottish countryside (Adams 1975: 15). Individual estates were mapped extensively during the rest of the century to improve agricultural practices and apply more scientific principles to land management. Taylor and Skinner, Scottish surveyors who had been mapping individual estates, produced a road atlas of Scotland in 1776 that contained a general map and sixty-one plates of Scottish roads (Adams 1975; Fairclough 1955). The publication of this road atlas can be considered the cartographic incorporation

of Scotland as a semi-periphery to the English core. It became part of the core's network of transportation for trade and movement of goods.

The 'second' English periphery

The portrayal of a genuine English periphery, the settlement of North America and islands of the Caribbean, evolved from a process of exploration for commercial potential into a colonization effort from the beginnings of the seventeenth century through the eighteenth century. Given the commodification of capitalist agriculture and the region's use of controlled cost labor systems, it meets every test of a Wallersteinian periphery. Within a decade of the Pilgrims' landing in the New World, the first English world atlas was published in folio format (440mm x 320mm) by John Speed in 1627, *A Prospect of the Most Famous Parts of the World* with twenty-two plates and text on verso. Typically Speed's English county atlas, *The Theatre of the Empire of Great Britaine* was published and sold with *A Prospect* as a one or two volume edition. The portrayal of the periphery in the original twenty-two maps was in continental maps of Asia, Africa and America (all engraved by the Dutchman Abraham Goos) with Maps # 17, 18, 19 and 20 portraying Persia, the Turkish Empire, the Kingdom of China and Tartary respectively. Map # 21 was "A Map of the Sommer Islands once called the Bermudas". Of interest on the Bermuda map is the list of "adventurers [in] this yeare 1622" that details the ownership of shares of land in the colony among the investors in the company. The main island of Bermuda was surveyed by Robert Norwood in 1622 and the map shows divisions into what appear to be cadastral plots. Dividing the land into shares for the colonists sent by the Adventurers indicates that agricultural potential was the intent and appropriate commodification for ownership of that potential was

accomplished very quickly. Engraved by an engraver from a rival country, Abraham Goos, and published in the first English world atlas, the map of the Sommer Islands or Bermuda gives an early example of the imposition of mapping as one of the first steps in incorporating this periphery to its London core.

Subsequent editions of Speed's Prospect were published in 1631, 1646, and 1662. The 1676 edition expanded map coverage of the Atlantic basin with four new maps: # 23 "A Map of Virginia and Maryland", # 24 "A Map of New England and New York", #25.1 "A Map of Jamaica", # 25.2 "Barbados", and # 26 "A New Description of Carolina".

By 1621 the plates of Jodocus Hondius' *Atlas Minor* (originally published in 1607 in Amsterdam) were acquired by London printers. This Dutch world atlas was published in London in editions of 1635, 1637 and 1639 with 192 quarto format maps (290mm x 205mm). Forty-five new maps were engraved for the English editions, six of which were of the Atlantic periphery: # 181 "The Ylandes of the West Indies"; # 184 "Virginia"; # 187 "Terra Firma et Novum Regnum Granatense et Popian"; # 188 Peru; # 189 "Mappa Aestivarum…" [Bermuda] and # 192 "New England – observed and described by Captayn John Smith".

The expansion of maps of the Atlantic periphery, and specifically those portions of interest as the devedloping English periphery, demonstrate an adaptive technique of the evolving composition of atlases to suit the interests of potential purchasers. The original Dutch atlas copperplates were sold, probably by auction, to a probable consortium of London printers who then adapted the atlas to their local English market. John Seller, a London atlas publisher, produced four world atlases, the first of which was

composed primarily of Dutch folio format map plates, *Atlas Terrestris: Or A Book of Mapps, of all the Empires, Monarchies, Kingdomes, Regions, Dominions, Principalities and Countreys in the Whole World*. Out of the forty-eight maps, nineteen were of the non-European periphery with three of Africa, six of Asia and ten of North and South America. Map # 43 of Jamaica is of particular interest because of an inset table of precincts and the "most eminent settlements" keyed by number to the map. This is similar in concept to the map of Bermuda discussed above. Jamaica was settled by immigrants from both Britain and the other Caribbean islands and over two hundred thousand acres of land were patented by seven hundred families for the production of sugar cane (Sheridan 1965: 296). Jamaica was successfully incorporated into the English periphery and the cartographic records began to show the largest settlements as a form of 'profit center' within the world economy. This information would have been of more than passing interest to the financial backers of the plantations.

A specifically American periphery atlas was published in 1671 by John Ogilby of the *Britannia* strip road atlas fame. The fifty-two maps and views in a two-volume folio format (450mm x 325mm) were a copy of Arnoldus Montanus' *De Nieuwe en Onbekende of Beschrynig van America* published the same year in Amsterdam. This ability to rapidly translate a Dutch atlas text into English, re-engrave the maps and actually improve the formatting is similar to Pieter Mortier's copying of Jaillot's *Atlas Major* in the same year as the original publication in Paris. An available high-quality atlas with text about the English periphery in North America was very attractive to London publishers. Ogilby also published periphery atlases of Africa (1670) and Asia (1673), both drawn primarily from Dutch sources. These three atlases are examples of

one core borrowing information already produced by a rival core that describes a specific region of the periphery. The Dutch texts could be quickly and accurately translated into English and the Dutch labels on the maps were supplemented by English titles.

Robert Morden's *Geography Rectified* published in 1680 in quarto (210mm x 165mm) contained forty-three non-European periphery maps out of the total of sixty-five with fifteen of Asia, nine of Africa, five of islands across the world's oceans and ten of America and the Caribbean. The map of Bermuda has a note within its title cartouche stating "Bermuda is 3300 miles from London and 500 miles from Roanoke in Virginia". Such a notation invites the reader to place this small but strategically-important island into a context referenced geographically to both the English core and its important twin colony in the periphery. Morden published a periphery atlas of North America and the Caribbean in 1687, another small atlas of the Atlantic periphery in 1687 entitled *The Present State of his Majesties Isles and Territories in America.*…in duodecimo format (105mm x 125mm) with only seven maps and accompanying text. (This volume in the British Library is noted as coming from the library of Sir Joseph Banks.) All maps are by Morden except the map of Jamaica by Richard Blome which reverses the typical scale by being the dominant map on the sheet with an inset of the rest of the West Indies. Other London atlas publishers during the eighteenth century included John Seller, Philip Lea, Herman Moll, Moses Pitt, Henry Overton, Patrick Gordon, John Senex, Emanuel Bowen, Thomas Salmon, John Gibson, Robert Sayer, Andrew Dury, Thomas Kitchin, William Guthrie, Thomas Jefferys, William Faden, Robert Laurie and James Whittle. A range of terrestrial world atlases were produced by these engravers and publishers – some large folio atlases with double-sheet maps, some were 'geographical grammars' with only a

half dozen to two dozen small maps illustrating the text. The maps in the atlases were often copied or adapted from earlier Dutch and French authors except for the maps of North America and the Caribbean. The British map publishers produced original maps of the American periphery from the beginning of the eighteenth century and as the colonization expanded along the eastern American coast, their French and Dutch competitors relied increasingly upon the London map sellers for new and improved maps of that region.

The publication of terrestrial world atlases in London grew from compilations of Dutch maps in the middle of the seventeenth century to dozens of original English maps in the eighteenth century. Fifty-six terrestrial world atlases published in London between Speed's *Prospect* of 1627 and William Faden's *General Atlas* of 1800 and Samuel Dunn's *A new Atlas of the Mundane System* of 1796 were collated for their percentages of periphery maps (Appendix B). For all editions, periphery maps average forty percent of the total with the actual number of periphery maps varying between four and fifty in the different editions. The average number of maps per English world atlas during this period is forty-two, less than the average for either the Dutch (178) or French (94) world atlases. One difference notable in this collation are the number of quarto and octavo atlases versus folio atlases. Just over half are folio format, the rest are smaller format. This is a greater percentage of reduced-format atlases than the French and even more than the Dutch atlases from the same period. Part of the reason for this may lie in the difference between the marketplace for printed atlases in Paris, Amsterdam and London – large folio atlases were handsome but quite expensive and only affordable for the nobility and the wealthy. British world atlases were not only less expensive than their French

counterparts but could also be purchased by subscription to monthly publications such as *The Gentleman's Magazine* or the *London Gazette*. Herman Moll published a five-volume world atlas, *Atlas Geographicus: Or, A Compleat System of Geography*.. in quarto format (230mm x 175mm) in the *London Gazette* from 1708 until 1717, a nine-year publication run of one hundred two maps of the world. The five-volume structure of the atlas was divided into thirty maps of Europe in the first volume, twenty-two more European maps in the second volume, seventeen of Asia in the third, eleven of Africa in the fourth and twenty-two of North and South America in the final volume. A list of subscribers appeared in the preface to the first volume. A contemporary, John Green, described the *Atlas Geographicus* in his 1717 book *The Construction of maps and globes* as

> the world in *chaos*; there are very good Materials, but they want a Form: And what is very incongruous, there are many supplemental Descriptions of Things and Places, that are much larger than the Accounts that are given first of them; which, however, I impute to the Author's being obligated to precipitate its Publication, that a Portion of it might come out Monthly…But that which goes by the Name of *Moll's* Geography, is the most perfect Piece that…has been writ yet in any Language, and yet it might be much improv'd; so that for all the World abounds with Books of Geography, yet a compleat one is still wanting. (quoted in Reinhartz 1997: 30)

The portrayal of the non-European terrestrial periphery in early modern atlases reveals new economic space. The satisfaction of public interest in the new territories and colonization is seen in the number of atlases published and the continued commercial success of many editions through the seventeenth and eighteenth centuries.

Atlas maps were often supplemented by texts describing regions of the world and these texts, at least in the English world atlases, identify the region's industries and the agricultural products available. One example is Patrick Gordon's *Geography*

Anatomized, or The Geographical Grammar, an octavo (170mm x 110mm) geography book first published in 1693 illustrated with sixteen small maps engraved by Robert Morden. This small volume enjoyed a remarkable fifty-year publication life in nineteen editions with three different sets of maps engraved by the best cartographers of the period. It is estimated that Gordon died in the early eighteenth century but the book sold steadily through its final edition in 1754. The title, 'geographical grammar', inspired other writers to imitation and the term evidently became the accepted title for a geography text (McCorkle 1994: 13). John Senex engraved the maps for the eleventh edition and these were used until the twentieth edition of 1754 when Emanuel Bowen, a leading map publisher and engraver, executed a new set, which had expanded by then to twenty-two maps. While the *Geography Anatomized* may appear as typical of its period in the dry recitation and descriptions accompanied by maps too small and dated in relation to the changing knowledge of geography of the times, it "fitted a niche in the curriculum of its day and gave many a scholar his/her view of the world beyond the shores of England" (McCorkle 1994: 15).

Conclusions to World Atlases as Periphery

Comparison of the early modern world atlases published in Amsterdam, Paris and London requires an untangling of the complexities of the respective publication industries, the economic histories of the three countries and satisfaction is likely to elude the researcher attempting to find distinctive differences between the three atlas traditions that can be definitively proven. The seventeenth century was the Dutch Golden Age in cartography and, as can be seen in the archival evidence, Dutch world atlases dominated the market (Appendix B). One indicator of the market expansion of atlases in the midst

of the great period of European external expansion is the number of foreign language editions of atlases produced by the Dutch. Van der Krogt notes that the period from ca. 1550 to 1675 was the hey-day of Dutch commercial cartography and certainly this period aligns with Dutch hegemony in the world system (Van der der Krogt 1993:73). A distinguishing feature of the Dutch approach to map and atlas publication, at least for world atlases, is that Amsterdam publishers sought to satisfy market demand in the kinds of maps, the morphology of their atlases and the language in which maps and text were composed. Dutch language publications had a narrow attractiveness since it was not a common language outside the Netherlands but the contents were valuable to the English as demonstrated by John Ogilby's translations of Dutch geographic descriptions and maps for his atlases of America, Africa and Asia in the 1670s. Dutch maps were printed in French and English atlases, sometimes with attribution, sometimes without. But the Dutch were never hesitant to create a French edition of an atlas and created far more French editions than English editions of any atlas.

To describe a Dutch periphery as observed in their world atlases requires the reminder that the United Provinces were the smallest country in early modern Europe. The Dutch core was smaller geographically than nearly all of the French provinces so their non-core atlases basically served to provide maps of everywhere outside a very small area. The size of the Dutch Republic meant that nearly any location further than fifty miles east or south from Amsterdam could be considered peripheral. The real Dutch periphery is revealed in Chapter V in the production of maritime atlases.

As for Dutch portrayal of the Atlantic periphery including the Caribbean, North and South America, Dutch cartographers were engaged in mapping the eastern North

American coast until the end of the first Anglo-Dutch War in the mid-seventeenth century. Once their territorial claims to North America had been abandoned, their cartographic interest shifted to the far East where a profitable trade network operated under the Dutch East Indies Company.

The French atlases were more focused on their European territorial periphery. Louis XIV's obsession with expansion and the struggles between France and Spain for control of the European polities dictated a predominance of maps of the European rather than extra-European countries. Maps of New France appeared in most French world atlases and documented the explorations of priests, explorers and official envoys from the Crown. But by the 1760s, French aspirations in the Atlantic had been narrowed by military reversals to a few Caribbean islands and settlements in Louisiana. As Wallerstein noted, the English pattern of exploration, exploitation of discoveries for raw materials and the setting of colonies was motivated in part by a need to create external markets for its exports. This approach towards developing its periphery can be understood in light of the differences between the three countries' Atlantic peripheries by the end of the seventeenth century.

> In the seventeenth century, 28 new separate units of colonization were established in the Western Hemisphere; 3 Dutch, 8 French and 17 English; as of 1700, the English had 350,000 – 400,000 subjects (including slaves) as against 70,000 for the French, and in the Flourishing Caribbean colonies there were twice as many Englishmen as Frenchmen. French Canada and Louisiana could not begin to match British settlements in North America in terms of size of population or production output (Wallerstein 1980: 102).

The English terrestrial world atlases reflect this difference in peripheral strategy in both the number of world atlases published and their specialization into Atlantic periphery cartographic depiction. World atlases of relatively modest size and, therefore, cost, were

printed and sold in London through prescription, through subscription, through lotteries. While Woodward describes English cartography during this period as ‘mediocre’, his comparator was the more intellectual, more thoughtful maps produced by the *geographes de cabinet* in France, cartographers who were not forced to create maps for the open market but only to satisfy the curiosity of their patrons. The map sellers and atlas publishers of early modern London were a diversified industry engaged not only in cartographic projects but books, pamphlets, broadsides, bibles, prints and any other printed product that could be sold for a profit (Harley 1997: 173-174). The Parisian cartographers were an industry regulated by the state with explicit privileges for each stage and craft. It is little wonder that the maps in the French atlases were beautifully engraved and colored since theirs was a product for an audience rather than for a market.

The Dutch atlases, including world atlases, catered to an external market whose clientele had broad interests in the East and West Indies, Africa, America and Europe. Both Dutch and French atlases had more maps per edition and were larger and more decorative in format than English world atlases. By comparison the English atlases were only occasionally colored and almost evenly divided between large folio and quarto or smaller formats. The maps in such atlases appear quite plain in comparison to the grand Dutch and French atlases. The advantage to this graphic plainness was reduced cost and the result was that their proliferation and affordability made the new geographical knowledge of the periphery accessible to more people.

CHAPTER V

CORES MAP THE MARITIME PERIPHERY

Maritime Atlases

The mapping of the maritime periphery deserves a separate chapter because it is in this charting of the coastal trades, the depiction of the entrepots and edges of the terrestrial cores that the northeastern European polities developed a network of trade that can truly be described as a world system. The geography of trade has been described by historians, economists, sociologists and geographers in voluminous articles and books, each contributing some portion to the body of knowledge that encompasses the geographic zone of focus in this study, the Atlantic basin. The historians of cartography have also made significant contributions to Atlantic history, but their research has typically been of two types: a cartobibliographic analysis of the production of maritime atlases (Koeman 1971; Schilder 1997; Van der Krogt 1993; Robinson 1962; Whitfield 1996;) or the history of mapping a particular place or region of the world (Black 1978; Verner 1963; Suarez 1999; Stephenson and McKee 2000).

Commodity chains

The trade networks of early modern Europe follow a distinct order of development. As described previously, Wallerstein defines core and periphery in terms of the labor relations of production. Peripheral production processes are sociologically bounded first then placed within a geographic framework. The concept of a 'commodity chain' as "a network of labor and production processes whose end result is a finished commodity" is the clearest geographical foundation to world-system studies (Hopkins and Wallerstein 1986: 159). The method of analysis for 'reconstructing' a commodity

chain involves the documentation of four properties for each operation or node within a chain. The first three properties are the flows immediately preceding and following a node, the dominant labor relations for the node itself and its organization including the production technology and the scale of the production unit. The fourth property, "the geographical loci of the operation in question", is asserted to be the most easily 'calculated' with no specific justification for this claim and certainly without reference to early modern cartography (Hopkins and Wallerstein 1986: 162). Since their intent is to be able to identify and classify the divisions of labor at each node in a commodity chain, they include the location of a node (or link) in the chain as significant without providing much explanation as to how the geographic location of any individual node's operation affects its role within the commodity chain itself. Two studies published subsequent to the conceptual outline address the commodity chains for grain flour (Pellizon 2000) and shipbuilding (Ozveren 2000).

Maritime network cartography

The history of sailing directions, pilot's guides and maritime or sea atlases provides a contextual framework for understanding the 'geographical loci' of production nodes within commodity chains of the emergent world-system in early modern Europe. Printed instructions for sailing were known as 'rutters' in English, *leescaert* in Dutch, *roteiros* in Portuguese and S*eebuecher* in German (Waters 1967: 12). These were small bound books of manuscript text illustrated with drawn coastal profiles, without charts. The text described in detail the direction and recommended approaches to take along the coasts and between ports. The coastal profiles were visual guides to enable sailors to recognize their location from offshore and to identify landmarks and hazards as intended

ports were approached. The earlier Italian Mediterranean *portolani* were in the same format but were produced as copied manuscript vellum charts. The first printed rutter from copperplate engraving, known as *kaert van der zee* or charts of the sea,was published in the first half of the sixteenth century in Amsterdam by Cornelis Anthonisz (1499-1577) and covered what came to be known as the Eastern Navigation.

The organization and division of the sailing directions in printed Dutch rutters was regional from their initial publication: regional geographically in the sections of coastline described and regional in terms of the market ports that would be accessed from that rutter. All rutters were prefaced by an introduction to the art of navigation. The next section, The Eastern Navigation, included sailing instructions for the North Sea and the Baltic. When the Arctic coastlines up to Archangel were also included, the regional rutter became known as the Eastern and Northern Navigation (Van der Krogt 1993: 119; Koeman 1970: XI). The coasts of Portugal, France and England were the Western Navigation. Early rutters also contained a special section for navigating the Zuider Zee, infamous for its sandbars and shifting shallows, as the approach to Amsterdam. These three parts, introduction to navigation, the Eastern Navigation, and the Western Navigation formed the organizational pattern for rutters and their successor publications, pilot books with charts and maritime atlases, through the next two centuries. Later a fourth section was added known as the Southern Navigation or *Straitsboek* for navigating the Straits of Gibraltar and the European and African coasts of the Mediterranean as well as the Canaries.

A distinction should be made between the rutters or sailing directions, the pilot guides, and the maritime atlases. The physical formats of these three publication types

distinguish themselves in terms of use: the rutters were typically relatively small texts as were the pilot guides and their format was typically oblong octavo. The rutters were informational documents used by sailors and navigators and therefore had to be small enough to fit in a pocket or be otherwise easily carried. Few rutters have survived to the present day, presumably because of their frequent use at sea. The pilot guides with sailing instructions, coastal profiles and some charts were slightly larger and more of them survive in archives. Maritime atlases in folio format with large printed charts were not for use by sailors but appealed to those involved in trade such as merchants, financiers and investors in ships and shipping (Delano-Smith 1999: 148). Maritime atlases, because they were not taken to sea, represent the largest set of artifacts to be found in cartographic archives and are the evidence analyzed to determine publication similarities and differences for their production in Amsterdam, Paris and London.

The archival evidence instructs us on how the world-system itself was visualized by those who were participants in the seaborne trade comprising such chains. The maritime networks that Wallerstein and Braudel cite as the foundations for the capitalist world-system did not spring suddenly out of the ports of Amsterdam or London to become a determining factor in subsequent economic world history. The sailors, pilots and ship owners responsible for the carriage of goods and agricultural commodities were part of a centuries-long tradition of moving products between ports and across the seas. Braudel makes a useful division of the three scales of trade that existed in Europe upon which the world-system was able to build.

> At ground level and sea level so to speak, the networks of local and regional markets were built up over century after century. It was the destiny of this local economy, with its self-contained routines, to be from time to time absorbed and made part of a ‘rational’ order in the interest of a dominant city or zone, for

> perhaps one or two centuries, until another 'organizing center' emerged; as if the *centralization* and *concentration* of wealth and resources necessarily favored certain chosen sites of *accumulation*. (Braudel 1992: 36)

Before any commodity chains had developed, first level local markets existed as part of every village, town or city. Transactions were as likely to be barter as cash and many manufactured products were brought in from others town for trade. The second level within the hierarchy of commerce was the exchange of products and goods between cities and regions. The network of trade fairs in France and west central Europe during the thirteenth century was the beginning of such a commercial network, as traders offered products from the south and north in a central location for a limited period of time. The third and highest level of trade is what Braudel terms 'capitalism', the level at which local concerns are of least consequence since the financial arrangements and movement of goods become part of Wallerstein's commodity chains. Such chains extended across regions, across political boundaries and utilized sophisticated instruments of credit and exchange valid over long distances and longer periods of time than the weekly markets at the local level for the bartering of produce.

It is at this highest level of finance, credit and goods exchange that the maritime network of trade expanded from its local and regional beginnings to an international scope. Venice dominated the Mediterranean commercially with its flotillas of the *galere de mercato* sent annually around the inland sea (Braudel 1992: 127). The portolan charts used by ship captains for sailing the Mediterranean represent the first cartographic depiction of trade networks whose character and sequence could be replicated in the same format over many years. Written as sailing directions with a singular manuscript chart of ink on vellum, portolans have not survived in great numbers, probably due to their hard

use at sea. The earliest extant copies are from the end of the thirteenth century and approximately one hundred eighty charts and atlases from the fourteenth and fifteenth century have been identified and dated (Waters 1967; Campbell 1987: 373). Portolan charts are lauded by the historians of cartography as the 'first true maps' and "one of the most important turning points in the whole history of cartography" (Campbell 1987:371). The mythological and theological orientation of the medieval *mappamundi* is absent from portolan charts whose content was the "clearest statement of the geographic and cartographic knowledge available in the Mediterranean." (Campbell 1987: 372).

The geographical scope represented in portolan charts was typically the Mediterranean and the Black Seas with occasional additions covering the Atlantic coast south to Morocco and north to Denmark as well as England, Scotland and Ireland. Such charts were pragmatic instruments of sailing information, valuable for assisting passage between ports of trade: typically 650 x 100 mm, there were at a scale of approximately 1:6 million; lacking graticules, they had radiating rhumblines that crossed through the sea so that navigators could plot parallel courses across the chart according to the scale (Campbell 1987: 376).. Place-names were written inside the shoreline at right angles so as not to interfere with the depiction of the coastline itself. Besides the placement of place-names, a second convention was to enlarge geographical features of navigational importance such as headlands, estuaries and islands. This enlargement of critical information continued well into the next centuries since mariners were steering by visible features (Campbell 1987: 377). Such graphic conventions were replicated for more than three centuries in the chart-making of the Dutch and the English. The emergence of Dutch pilot books in the sixteenth century can be understood to be part of "an unbroken

tradition of seamanship…telling of courses and distances, shoals and other dangers, landmarks, anchorages and watering places" (Taylor 1949: 58). Cartographers in Genoa and the Balearics produced portolan charts as mariner guides throughout the fifteenth and sixteenth centuries . But these portolans were confined in their depictions primarily to Mediterranean coastlines and as manuscript charts were not incorporated into books but mounted to leather, linen or wooden backing (Campbell 1987: 376).

The expansion of trade routes beyond the Mediterranean and the Atlantic coasts brought a second form of navigation required to cross open seas. The Portuguese explorations along the coasts of Africa to the Indian Ocean and the Spanish explorations across the Atlantic and Pacific oceans required navigational techniques more dependent upon astronomical observations than the historic coastwise routes documented on portolan charts. The sea charts of the Portuguese and Spanish were drawn by cosmographers, copied by hand and updated by pilots returning from voyages. Such cosmographers and chartmakers were independent contractors to the Portuguese *cosmografo-mor* in charge of the *Almazem de Guine e India* (Storehouse of Guinea and the Indies) in Lisbon and the Seville-based *pilot-major* of the Spanish *Casa de Contratacion* (Zandvliet 1998: 15-24). Both the *Almazem* and the *Casa* initiated schools for training navigators, the former for the East Indies and the latter for the West Indies. Detailed recording of weather, sailing conditions and other observations were made by navigators on all voyages and this information brought back to the schools.

That mapmakers were independent is evidenced by the correspondence between Luis Teixeira and Abraham Ortelius through which Ortelius received Teixeira's charts of the Azores (1584) and Japan (1595) for inclusion in the *Teatrum orbis terrarum*

(Zandvliet 1998: 21). This example also illustrates the early independence of cosmographers and map makers within early modern Europe, a situation in which the knowledge of sailing and navigation circulated widely and relatively freely across regions and territories. Such exchange of cartographic knowledge and specific maps belies official attempts in Lisbon and Seville to keep secret maps of the Portuguese and Spanish voyages. The manuscript charts produced by those countries' cartographers survive most often from the subsequent later engraving of the work in France, The Netherlands and England. For example, a copy of a famous rutter covering the routes in the Red Sea from 1541 by Joao de Castro, a navigator destined to be the Portuguese governor of India, was acquired by Sir Walter Raleigh and published by Samuel Purchas in England in 1625, eighty years later! (Zandvliet 1998: 18)

Sailing in the Mediterranean meant the use of "compass, pilot books, marine charts and other instruments…From the Atlantic tradition, they learned about tides and tide tables and the habit of taking careful and constant soundings in navigable waters, especially off unfamiliar coasts" (Zandvliet 1998: 15-16). The differences between these two kinds of sailing also meant differences in the kinds of trade which was carried on and the kinds of goods that could be traded.

> First the regions exporting bulky commodities on which freights ran high in comparison to costs, which required many ships and could best be served by vessels from two to five hundred tons cheaply built and cheaply operated, built for stowage and carrying no guns. Roughly speaking, this field embraced northern and eastern Europe from the mouth of the Garonne to Archangel, from which were exported great quantities of wine, salt, fish, grain, timber of all kinds and other weighty naval supplies, as pitch, tar, hemp, flax; also lead, tin, iron and copper. The second field comprised southern Europe from Biscay to the Levantine ports of the Mediterranean, the Canaries, Madeira, Guinea and the East Indies. These regions nourished what Downing [Sir George Downing] had called the 'rich trades.' Though they produced some bulky wares, their exports were for the most part of small size and weight in proportion to their value. In a commerce

> of this nature, the figure of freights would not have the supreme importance that it possessed for the northern field. In general, the rich trades were also the dangerous trades into which unarmed ships could venture only at great risk. (Barbour 1930:265)

The Hanseatic network of ports facing the Baltic and North Seas was a loosely-organized system of trading cities. Navigation between the Hanse ports required knowledge of not only the eastern Atlantic but also the English Channel, North Sea and Baltic (Kirby and Hinkkanen 2000). It is the expression of this northern network that marks the emergence of the maritime periphery for The Netherlands in the form of sailing instructions. Prior to examining the specific instruments or 'cartographic software' that enabled Dutch ships to achieve economic hegemony in the seventeenth century, clarifications must be made of the types of documents published.

Metalevel Assessment of Maritime Atlases

The expansion of the European cores to encompass trade along the western Atlantic, Baltic and Mediterranean coasts can be documented by the maritime atlases published in Amsterdam, Paris and London. The creation and publishing of these atlases reflect the relative importance assigned to seaborne trade within these three cores. Braudel, Wallerstein and others acknowledge the emergence of the northern Netherlands and Amsterdam as a commercial power and as the first genuine international economic hegemon. The archival cartographic record and, in particular, the maritime atlases document this hegemonic rise. The dominance of Amsterdam from the end of the sixteenth century through the seventeenth in the publication of rutters and maritime atlases corresponds with their dominance in trade. Not only do the organization and division of the first rutters reflect the customary Dutch pattern of trade along the Atlantic

periphery and into the Baltic, but the established order of the charts in the maritime atlases documents the customary 'order of business' by which the Netherlands' maritime supremacy was achieved.

Maritime atlases represent nineteen percent of the more than 3000 atlases held in the British Library and over seventeen percent of the 1173 atlases in the Library of Congress (Appendix A). Maritime museums and other collections may contain atlases not represented in these two archives but the holdings are not easily accessible. Since no previous research was found with the exception of Akerman's collations of the Library of Congress, an initial dataset was built from Shirley's MABL and cross-referenced to Koeman's *Atlantes neerlandici*. Maritime atlases are collated as separate volumes in both the MABL and Koeman bibliographies. The atlases are arranged alphabetically by author name. A re-classification to establish the city of origin (Amsterdam, Paris and London) eliminated those few atlases published in Germany, Italy or other countries. The British Library holdings totaled 325 for the period from 1576 to 1800 with thirty-one percent Dutch, ten percent French and fifty-three percent English. Distinct editions by separate authors and successive editions in different years were counted while duplicate copies of the same edition were excluded. When these 325 maritime atlases are charted by century quartile, the publication rates and percentages reveal a dominance of the Dutch publishers in this field from the original printing of Waghenaer's *Spieghel de Zeevaerdt* in 1584-85 through the end of the seventeenth century (Appendix C). Dutch atlases account for more than half of the archival holdings for each century quartile and through each quarter of the seventeenth century more than seventy percent of maritime atlases published originated in Amsterdam.

A second sieve removed all atlases that were not directly focused on the Atlantic periphery and Atlantic basin. Atlases of Asia, the Mediterranean and the Pacific were eliminated. This reduced the number of atlas editions to 234 with thirty-seven percent Dutch (87 atlases), nine percent French (21) and fifty-four percent English (126). These atlases were then divided into decadal publication periods (Appendix C). The dominance of the Dutch in publication of maritime atlases is again clearly evident from 1585 through the end of the seventeenth century. Only in the decade of the 1680s does publication in London approximate that from Amsterdam. The decade before is one hundred percent dominated by the Dutch production. French atlas publishing in the seventeenth century is noticeably slower than its competitors. English maritime atlas publication achieves a relative parity with the Dutch in the second decade of the eighteenth century and then, at least in the holdings of the British Library, represent from seventy to ninety percent of the maritime atlases in each decade until 1800. The French publication of maritime atlases reflects what has been described previously as a predilection for territorial dominance rather than the commercial seaborne dominance pursued from Amsterdam and then London.

The Dutch, French and English maritime atlases held in the Library of Congress for the same period using Akerman's collation of Phillips (Akerman 1991: 308-313 Table 4.3). This data is included for preliminary comparison to the British Library maritime atlas collation (Appendix C). Because the individual atlas titles in Akerman's dataset are not available, it was not possible to further sieve the data into decadal time divisions or to eliminate any Library of Congress maritime atlases that do not cover the Atlantic periphery.

Cartographic Definition of the Maritime Periphery

Not only were the Dutch dominant in shipping through the European Atlantic coastal periphery but their publications defined the first world-system networks of core and periphery in the seventeenth century. As will be described in succeeding sections, Dutch ship-building technology, navigational skills, financial acumen and investment patterns were supplemented by printed documentation distributed to the rest of Europe. The Dutch sold maritime atlases of charts for every place in the world except Asia until the middle of the eighteenth century. This documentation created the network in which France and England attempted to compete.

Dutch maritime periphery

The first pilot book printed with text, coastal profiles and printed charts was the *Spieghel der Zeevaerdt* by Lucas Jansz. Waghenaer in two parts from 1584 and 1585. Part One of the *Spieghel* was the Northern and Eastern Navigation, Part Two was the Western Navigation. These two parts are the first cartographic depiction of the European maritime periphery for The Netherlands, France and England. From the end of the sixteenth century until nearly a century later in 1675, only one other part was added to the pilot books, a section on the Mediterranean. Sometimes called the *Straetsboek* (Straits book) after the voyage through the Straits of Gibraltar, this fourth part identifies the Mediterranean as part of the northern European trading nations' periphery. The *Spieghel* delineates in specific geographic detail the circuit of trade by which the Dutch learned their craft: "a figure eight trade pattern with Amsterdam at the nexus" (Pellizon 2000: 159). The pattern for the Dutch shipping circuit was to sail southward to Portugal (Oporto) or Brouage near La Rochelle for salt then a return to Amsterdam to unload salt

and pick up goods saleable in the Baltic. Danzig (Gdansk) was the typical destination where the rest of the salt and Amsterdam goods could be sold and the ship loaded with grain for return to Amsterdam. In Amsterdam, depending upon prices in The Exchange, the wheat might be unloaded and sold, stored in warehouses or sent on to the Mediterranean for sale in Genoa or Livorno (Pellizon 2000: 159). Such a double loop along both the Atlantic and Baltic coasts might take a shipmore than a year, depending upon whether it had to winter in the Baltic.

The charts in Waghenaer's *Spieghel* are at approximately 1:400,000 scale in a folio (330mm x 500mm) numbered in two parts. Part One, consisting of twenty-two charts, covers the Atlantic coast south as far as Portugal and the Canaries then back north to the southeastern coast of England. Part Two, with twenty-three charts and a general map, follows the eastern coast of England through the North Sea, across to the southwestern Norwegian coast, through the Skagerrak, Kattegat and Danish Sound into the Baltic. The charts then follow the western coast of Sweden to the mouth of the Gulf of Bothnia before jumping eastward to the Gulf of Finland and along the northern Baltic coast to the Jutland peninsula to end at the Helgoland Bight (Schilder 1997: 144: Figure 64).

The best engraver in Amsterdam, Johan van Doeticum, was engaged by the publisher Christopher Plantin and the resulting craftsmanship and beauty of the charts make the surviving copies of the *Spieghel* prized volumes in contemporary cartographic archives. The quality of the text, charts and engraving far exceeded the "existing crude and simple rutters in style and content" (Schilder 1997: 139). The biography of Waghenaer indicates that financial pressures plagued him throughout his publishing

career: he had to support his wife and ten children. Waghenaer's patron, Francois Maelson, the pensionary of Einchuysen, took a specially-dedicated copy of the *Spieghel* to England in 1587 as a gift to Queen Elizabeth. This copy was given to Anthony Ashley, the clerk to the Privy Council, who translated the Latin edition of the original Dutch sailing instructions into English and had the charts freshly engraved in London (Shirley 2005: 1318). This pirated English edition entitled *The Mariners Mirrour*, was published in 1588, only three years after the original Dutch edition. The *Spieghel* was subsequently translated into French with editions in 1590, 1600 and 1605 and German in 1589 and 1615 editions. Altogether the *Spieghel* was published in seventeen editions and four languages from 1584 to 1615, a truly international publication that advanced the theoretical knowledge of Dutch mariners and began the period of complete hegemonic leadership by the Dutch in marine cartography.

Waghenaer published a second pilot book in 1592 entitled *Thresoor der Zeevaert*. The *Spieghel's* large format was "too large and unpractical and moreover, …the price was too high for the average seaman." (Schilder 1997: 150). The *Thresoor* was an oblong rectangular format with text and coastal profiles more similar to the traditional rutters than to a maritime atlas. Three parts and an appendix include the first part as a treatise on the art of navigation in twenty-five chapters, covering the subject in much more detail than the *Spieghel*. The second and third parts cover the western, northern and eastern navigations with 166 pages of sailing instructions and twenty coastal charts. The charts are at 1:600,000 scale approximately, printed on double pages (190mm x 550mm). Coastal profiles are interspersed throughout the twenty-one sections of the second and third parts of the *Thresoor*. The *Thresoor* did not achieve the same publication success as

the *Spieghel* but was translated into French by 1601. By the 1602 Dutch edition, an "interesting supplement" showed the navigation to the East and West Indies with twelve pages of sailing instructions (Schilder 1997:154). This supplement demonstrates the expansion of the Dutch trade network as it extended across the Atlantic to encompass the Caribbean and Americas as well as eastward to Asia.

The market demand for pilot guides and maritime atlases demonstrated by the commercial success of the *Spieghel* was quickly recognized by other atlas publishers in Amsterdam. Willem Jansz. Blaeu brought out a new mariner's guide, *Het Licht der Zee-vaert* in 1608, the year of Waghenaer's death, In the first decades of the seventeenth century, Blaeu had little competition in atlas publishing. The *Licht der Zee-vaert* was published in more than seventeen editions into the 1620s with an English edition in 1612 and a 1619 French edition. Extensive bibliographic documentation has been made of the seventeenth-century Dutch pilot book and maritime atlas production (Koeman 1971; van der Krogt 1993; Schilder 1997). Innovations such as Janssonius' "marketing ploy…to claim that a description of the world was not complete without maps of the seas and coasts" as he wrote in the introduction to the fifth part of *Atlas Novus* opened the maritime publishing field to terrestrial publishers. Janssonius combined his marine atlas with an atlas of the old world called the *Water-weereld*" (van der Krogt 1993: 124). The *Water-weereld* immediately found imitators from the publishers of pilot guides such as Arnold Colom, Hendrik Doncker, Pieter van Alphen, the Lootsman brothers and Johannes Van Keulen. Most of the charts were based upon Waghenaer or Anthonie Jacobsz. from copied or re-engraved original plates.

The next competitor to emerge in the 1680s was Johannes van Keulen who produced a large folio format maritime atlas in multiple parts, *De Nieuwe Groote Lichtende Zee-Fakkel*. The Eastern and Northern and Western Navigations were published in 1681 with the Mediterranean added in 1682, the Caribbean Sea and eastern coast of North America in 1684 as the fourth part and a fifth and final part for the Atlantic coasts of Africa and South America in 1684. The *Zee-Fakkel* became "the *Atlas Major* of marine atlases: five folio volumes containing 136 accurate maps of all the coasts and seas of the world" (Van der Krogt 1993: 127). However, this *'Atlas Major'* did not contain the entire world's coasts. Maps and charts of the East Indies were kept confidential as sensitive proprietary information by the Dutch East Indies Company (VOC) which had its own cadre of chart makers and engravers both in the Netherlands and in Asia. Not until the English and French had published maps of the East Indies in the mid-eighteenth century did the VOC grant permission for Dutch map publishers to incorporate VOC maps as the sixth part of the *Zee-Fakkel* in 1753 (van der Krogt 1993: 127). For most of the eighteenth century the Van Keulen publishing firm had few competitors and as other publishers left the commercial market, Johannes Van Keulen bought the printed materials and plates of the firms. This consolidation is similar to the same acquisition strategy practiced by Covens and Mortier in the terrestrial atlas market.

French maritime periphery

Scholarship on early French mapping of the maritime periphery is relatively slim, at least prior to the end of the seventeenth century. While trading was active in the French Atlantic ports and Marseilles in the Mediterranean, little documentation is provided from archival evidence. The presence of Portuguese pilots and chart makers

was influential in the center of French manuscript chart-making, Dieppe, in the sixteenth century (Bagrow and Skelton 1964: 116). A pilot book of sailing instructions was printed, probably in Dieppe, in 1610 by Pierre Garcie that was a combination of Italian *portolani* and Portuguese *roteiros* of the Mediterranean and southern Atlantic coasts as well as northern navigation to England and the North Sea from German *seebuchs* (Waters 1967: 12). Garcie's *Le grant routtier* was first published in Rouen in as *La routier de la mer* by Jacques le Forestier sometime between 1502 and 1520. The second edition titled *Le grant routtier* was published by Sire Enguilbert de Marnef in 1520 from Poictiers.

An English translation of *Le grant routtier* was evidently printed from a copy brought back to London from Bordeaux in the late 1520s. The publisher Robert Copland had the pilot book translated and published by 1528. Evidently The *Rutter of the Sea* was the only printed rutter in English during this period (Waters 1967: 4). Because *Le grant routtier* ended at the southern coast of England, it evidently did not cover the necessary coasts for English trade because during the 1540s and in subsequent English editions a *Rutter of the Northe* was added from a compilation by Richard Proude for circumnavigating England, Wales and Ireland (Waters 1967: 4). Such an addition to a pilot book that gave sailing instructions from the Mediterranean through Gibraltar and up the Spanish and French coasts exemplifies a consistent trend in navigational manuals to be adapted and supplemented to provide the maritime network knowledge required for trade between the English and Irish ports with the Atlantic continental ports to the south.

Of the subsequent twenty-nine editions of Garcie's guide published up to 1643, four were published in Poictiers, eighteen from Rouen and seven from La Rochelle. *Le grand routier* as it came to be known, was never published in Paris. It should be noted

that the sole French pilot guide to the European maritime periphery of the sixteenth and seventeenth centuries was never published in the capital core city where all other cartographic production occurred. Poictiers and La Rochelle were both 'outside' the French territorial core of the seventeenth century as distinguished by Braudel. Rouen is the first major inland port on the Seine upriver from the head port of Le Havre. The interests of French sailors sustained sales of Le grand routier for over a century but evidently the need for pilot guides was met as well by Dutch pilot books printed in French.

One other pilot book was published in France in the late seventeenth through the early nineteenth century. *Le Petit Flambeau de la mer* by R. Bougard from 1684 is similarly named to the Pieter Goos' atlases from twenty years earlier but the Bougard edition is octavo format (189mm x 149mm) while all of the Dutch *'Flambeau'* were in folio format (460mm x 300mm). *Le Petit Flambeau* is a true coasting pilot, not a maritime atlas, with 421 pages of text, coastal profiles and sixty-four charts. Its market appeal is indicated by the fourteen editions published in Le Havre and Saint-Malo between 1684 and 1817. An English edition was published in London in 1801 as *The little sea torch*. As with Garcie's *Le grand routier*, *Le Petit Flambeau de la mer* was never published in Paris but from the Atlantic head port of the Seine river instead. The only two French pilot guides for the commerce of the European Atlantic periphery were published in peripheral coastal France. The French printing of coasting pilots began just as Dutch publication slowed and that in London began to increase. But it appears that Amsterdam and London were the primary competitors for the periphery in the emergent capitalist world-system and were responsible for producing the geographic information

base for that commercial rivalry. Paris failed to grasp the importance of that knowledge base except as maritime activity affected its territory and turned to mapping the edges of its continental possessions.

Louis XIV ordered an accurate survey of the coasts of France by scientists and astronomers from the *Academie des Sciences* in 1666. The group, known as the Ingenieurs du Roi, published a set of charts in 1693 as *Le Neptune francais*. Alexis Hubert Jaillot was the publisher and Charles Pene, with an Ingenieur-geographe privilege from the king, served as the editor of the folio volume with twenty-nine charts and six pages of text, all on the Mercator projection (Crone 1978:70; Koeman 1970: 423). While Jaillot's name appears on the title page, the charts for this and all subsequent volumes were engraved in Amsterdam. The charts of the original French prototype were engraved by Hendrik van Loon. However, in the same year, editions of the *Neptune* were published in Amsterdam by Pieter Mortier in French, English and Dutch. The *Neptune* was expanded the next year by Mortier to include nine charts from the *Atlas Maritime* or *Cartes marines a l'usage de la Grande Bretagne* whose charts were engraved by Romein de Hooghe from British manuscript sources of the same coasts. At a large folio format (660mm x 530mm) and containing thirty-one lavishly illustrated maritime charts, the *Neptune francais* and its companion *Cartes marines* was the "most expensive sea-atlas ever published in Amsterdam in the seventeenth century. Its charts are larger and more lavishly decorated than those of any preceding book of this kind. For the engraving and etching Mortier had recruited the most qualified artists" (Koeman 1970: 424). A third volume was published by Mortier in 1700 comprising charts of the non-European periphery prepared by N.P. d'Ablancourt from Portuguese manuscript sources entitled

Suite du Neptune Francois. A second edition of the first volume was published in 1703 but no other editions were ever produced.

Mortier, whose publishing house was quickly attaining a reputation as the most pretigious in Amsterdam, knew there was a market, albeit limited, for such a publication. Copies in the British Library come from the collection of George III, another from Joseph Banks. Such a 'show atlas' was never intended to be taken to sea and was obviously expected to be part of a nobleman or merchant's library. That ship captains or ordinary seaman would never see such an atlas nor dream of owning it is subtly hinted at by Shirley's comment "although produced with great diligence under official auspices, the sea-atlas *Neptune Francois* was not well received by French mariners" (Shirley 2004: 1268). The charts of the *Neptune Francois* were never updated and the archival volumes exist as an example that the commercial market for a splendid, lavishly-produced publication was extremely limited. The prosaic, pragmatic offerings of the other Amsterdam publishers for rutters, pilot-books and maritime atlases served a different and much broader market within the growing maritime network of early modern Europe.

Despite Mortier's co-option of the name, the French reclaimed the title for their second official maritime atlas in the mid-eighteenth century. The Ingenieurs du Roi became an official French agency in 1720, the Depot des Cartes et Plans de la Marine. The Depot became the repository for all surviving copperplates, charts and memoires and is recognized as the first national agency dedicated to the new science of hydrography. Jacque-Nicolas Bellin, a geographe de cabinet active in Paris, edited the 1753 edition of *Neptune Francais*. Bellin published a range of hydrographic books, separate charts and maritime atlases. As the first Ingenieur hydrographe de La Marine, Hydrographer to the

King, and a member of the Royal Society in London, Bellin undertook numerous hydrographic surveys during his fifty years at the Depot. First came the surveys of the French coastlines published as the *Neptune Francais,* then surveys of New France published as *Partie occidentale et orientalede la Nouvelle France, ou du Canada* in 1755. The 1753 *Neptune* was a large folio atlas (653mm x 512mm) of twenty-nine double-page charts with several editions through the second half of the eighteenth century. A quarto format (260mm x 215mm) maritime atlas titled *Petit Atlas Francois* came out in 1763 whose contents were to eventually fill five volumes. The order of charts in the *Neptune Francais* was roughly the same as the Dutch pilot guides and maritime atlases but the coverages moved north to south, beginning in Denmark then proceeding through the Danish Sound, North Sea and ending at Gibraltar or the Mediterranean. Due to Bellin's involvement with the Depot, numerous atlases with variable contents were issued and the Depot also sold individual charts. Always well-engraved and typically with attribution, the Bellin charts are high-quality maps. The five hundred eighty-one charts of *Petit Atlas Francois* were divided into five volumes,: North America and the Antilles; South America; Asia and Africa; Europe; France (Bellin 1764). The charts are finely-engraved and nearly all contain multiple scales in French, English, Dutch, German and Italian. The only color in the copy examined was a blue outline to the coasts and land/water edges with a lighter blue wash on water bodies such as bays and lakes. There are no coastal profiles although many of the charts, depending upon scale, show water depth in fathoms and detailed plans of settlements.

The role of the Depot places production of French maritime atlases into a different publishing milieu than those of the Netherlands or England. With an official

hydrographic office, France developed very fine charts of its own coastline and of other coastlines around the world. These were, with the exception of the *Petit Atlas Maritime*, in large folio format and therefore not marketed to ordinary seamen and ship captains. The Netherlands production of maritime charts and pilot books was almost entirely produced from the private sector with the exception of the maps of the Dutch East India Company. The same private sector dependency is observed in Britain during this period. But in France, an official approbation of chart making was possible along with the subsidies for life that individuals such as Bellin received. The situation in England was very different as were the rates of production.

English maritime periphery

The development of English rutters, pilot guides and maritime atlases was slow or nonexistent from the sixteenth through most of the seventeenth century. The dominance of Dutch publishers in maritime publishing meant that English mariners depended upon Dutch cartographers for charts of their own coastline as well as for rest of the European maritime periphery. Surveys of ports, harbors and fortifications had been made under Henry VIII, many by Italian or Dutch engineers, but these remained in manuscript to be copied by hand. Not until near the middle of the sixteenth century were sufficient charts produced that archival evidence remains. Issues of silting at river mouths such as the Humber and Thames caused surveys to be commissioned and these were nearly all accomplished by land surveyors in collaboration with seamen familiar with sounding (Robinson 1962: 15-33).

The dependency on Dutch seafaring knowledge even extended to the publication of the first English maritime atlas by John Sellers in 1678. The English pirated version of

Waghenaer's *Spieghel der Zeevaerdt* had been in publication for eighty years with few revisions while the publications by Blaeu, Colom, Goos, Lootsman and Van Loon were were available in English editions and largely superceded the *Spieghel* (Robinson 1962: 36). In the mid-sixteenth century, the *Book of Sea Plats* was published by Joseph Moxon, an early English hydrographer who relied heavily on Dutch charts from Moxon's printing apprenticeship in Amsterdam. By the 1670s the need for the English core to develop its own charts was growing (Samuel Pepys' Naval Minutes record less than a half dozen original English charts of the coastline) and Sellers was commissioned to create a marine atlas. The lack of original English charts forced him to Amsterdam to buy worn out copper plates being sold as scrap. These plates were originally engraved by Johannes Janssonius as a counterfeit 1620 edition of *Het Licht der Zeevaert,* Blaeu's successor atlas to the Spieghel. The plates had then been printed in a 1650 French edition of *Le Nouveau Flambeau de la Mer* by Jan Van Loon before their condition was considered too worn to be used again and they were therefore sold for their copper (Shirley 2004: 1287). These were the plates that Seller refurbished and printed, initially with few revisions, as *The English Pilot*. The *Pilot* then had a long history of revisions and additions extending through the entire eighteenth century. Richard Mount, a minor London publisher at the time, received the publication rights and Seller successfully petitioned for an order that banned the import of Dutch 'waggoners' for thirty years (Robinson 1962: 38). The private firm of Mount and Page continued to publish the *Pilot* into the nineteenth century. The 1671 edition contained sixty-six charts on forty-three sheets in two parts, the Northern Navigation and Southern Navigation in folio format (455mm x 325mm). Subsequent volumes under the general title of *The English Pilot* covered the

Mediterranean, Oriental, West India and African navigations (Verner 1978: 128). The charts in the various volumes were assembled and mixed between editions so that a 'final' sequence of contents is not possible.

Great Britain's Coasting Pilot published in 1693 was the first maritime atlas based almost entirely upon English land and coastal surveys. Greenville Collins, a Royal Navy captain, spent seven years from 1681 to 1687 preparing the manuscripts. Engraving of the charts for printing involved a number of engravers such as Herman Moll and John Harris, and out of the 120 manuscript plans prepared by Collins, forty-eight were engraved and published in 1693. Richard Mount, who had also acquired the charts from *The English Pilot,* was selected to publish the *Coasting Pilot* as well. Published in folio format (520mm x 360mm) the *Coasting Pilot* went through twenty-five editions until the last in 1792. Despite criticism of the charts' inaccuracies due largely to the inadequacies of marine survey techniques at the time, this atlas of the English and Scottish coastlines was copied in 1757 and published by Nicolas Bellin in Paris. The *Coasting Pilot* can be regarded not only as the 'first' true English coastal chart atlas but also the first definitive portrayal of the British semiperiphery's edge. The first two charts are of the English Channel and then charts portray the coastline south and east of the Thames. The second half of the atlas begins with a chart of the mouth of the Thames and proceeds northward to include the Orkney Islands.

English portrayal of the non-European periphery is depicted in maps in both terrestrial world atlases and maritime atlases. As noted in Chapter 4, the inclusion of maps of royal possessions in North America and the Caribbean began with Speed's Theater and were a consistent feature of English world atlases. English maritime atlases

began to portray Atlantic America with the 1675 publication of John Seller's *Atlas maritimus or The Sea-Atlas*. An presentation copy purported to have been given to James, Duke of York (later James II), contained the map of Africa with a large elephant in the middle of the page that inspired Jonathan Swift's quatrain "So Geographers in Afric maps with savage pictures fill their gaps; and o'er unhabitable downs place elephants for want of towns" (Shirley 2004: 1298). English mapping of the "English Empire in America" was a process in which the Dutch maps provided a first baseline of cartographic expression. As Dutch interests shifted elsewhere in the world-economy, the Dutch atlases no longer provided much improvement in the geographic knowledge available. For the first time, the English cartographers were on their own.

> The beginning of English mapping in the new areas was the result of necessity. The English made maps because they had to, and conversely they seldom made maps for which they did not feel an immediate need. Nothing was done for pleasure, nor was there much in the way of pure geographical scholarship. It was a serious business (Black 1978: 104).

That English chartmaking as expressed in the maritime atlases was a pragmatic business of portraying English trade interests is demonstrated in the Preface to the 1728 *Atlas Maritimus & Commercialis* attributed to Daniel Defoe (Novak and Thrower 1973):

> Our Title is, indeed, *A General View of the World, as far as relates to Navigation and Commerce*: But we are to be understood with some Restriction, namely, that there being several Coasts, Seas, Rivers, and Ports, which tho known in Geography and History, yet are not known in Commerce to the *European* Traders, and to which we have no Access either by Shipping or for Trade; such Places are not suppos'd to be included in our present Account, or at most are by slightly touch'd upon.
>
> Our Search has been confin'd to the practicable Seas of the known World, and to those Places to which our *European* Ships go in common with one another, to fetch and carry Merchants Goods. Such Places as are not frequented, and cannot be come at, there was no Occasion to concern ourselves much about: And this

> without any Derogation from our Title, or our Pretensions to a general View of the Trading and Navigating World (*Atlas maritimus & Commercialis* 1728: ii).

State support of British marine cartography had begun with the establishment of Trinity House in 1514 in London under Henry VIII to reinforce defenses along the vulnerable southeastern coast across from France. Granted authority to license Thames River pilots from James I, the pilots were a review board and offered criticism of maritime charts but rarely provided material support for improved surveys. Not until the 1790s were both the Ordnance Survey and the Hydrographic Office created. Until that time, nearly all maritime atlases were published by private publishing houses. Shirley indicates one hundred eighty of the three hundred fifty atlases are British in origin but my collation to eliminate duplicate copies of the same edition reduced this total to one hundred seventy-one out of three hundred twenty-five, a fifty-five percent majority. Instead of recounting the individual publication histories of maritime atlases published in London, the reader is referred to several excellent histories of English maritime atlases (Brown 1950; Robinson 1962; Thrower 1978; Shirley 2004: Vol II). A fascinating history of publishers, cartographers, adventurers and sea voyages comprise the exploration and expansion of the English into the extra-European maritime periphery. Competition between the English and the Dutch for long-distance trade in agricultural commodities has provided fodder for many academic careers and the publication of hundreds of articles and books, been the subject of numerous conferences and has re-emerged as an area of scholarly interest in just the past few years.

Two points should be made concerning English maritime chart-making and atlas publication to re-cast the perspective to a world-systems viewpoint. First, is that English

chart-making was slower to develop than the traditions in France or especially the Netherlands (Robinson 1962: 15). Second, by the middle of the eighteenth century, English charts had overcome the previous century's monopoly by the Dutch and were being copied by their former rivals in maritime cartography.

Conclusions to Maritime Periphery

Dutch dominance in publication of pilot guides and maritime atlases indicates that the informational software required to navigate the European and Atlantic peripheries was available on the Amsterdam market. Trade statistics for the Baltic demonstrate that the concept of commodity chains was developed to a sophisticated level by the United Provinces during the seventeenth century. Dutch ships carried more than sixty per cent of the goods passing through the Danish Sound until the beginning of the eighteenth century (Barbour 1930; Unger 1959). England learned from the Dutch, copied their geographic software as presented in the maritime atlases and pilot guides but were frustrated in their attempts to compete in the Baltic and northern trades well into the eighteenth century. The Dutch dominated the Baltic trade, became the leading purveyor of grain to the Mediterranean and, in the fisheries trade, outperformed England and France in their own coastal peripheries. Complaints about Dutch efficiency, ship technology and sailing knowledge of the English coasts were made well into the eighteenth century (Salmon 1739; Guthrie 1770).

English depiction of the maritime periphery began with outright copying of dated Dutch material and only slowly was London about to produce its own knowledge base from coastal surveys and charts. London learned its lessons well and finally took the lead in publishing the cartography of the maritime periphery by the middle of the eighteenth

century. The only state-sponsored maritime surveys were of the edge of the English core, the coastlines of England, Wales and Scotland. Private publishers responded to market demand and increased their publication rates.

France was never a strong player in the publication of maritime knowledge. The fledgling chart industry centered on Dieppe during late sixteenth century simply faded away. There were no pilot books published in Paris during any century. It is as though France did not need any sailing knowledge beyond her own coastlines. Paris never engaged in the emergent world-system as a purveyor of trade software, evidently content to remain dependent on Dutch information technologies. The difference between France and England in this history is that the English, from Pepys' charge to John Sellers, attempted by 1670's to mount a challenge to Dutch cartographic hegemony of the periphery. But France only published two maritime atlases of the non-European periphery during this period, one hundred years apart, and even these were never popular or useful enough to generate much market interest. The Depot de la Marine was a competent and important state agency whose charts were of high quality. Depot surveys and charts of the French coast were compiled using the most advanced mathematical techniques and then immediately copied and published from Amsterdam and London. The French produced only a few maritime atlases whose folio formats and elaborate illustration made them too expensive for the cartographic technicians to afford to buy even one map. Just as with the large world atlases, French production was for an elite clientele with sufficient wealth to afford such show pieces. This is in complete contrast to the production of the Dutch and English whose market orientation resulted in the sale all sorts of maps & atlases, some in folio format but many in quarto or octavo.

CHAPTER VI

CONCLUSIONS

> Put in simplest terms, geography and history, unlike the social sciences, are a point of view: they are not the study of any particular set of things, but are a particular way of studying anything. Hence, the bewildering range of topics that characterize our literature. We bind these disparate topics together by a common approach—by a search for patterns of arrangements and relationships that allow us to describe and assess complex ensembles and sequences that themselves comprise different classes of phenomena (Meinig 1978, 1186)

Developing a world-systems theory in the history of cartography is a search for "complex ensembles and sequences" whose patterns represent different phenomena than those traditionally seen in the history of maps and atlases. Previous chapters have detailed the challenge that existing bibliographies present to the researcher whose focus is on the relationships between economic growth and the history of cartography. Parallel approaches to the history of mapmaking exist but visibility is poor for approaches outside the accepted canon of maps in the service of the emergent early modern state. As is accepted within the more quantitative sciences, the use of the same dataset to derive different results depends upon finding a rigorous methodology that can be replicated by others. My analysis of the printed atlases described bibliographically by Koeman, Pastoureau, Phillips and Shirley in the search for indicators of economic growth, expansion and leadership creates an alternative history of cartography, a history in which the great commercial outreach and extension of trade networks from Amsterdam and London reflect a different intent for the Dutch and English atlases than has previously been described. This alternative history places the previously-accepted predominance of France's national survey into a differently-constructed theoretical context. The extension

of Walllerstein's world-system theory by Hugill into the distinctions between trading polities and territorial polities provides the basis for analyzing the trends in atlas production in the early modern period (Hugill 2005). The motivations and impetus for trading polities to map are in response to the emergent commodity networks between core and periphery. The motivations for territorial polities to map are the consolidation of state power and administrative control. By telling the history of early modern cartography as mapping of the cores, the terrestrial and maritime peripheries, a broader theoretical framework can incorporate Dutch, French and English cartographic efforts for evaluation by a different set of criteria.

Cartography as a Leading Indicator of Economic Dominance

The seven questions posed in Chapter I (Modelski and Thompson 1996) as to the relationship between cartography and long-term economic processes can be more explicitly discussed through the perspective of the capitalist world-system model:

Cartography and long-term economic processes

Cartography was only one of the innovations that emerged in the expansion of the early modern European states into the ocean trading system. In the Netherlands, the creation of the internal transport canal system, the diversification of ship design including the *fluyt*, the creation of the Amsterdam bourse were all within what Modelski and Thompson would term the "cluster of innovations" characterizing Dutch economic growth. That printing and publishing of world atlases and maritime atlases were strongly influenced by the growth of trade is seen in the trends shown by archival holdings from this period of increased publishing in Amsterdam in the seventeenth century. That cartography and its products are responsive to economic processes has been

acknowledged in an off-handed way by historians and historians of cartography. But the actual documentation of this response as visible in the atlas production figures from two major archives documents this.

This increase parallels the growth of the early modern Dutch economy as the Baltic trades became more profitable and the Netherlands dominated shipping, finance and commodities exchange. However the production of printed pilot guides, sailing directions and maritime atlases appears to lag behind the first wave of growth and to have been responsive to a need for better charts since they only began to increase at the end of the sixteenth century, a full half-century after Dutch shipping and trade had begun to outpace others in the European trade networks. We might posit that clusters of hardware innovations are followed by clusters of software innovations that cement the earlier advantages. The capitalist system relies upon predictability in time, transport and location of commodities for the profitable exchange of goods and services. This was enhanced by and dependent upon good maps. Early modern trade relied upon sailing vessels subject to the seasons and weather conditions. Production of agricultural commodities was also dependent upon the seasons and availability. Maps became an important tool in the locational geography of commodities and this has been true since the first portolans portrayed the ports of the northern Mediterranean coastline. Even if the sailing charts could only be produced with a relative accuracy, such precision was evidently sufficient for a gradual buildup of entrepots around the Baltic, eastern Atlantic and then into the western Atlantic basin. The transport times shown as connecting Amsterdam and London to African and American ports were always just an estimate. The lack of an accurate method for determining longitude also meant that navigation in the open seas

was a process requiring experience and some degree of luck to avoid wrecking on a dangerous coastline. These uncertainties were regarded as part of the risk of doing business and appear not to have been a deterrent to ships that crossed the seas connecting the capitalist core cities with their periphery.

Cartography sensitivity to economic growth

Different actors were motivated by different mapping needs. One of the weaknesses to previous theory in the history of cartography is the generalized assumption that the primary role of cartography in early modern Europe after the period of the great discoveries was limited to service to the state. Such a generalized assumption about all early modern actors' sensitivity to mapping and economic growth fails to recognize that mapping was a purposeful enterprise, a tool of management and power used simultaneously to legitimize territorial claims by fledgling state bureaucracies and commercial claims by fledgling capitalists. The bureaucrats were interested in maps of the core as a geographic inventory of resources and to cement state power. Capitalists were concerned with the visualization of transport networks in the core and periphery, both on land and by sea, through which commodities were to be delivered for sale in different markets.

The core atlases enabled more efficient management of resources and transportation within a polity. The capitalist core cities of Amsterdam and then London mapped their cores first and were also the most efficient in developing transport networks. The *trekvaart* and *buervaart* canal networks of the Netherlands were the first and most efficient transport systems in an early modern capitalist country. The Ogilby strip road maps of England and Wales provided the first focused geographic portrayal of

the road network centered upon and feeding London as well as connecting to the international trade. Was the Ogilby atlas for state purposes or a response to the needs of merchants for a more accurate picture of the English economic core arena? This is a question that deserves more consideration but is an example of how maps were produced and atlases published that were responsive to a commercial market for geographic knowledge, a market of investors, merchants, bankers, bureaucrats, taxmen, all of whom were intent upon deriving value out of the transport and sale of commodities, both agricultural and manufactured. The original atlas was funded by subscription and a promised sum from Charles II never materialized. The Ogilby atlas is of the English commercial core and was financed through a group of interested supporters, not by the state. In contrast, the French core atlas ultimately produced by the Cassini surveys was a legitimizing exercise of the state's authority and management of resources. The most accurate core atlas produced in early modern Europe, the Cassini survey-by-triangulation permitted the regional authorities to become part of the larger national system of development and coordination of the regional engineers building bridges and roads. Unfortunately the French core atlas was produced in finished form only in the late eighteenth century, more than a century after both Amsterdam and London had mapped their cores. The prevailing attitude that the Cassini survey represents the penultimate early modern core atlas would appear to value quality over quantity, absolute accuracy over relative accuracy and painstaking perfection over pragmatic availability. Ogilby's *Britannia* was sufficiently accurate to meet the needs of merchants and bureaucrats. Its popularity meant four printings were required in the first two years of its publication. It is unknown how many complete atlases of the Cassini survey were ever produced.

Durable links between cartography and long-term economic growth

The portrayal of maritime trade networks began with the manuscript portulan atlases and continues to the present day. The growth of the Dutch economy was paralleled by its dominance in the production and publication of maps and particularly atlases. The innovations of printing pilot guides, marine charts and maritime atlases were solely the effort of the Netherlands and one of their greatest contributions to the emergence of the capitalist world-system. Dutch pilot guides and maritime atlases defined, in replicable format, the geography of the Baltic maritime periphery for the first time. The huge numbers of Dutch maritime publications made Holland completely dominant in cartographic production through the sixteenth and seventeenth centuries. Paris managed to produce two maritime atlases during the same period, atlases that were lauded for their accuracy and beauty but that were never affordable by ordinary seamen. London copied the Dutch maritime atlases at the end of the sixteenth century and English seaman learned the art of navigation and studied the Baltic, Mediterranean and Atlantic maritime periphery as presented by the Dutch.

Evolutionary change in cartography linked to economic growth

Technical improvements in navigation, astronomy, mathematics and printing all impacted the production of maps and atlases in the early modern period. The increased productive capacity for printing is well-documented as an important characteristic in the dissemination of knowledge at this time (Eisenstein 1979) and increased production of all kinds of maps and the binding of those maps into atlases also occurred. The differences in production between the cartographic workshops of Amsterdam, Paris and London indicate that Amsterdam and then London became centers for mapping publications that

were targeted at a wide range of interested buyers. Maps were appearing in many publications in all three cities but those from Amsterdam and London were more widespread than those from Paris. The evolution in surveying techniques and improved instrumentation also affected mapping both in the cores and the Atlantic periphery. The triangulation network for the Cassini survey of France was unmatched by the Netherlands or England until the end of the eighteenth century when the Ordnance Survey under General William Roy was begun in England. The development of an accurate timepiece that could be carried onboard ships by John Harrison transformed forever the relative accuracy of maritime charts and, in a cartographic sense, signaled the transition from the relative accuracy of early modern maps to the absolute accuracy of modern cartography.

Evidence linking cartography and long-term economic growth

The evidence from the two largest atlas archives, the Library of Congress and the British Library, as analyzed in Chapter II, indicates that atlas publication at a meta-level is consistent with the rise of Dutch economic leadership in the world-system and its successor, Britain, in cartographic publication. The positioning of France as the "king of cartography" in the eighteenth century reflects as bias toward the statist model in the history of cartography and ignores completely the publishing dominance of first Amsterdam and then the London mapping communities. Dutch world atlases represent nearly fifty percent of atlas production for the first three-quarters of the seventeenth century. English world atlases overtake Dutch publication at the end of the seventeenth century and represent nearly half throughout the eighteenth century. In maritime atlas publication, the Dutch are completely dominant from the end of the sixteenth through the seventeenth century at which time English maritime atlas publication first equals then

becomes as dominant in the eighteenth century as the Dutch were in the seventeenth. The claim that France was ever “king of cartography” is not visible in the archival evidence for world or maritime atlases, the primary cartographic instruments for world-system growth.

Major anomalies to the hypothesis

The confusion within the history of cartography created by this French statist exceptionalism has promoted an institutional framework for the history of cartography that sets eighteenth-century French mapmakers to be the successors to the Dutch cartographic dominance of the seventeenth century. The conventional history of cartography literature raised the question in my mind as to what evidence there was to justify the privileged position awarded to eighteenth-century French mapmakers? The understanding that emerged came as a result of realizing that, from a world-systems point of view, the Parisian cartographers were operating in a completely different market and audience context than their Amsterdam and London counterparts. Since there has, until now, been no other theoretical framework by which to understand the transition between the Netherlands, France and England in the history of cartography, the prevailing theory for early modern state-making was the default approach.

The French monarchy centered on Louis XIV and Louis XV insisted upon a focus on the territorial ambitions of the French crown to the exclusion of the coastal trade networks so active in the Mediterranean, eastern Atlantic and Baltic. European expansion into the western edges of the Atlantic basin brought a window of extra-territorial possibility to France but that opportunity was largely unrealized when royal attention was distract by the pressures to field large armies and secure the more

traditional alliances on the European continent. France enjoyed both Atlantic and Mediterranean coastlines and sufficient grain-producing potential in its northern plains to be agriculturally self-sufficient. This situation enabled France to remain a territorial polity long after the Netherlands and England had committed their resources towards building expanding networks of trade. A state-supported cadre of geographers, engravers and publishers emerged in response to the early modern French state's need to administrate and control its territory. The national survey led by the Cassinis for well over a century is a monumental task worthy of recognition as the most thorough and complete national cartographic project of the period. However, the focus on the Cassini survey as the sole example of 'good mapping' in the eighteenth century has cast a shadow on all other mapping efforts during the same period. As is evidenced in the production of world and maritime atlases from Chapter II, the criteria for judging cartographic quality seems to shift in judging eighteenth-century production.

> The English were at least as well placed as the French to make progress in the practical application of mathematics to cartography, but the indifference of many scientists and inadequate funding compromised their efforts. Despite attention to estate surveys, to better instrumentation, to problems of navigation and to instruction in mathematics, after the 1620s triangulation was no more in evidence in England than in the Netherlands (Konvitz 1987, 3-4).

What Konvitz fails to recognize is that both The Netherlands and England had already mapped their cores by the 1620s. The core mapping process applied to the United Provinces was done by triangulation and the maps were sufficiently accurate for taxation, more detailed local surveys, the planning of polders and drainage products and as strategic weapons during the seventeenth-century struggle against Spain. The utility of Dutch maps to serve these capacities is evidence that, triangulated or not, the Dutch core maps were more than sufficient for the purposes to which they were put. England had no

particular need for triangulated surveys since her counties were relatively small and politically united already. Konvitz presumes that the state-supported triangulation surveys conducted in eighteenth-century France were the 'standard' against which all other polities should be measured. This is a blatantly positivist presumption that only maps produced by the latest surveying technology could be considered good. That only state-supported cartography should be the second standard for evaluating eighteenth-century maps is clearly expressed by the statement "Cartography needed consistent, visionary leadership, the cooperation of many talented and well-trained professionals and a lot of money. In France, the government under Louis XIV and Colbert began to provide leadership that brought results" (Konvitz 1987, 5).

What Konvitz does not acknowledge is that map and atlas production in Amsterdam and London was far greater than that in France at any time period. Because the French mapping legacy was focused on the state itself and is documented by so much institutional history, it has been given an importance beyond its significance. England didn't initiate a state-sponsored 'official' national survey until a hundred years after than the French Cassini survey had begun. However, there was a reward posted for county surveys at 1" = 1 mile of 240 pounds that was supposed to serve as an incentive. The interest (and subscriptions) of local landowners and merchants prompted a succession of English county surveys at a local level. County surveys continued to be improved, but these were piecemeal until the founding of the Ordnance Survey in the 1780s.

Mapping the Core

The rules of the world-economy (Braudel 1992, Vol III, Chapt 1) can be applied to the history of mapping; the dataset of maps and atlases that has been used by historians

of cartography to describe the history of nation-states also serves to describe the history of the emergence of the capitalist world-system. By analyzing the archival record from the early modern period for publishing rates from identified centers for atlas production, trends were identified that align with the competitive processes that characterized the early modern European economies of the Netherlands, France and Britain. Amsterdam, Paris and London were the primary cartographic production centers from the end of the sixteenth to the nineteenth century. But only two of these cities would emerge as dominant capitalist cores to their respective polities and extend their economic roles into the capitalist world-system. These cities shared some of the characteristics of economic core cities as identified by Braudel and Wallerstein but their individual histories create very different roles for cartography. The extension of political, economic and other forms of social power are identifiable in the mapmaking traditions which each city developed. Just as successive hegemons took it in turn to be the dominant player in the capitalist world-economy, the development of cartography benefited from the expertise, energy, money and political support within these three cities, but with very different outcomes.

The number of different cartographic products, the types of maps and the publication and production of atlases from Amsterdam and London reflect their successive roles as world-system core cities embedded in trading states. The cartography of France as exemplified in the maps and atlases produced in Paris during this same period cannot be judged on the same standard since Paris never achieved the same kind of global economic dominance as Amsterdam and London. The geographic size and resource base of France meant that Paris served as the most important economic center

for the largest economy in Europe. But this position did not translate into a competitive role in the emergent world-system. France was a territorial state, never a trading state.

Chapter III demonstrates how the leading early modern competitors mapped themselves but at different times and in different ways. The core atlases of the Netherlands, France and England demonstrate that the differences in size and natural geographic boundaries created individual contexts for the polities to map themselves. The impact of geographic area in the timely production of core maps is seen by comparing Jacob van Deventer's survey and publication of the Dutch provincial maps within a decade while the first Cassini survey of France took nearly fifty years and then was published only as a set of triangulated baselines rather than a complete set of maps. The English core atlas of county maps was gradually improved over a century and served as a sufficiently-accurate base for dozens of subsequent atlases.

The consequences of an early modern polity being unable to map itself would seem to be one of the most telling indicators as to whether that polity could ever achieve any stature within the world-system.

Core cities in the world-economy

Alongside the attraction into core cities of all manner of educated and ignorant, skillful and unskilled, merchant and beggar, the concentration of trades essential to publishing maps and atlases was encouraged by the concentration of mapmaking knowledge and expertise. Maps were a critical component in the knowledge base of kings, scientists, explorers, navigators, generals, admirals and merchants. The quality of information on the maps available to them was tested in their uses for different purposes. The quality of maps and the narrative integrity of maps published in atlases underwent a

constant testing for value, accuracy and utility as well as the market competition for affordability. The international ports of Amsterdam and London were also centers for atlas production and cartographic products were sold to anyone who could afford them. The publication of atlases benefited from the interest of market participants in the geographic portrayal of economically viable geographies just as the manufacture and distribution of manufactured goods benefited from the constant stream of in-going and out-going ships. Knowledge about distant ports, political situations, and markets for agricultural and industrial products was centered in international ports. The men who carried this knowledge in their heads were also those with interest in owning visual depictions of the geographic arena across which that knowledge was distributed.

France had a different motivation and context for mapping than its competitive neighbors. As a territorial state seeking to expand its terrestrial control, France focused on the control which the mapping of European territory could bring. As the largest country in Europe, France enjoyed both the benefits and disadvantages that size could bring. Sufficient resources created disincentives for the establishment of peripheral markets through colonization and this eventually affected French mapping efforts in its North American and Caribbean periphery. Parisian publication of regional European atlases reflect the French focus on the European continent.

Mapping the terrestrial and maritime peripheries

The Netherlands and England did not enjoy the same resource base as France. The search for agricultural commodities and resources to support the growing urban population led Holland into the European periphery of the Baltic and then the Mediterranean. The English followed the Dutch, emulated their methods and trailed

behind them in the Baltic, the Mediterranean and into the Atlantic periphery. When the Dutch shifted their trade focus from the Atlantic periphery to exploit their Asian markets, the English colonization of North America motivated subsequent mapping and surveying. The mapping traditions in the Netherlands and England reflected in the predominance of Dutch and English world and maritime atlas publications highlight the differences between the Dutch and English drive for mercantile sovereignty and the French drive for territorial sovereignty.

Desiderata

This research has only initiated a first view of the history of early modern cartography through the lenses of the capitalist world system and state type. More questions have been raised than answered. A more careful examination needs to made of the relationship between cartography and economic growth at several scales of mapping that follows Braudel's scalar distinctions between markets serving local economies, commercial networks connecting cities and regions, and the global capitalist system where core cities control the flow of commodities between continents. World-system theory needs to be carefully extended into the individual histories of mapping by the capitalist cores to illuminate how the evolution of mapping techniques, the growing density of commercial networks and the changing needs of the cores themselves for products from the periphery caused shifts in the markets and the geography of commerce. The history of the mapping of the Chesapeake basin and the surveying of Virginia can be re-interpreted within the context of its economic history. The development of the port of Charleston and the extension of that entrepot's influence on South Carolina agricultural

commodities is another candidate for world-system theory. At a meta-level of research, the following topics emerged during this dissertation for future work.

Expediency and sufficiency versus beauty and accuracy

Dutch and English atlases were published much faster, much more often and in much more affordable formats than the magnificent, elegant, and expensive French atlases. This is visible in the archival time-series analysis for world, regional and maritime atlases in the Library of Congress and the British Library. The French produced the most beautiful maps and atlases, but their more pragmatic competitors availed themselves of the best knowledge not only of French mapmakers but wherever the best cartographic information was to be found. This expedience and rush to publish leaves us with a larger archival record of less-than-perfect and more hastily-assembled geographic information in the Dutch and English atlases. Did the availability of atlases to a broader range of interested customers promote a wider participation in the competition for capitalist markets and seaborne trade? The French system for cartographic production was integrated and dependent upon state support and patronage. The pressures of creating atlases saleable in the open market were not to emerge until the middle of the eighteenth century in France. With less pressure to publish and supported financially by the crown, it might be expected that the French *geographes de cabinet* could produce the most accurate and thoughtful maps of the age. Their counterparts in Amsterdam and London were less fortunate in receiving royal patronage, and the production of maps and atlases was a market-driven business. This should not necessarily be taken as a disadvantage for Dutch and English cartographers and atlas publishers. Unfortunately, their orientation toward marketable formats and affordability

has earned their eighteen-century atlases labels as unoriginal and mediocre. In both Amsterdam and London, publishing cartographic products was a business and this business was growing along with seaborne trade, commodities production and the network of economic relationships that became the capitalist world-economy.

For the trade networks and maritime sailing information, the Dutch were unexcelled and their maritime atlases established the standard for the rest of the world. Only the English were motivated to imitate the Dutch mapmakers and to use their trade network information to build their own knowledge base for trade. This is recognized by historians of cartography, but without the proper theoretical framework the significance of knowledge transfer and the international flow of cartographic data pertinent to trade has not been appreciated.

Cartography as an international software technology

The skills and knowledge of how to make a map were always held by an elite international group. The tentative borders of early nation-states were no barrier to sharing knowledge. The first atlas by Ortelius contained contributions from eighty-seven authors whose biographies read like the resumes of modern corporate chief executive officers in respect to their education, travel, and where they worked (Karrow 1993). This was an independent and internationally circulating pool of expertise for surveying and map production. While historians of cartography acknowledge mapmaking dominance shifting among European cities and countries beginning with the Portuguese and Prince Henry the Navigator, there has been no conscious recognition that cartography was an international activity practiced by a class of men whose capabilities were recognized and sought after across Europe. The software component to the history of cartography and

the utilization of expertise in an apparently 'nationality-blind' labor market illustrates that cartography was a profession poised to take advantage of an international market for expertise that came with the capitalist world-system. Just as in business connections and the early credit networks dominated by extended families, cartographic expertise crossed borders and changed sides in war and economic competition. In printing and publishing, engravers and map makers seem to have moved across international borders with relative ease. Such expatriates may spend a few years or a decade before moving again or moving back to their country of origin. The Frenchman, Joseph Delisle, brother of Guillame Delisle, was brought to Russia in 1717 by Peter the Great to develop Russian map making enterprises (Bagrow and Skelton 1964). Delisle's newly-acquired knowledge of Russian geography made its way back to western Europe to be incorporated into atlases.

What were the incentives for international movement of cartographers? Geographic knowledge and information had value to both kings and merchants. Engravers are known to have taken copies of particular maps with them when they 'moved on' to other employment or to another country such as John Roque presenting an atlas to Henry VIII. In 1787 Comte de Cassini (Cassini IV) visited William Roy and the Royal Society in London and, while there, tried to convince the famous instrument-maker Jesse Ramsden to join his staff at the Paris Observatory. Ramsden declined to move to Paris or to take on French apprentices but was willing to make an instrument for Cassini. An optician, Sieur Carrochez, was part of the French delegation interested in examining William Herschel's telescopes and learning more about English optical glassmaking. (Konvitz 1987, 27). The French had perfected the theory and method of surveying but

lacked pragmatic experience for building the instruments needed to put that theory into practice.

The transfer of cartographic knowledge and expertise that accompanied the diaspora of French and Flemish Huguenot engravers to northern Holland, Germany and England brought a fresh wave of 'intellectual software' to Amsterdam and London in the 1590s that probably could not have been attracted otherwise. English cartography benefited greatly from the impacts of French political decisions. Saxton's core atlas of English counties was engraved primarily by Dutch or Flemish engravers (Delano-Smith and Kain 1999, 68).

Dominant economies map for dominance

This is a statement of the null hypothesis: if a country does not map, it cannot become an economic leader. Hegemonic states map weaker states as part of the process of making the latter part of their periphery. In the frequent territorial conflicts that characterized early modern Europe, mapping was one method for developing a geographic self-identity. This concept has proven true from a nation-state point of view. But it also holds true from a world-systems point of view and from the point of view of state type. The cores mapped their semiperiphery and periphery in order to commodify resources and to optimize efficient commercial exploitation. An example is that early modern Dutch terrestrial and maritime atlases contained maps of Danzig and its port long before such maps were ever produced in Poland (Koeman 1974). Polish magnates were interested primarily in mapping their own estates, not contributing to a general survey of the country.

> Though in these last years the air was full of talk of large-scale mapping projects of the kingdom, their execution was foiled by the nobility, while Poland's

> neighbours were able to map Polish territory at a large scale with impunity, as Friedrich Wilhelm von Schmettau did for Frederick II of Prussia. It is fair to say that by 1796 Poland was not only out-gunned and politically out-manoeuvred by her neighbours. She was also out-mapped. (Barber 1997: 93)

This fits Wallerstein's description of the process of 'appropriation' by core states of surplus value of a peripheral area, the 'unequal exchange' between strong states and weaker ones. It could be argued that Poland was both a 'world-system peripheral state' to the Netherlands as a trading state, accessed for its grain production and also a 'nation-state periphery' sought by its more powerful territorial state neighbors as a prize. The Polish land owners had succeeded in thwarting a strengthening of their own nascent state in order to control the production of grain on their estates and to continue to negotiate their own profitable exchange with Dutch merchants. But what Wallerstein characterizes as "re-feudalization" also meant that the Polish state was too disorganized and under-funded to create a national map, too weak to make itself into a nation-state and therefore too weak to resist the territorial ambitions of its more powerful neighbors.

> Once we get a difference in the strength of the state-machineries, we get the operation of 'unequal exchange' which is enforced by core states on peripheral areas. Thus capitalism involves not only appropriation of the surplus-value by an owner from a laborer, but an appropriation of surplus of the whole world-economy by core areas. And this was as true in the stage of agricultural capitalism as it is in the stage of industrial capitalism. (Wallerstein 1974:401)

Historical geography of commodities in maps

What is not available as yet is a cartographic genealogy that is thematic in the sense of a place being identified as the source of a particular commodity of interest and the tracing of that place's depiction in maps, inclusion of that place in maps in atlases and how the depiction of that place changed over time. Mapping changed at the same time that interest in places shifted and interest by the cores in particular places also shifted.

An example would be the depiction of the Grand Banks fishing grounds off the Newfoundland coast. These appear in some of the earliest maps of the 15th and 16th centuries as a shaded zone, sometimes labeled, sometimes not, but consistently depicted well into the 19th century. Even a 1975 atlas published in London that happens to be on my shelf shows the Grand Banks (Fullard and Darby, 1975). But there is not, to my knowledge, any research about the particular importance of the Grand Banks in terms of its consistent portrayal in early modern maps. Another approach would be to use Vance's transportation geography diagrams as compared to the historical maps of Caribbean islands such as Bermuda or Jamaica or of a particular port such as Charleston to illustrate how the mapping of a commodity source or entrepot evolved as the value of the commodities trades increased and the increase in trade in turn elevated the stature of that particular location.

Yet another approach to the cartographic geography of commodities as depicted in early modern maps would be to study one of the most highly-valued and traded commodities from the period, such as cod, timber and naval stores, sugar, or tobacco, from a thematic point of view and then to identify the cartographic expression of that commodity. Where were the sources, when were they first depicted and were these depictions related to the awareness of the commodity? If not, then did the depiction change when the commodity was discovered or implanted? Was the place re-mapped or mapped more accurately the longer its productive capacity was part of the world-system commodity network? Were the Dutch, French or English maps of the same place different because their respective strategic interests differed sufficiently to use different cartographic language?

The maritime atlases published in Amsterdam and London have a number of inset maps of ports and cities on the individual map sheets. There has never been an examination of the patterns, frequency or evolution of these 'ports of interest' by historians of cartography. The Shirley database of the maps in the atlases of the British Library has a searchable category for inset maps that would provide a first step to investigating the questions posed above. Unfortunately a query of MABL can identify a specific map in any one atlas and the map's description may include mention of an inset. But if that inset is not part of the map's name, it will not appear in the query results. It was realized that such an investigation was a logarithmic expansion of this research. Initially it was expected that this could be accomplished in a timely way but building a new theoretical foundation for the history of cartography has been a substantial process.

A thematic approach to mapping agricultural commodities would require focus on known ports trading in commodities. Part of this focus should include the genealogy of known maps that include sources of agricultural commodities during the early modern period originating from Amsterdam, Paris, and London. Such genealogies are published as individual cartographic histories of a particular place in books and articles. Many of the maps are used in other contexts or as examples from the other two kinds of map histories described above. My identification of a particular map of a particular place would concentrate on that place as a commodity source at that particular period of time and the characteristics of the place as depicted cartographically that would identify it as an important node within the world-system network of trade.

Does size really matter?

My collation of world atlases included recording the dimensions of each of the 195 atlases. The publication history and number of editions of the quarto, octavo and duodecimo atlases is a dimension to the history of atlas production that receives no attention by scholars in the history of cartography. Delano-Smith calls these atlases available to the 'middling-sort' of map users and this elitist point of view is not atypical for historians of cartography whose focus is on the atlases that are 'first', 'largest', most magnificent, or otherwise superlative. The proliferation of geographic knowledge is an acknowledged part of enlightenment learning that became part of every gentlemen's education (Smith 1996). The connection between the commercial community investing and developing the capitalist networks of trade and the publication of atlases affordable to the rising class of merchants and entrepreneurs has never been made explicit.

The prevalence of quarto and smaller atlas formats compared to folio atlases published in London in the seventeenth and eighteenth centuries is discernable in the archival evidence from the British Library (Shirley 2005). However, these are traditionally treated in the scholarly literature as lesser quality cartography since they were almost invariably uncolored, small volumes sold at a modest price. The long publishing history in successive editions of atlases depicting the English road network demonstrate a need to be able to visualize the network by which goods and people could be moved in early modern England. Neither the Dutch nor the French achieved any similar pragmatic expression of their respective transportation networks before the nineteenth century.

An indicator of the importance of affordable atlas editions is to compare them and their life-cycles of publication with the larger, more expensive folio atlases that typically take pride-of-place in map archives. One could hypothesize that making geographical information in the form of atlases available to more buyers ought to align with an increase in the number of investors in overseas commercial expansion. Did the availability of a global geography in mapform lead to more participants in commerce, more interest in the movement of goods both into and out of the core cities and into the peripheral networks?

The bibliographies indicate that 'reduced-size' atlases published of various 'famous' atlases seemed to sell very well and enjoy extended production runs. This is a tradition in the history of atlases that begins with the *Epitome* of Ortelius' TOT by Galle and Peter Heyns. The text was translated into four languages, rewritten by Petrus Bertius and saw thirty-two editions published between 1577 and 1724. A second example is George Humble's reduced version of Speed's *General Prospect* and *Theatre of the Empire of Great Britain* with maps engraved by Pieter van den Keere. This is known as the "miniature Speed atlas" and sold very well. In maritime atlases, the octavo volume size for Waghenaer's second atlas after the *Zee Spiegel* was a smaller version with more coastal profiles and text added. Waghenaer went back to the more familiar and traditional format of rutters for this publication. De Wit and van der Aa both published octavo and duodecimo world and regional atlases.

Fine large expensive folio atlases were published in Paris through the seventeenth and eighteenth centuries and many of these have survived to be studied for their admirable engraving, quality, coloring and completeness. Equally splendid atlases were

published in Amsterdam but were only a small percentage of the atlas trade that flourished in that city. A similarly pragmatic publishing tradition seems to characterize much of the English atlas production. Map size for an atlas was the primary determinant of cost for the volume. That there was cost-sensitivity within the market would seem to be evident in the publication of smaller format atlases. The reduced size versions tended not to be as elaborate and were more reasonably priced compared to the large ornate 'show atlases' that receive such attention in the map archives. It seems clear, on the basis of number of editions alone, that many more atlases of plainer style and in reduced format were published than the grand expensive folios affordable only by the wealthy, but this is an assertion that needs to be documented from archival evidence.

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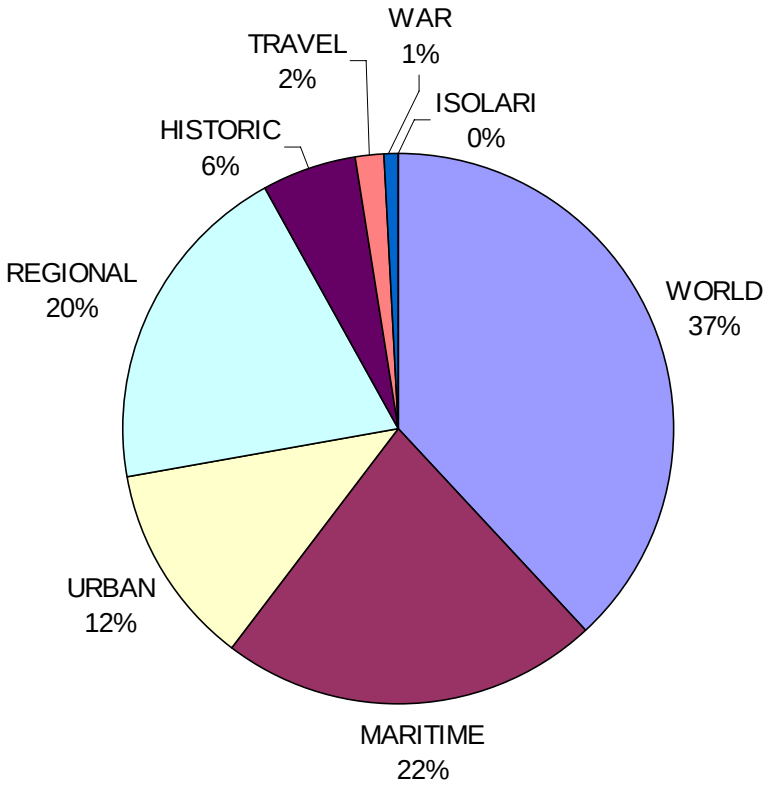
APPENDIX A

Appendix A-1:

BRITISH LIBRARY TOPICAL ATLAS HOLDINGS FROM NETHERLANDS

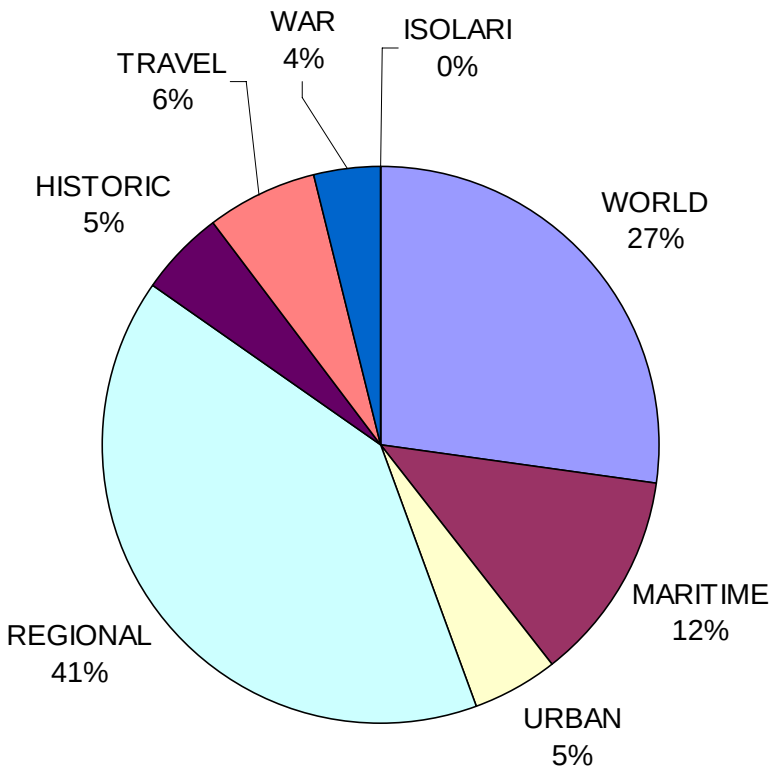
	TOTAL	WORLD	MARITIME	URBAN	REGIONAL	HISTORIC	TRAVEL	WAR	ISOLARI
1476 - 1500									
1501 - 1525									
1526 - 1550									
1551 - 1575	13	13							
1576 - 1600	34	31	7		3				
1601 - 1625	47	29	8	2	11	5			
1626 - 1650	38	25	6	7	5		1		
1651 - 1675	41	21	29	9	8	2	1		
1676 - 1700	55	24	30	10	19	2			
1701 - 1725	69	9	11	25	15	13	2	4	
1726 - 1750	28	10	5	1	12	3	2		
1751 - 1775	13	6			5	1	1		
1776 - 1800	17	5	6		12				
	355	173	102	54	90	26	7	4	0



Appendix A-2

BRITISH LIBRARY TOPICAL ATLAS HOLDINGS FROM FRANCE

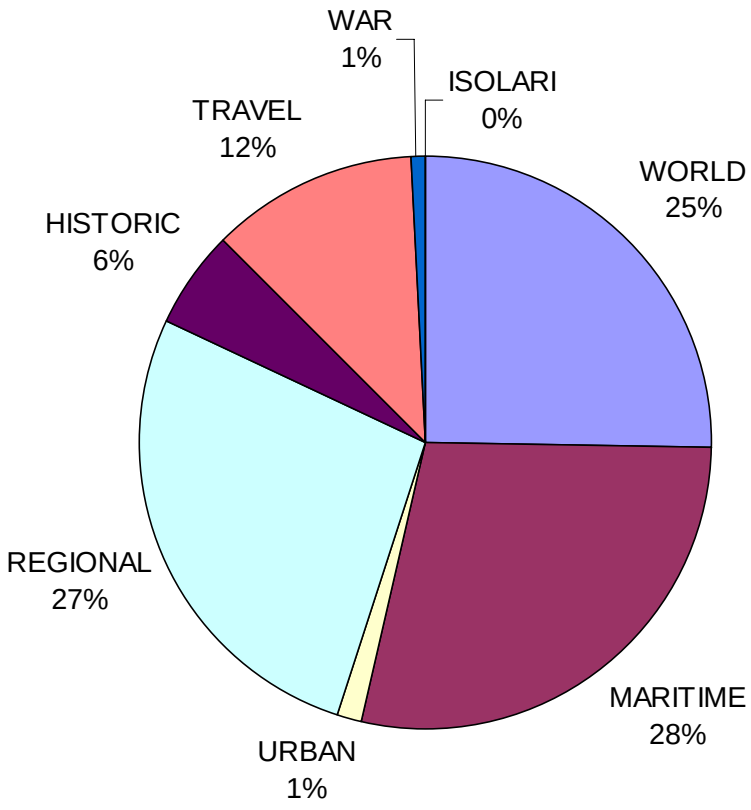
	TOTAL	WORLD	MARITIME	URBAN	REGIONAL	HISTORIC	TRAVEL	WAR	ISOLARI
1476 - 1500									
1501 - 1525	3	3							
1526 - 1550	2	2							
1551 - 1575	2	2							
1576 - 1600	3	1			2				
1601 - 1625	8	4	1		4				
1626 - 1650	19	1			16	2			
1651 - 1675	32	4	2	2	23	2		1	
1676 - 1700	22	9	2		9	1		3	
1701 - 1725	22	6	1	1	9		1	5	
1726 - 1750	14	6	3	2	5		1		
1751 - 1775	61	22	12	2	21	4	10	2	
1776 - 1800	54	15	13	7	22	5	5		
	242	75	34	14	111	14	17	11	0



Appendix A-3

BRITISH LIBRARY TOPICAL ATLAS HOLDINGS FROM ENGLAND

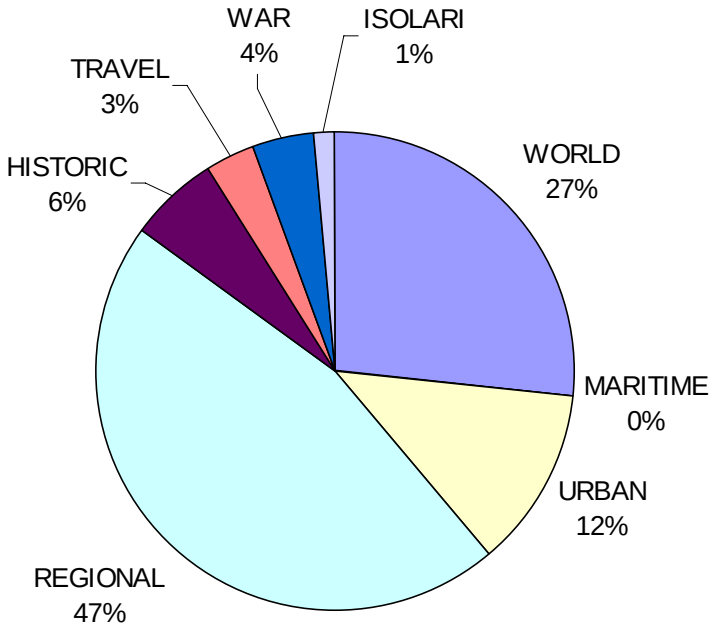
	TOTAL	WORLD	MARITIME	URBAN	REGIONAL	HISTORIC	TRAVEL	WAR	ISOLARI
1476 - 1500	0	0							
1501 - 1525	0	0							
1526 - 1550	0	0							
1551 - 1575	0	0							
1576 - 1600	2	0	2						
1601 - 1625	13	0			13				
1626 - 1650	15	6	1		5		4		
1651 - 1675	16	3	7		8		5		
1676 - 1700	48	21	20		23		3		
1701 - 1725	53	16	18	1	18	6	11	1	
1726 - 1750	63	20	23		24	12	7		
1751 - 1775	79	22	38	6	28	4	16	3	
1776 - 1800	149	66	62	1	45	12	24	1	
	438	154	171	8	164	34	70	5	0



Appendix A-4

BRITISH LIBRARY TOPICAL ATLAS HOLDINGS FROM GERMANY

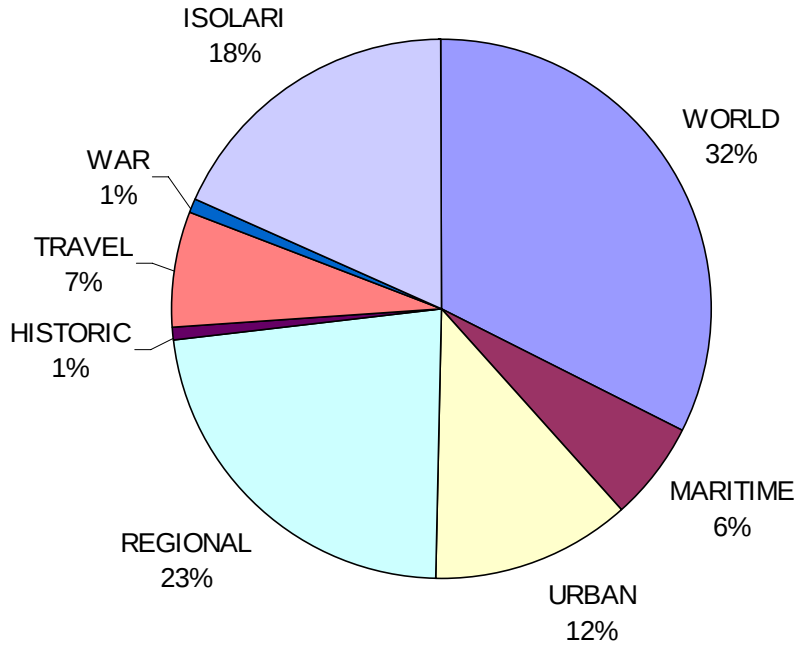
	TOTAL	WORLD	MARITIME	URBAN	REGIONAL	HISTORIC	TRAVEL	WAR	ISOLARI
1476 - 1500	2	2							
1501 - 1525									
1526 - 1550	1	1							
1551 - 1575	4	1		3					
1576 - 1600	21	7		4	8			1	1
1601 - 1625	15	3		4	5		3		
1626 - 1650	3	1			2				
1651 - 1675	2			1	1				
1676 - 1700	21	5		1	11			3	1
1701 - 1725	16	6			6	2		2	
1726 - 1750	26	8		4	8	6			
1751 - 1775	16	3			11	1	1		
1776 - 1800	20	2		1	16		1		
	147	39	0	18	68	9	5	6	2



Appendix A-5

BRITISH LIBRARY TOPICAL ATLAS HOLDINGS FROM ITALY

	TOTAL	WORLD	MARITIME	URBAN	REGIONAL	HISTORIC	TRAVEL	WAR	ISOLARI
1476 - 1500	7	4							3
1501 - 1525	3	3							
1526 - 1550	7	1			1				5
1551 - 1575	19	6		3					10
1576 - 1600	16	7		3	2		1		3
1601 - 1625	11	2		1	3		3		2
1626 - 1650	8	1	1	3	1		3		
1651 - 1675	10	3	2		6				1
1676 - 1700	21	10	2	1	7			1	2
1701 - 1725	15	3		3	9				
1726 - 1750	4			3	1				
1751 - 1775	6	1			1	1	3		
1776 - 1800	6	5	3		1				
	133	46	8	17	32	1	10	1	26

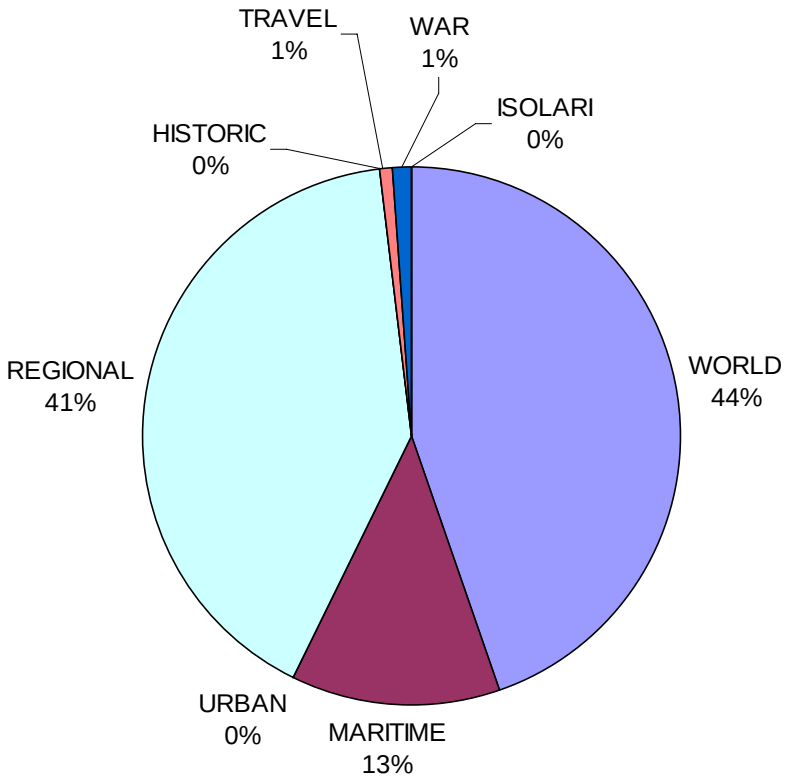


Appendix A-6

BRITISH LIBRARY TOPICAL ATLAS HOLDINGS FROM 'OTHER'*

	TOTAL	WORLD	MARITIME	URBAN	REGIONAL	HISTORIC	TRAVEL	WAR	ISOLARI
1476 - 1500									
1501 - 1525									
1526 - 1550	12	10			2				
1551 - 1575	13	12			1				
1576 - 1600	8	7			1				
1601 - 1625	3	1			1			1	
1626 - 1650	1		1		1				
1651 - 1675	1		1		1				
1676 - 1700									
1701 - 1725	3				3				
1726 - 1750	7	2	1		4		1		
1751 - 1775	8	1	1		7				
1776 - 1800	28	10	8		18				
	84	43	12	0	39	0	1	1	0

* NOTE: this category includes atlases from China, Japan, Portugal, Spain, Russia & America



APPENDIX B

Appendix B-1
WORLD ATLAS COLLATION SUMMARY

	TOTAL ED	# AUTH	AVG # MAPS	TOT MAPS	% PERI	% AFRICA	% ASIA	% AMER	% HEGE
Dutch WORLD Other	45	9	170	7305	19	18	46	36	40
MercHondJanss	19	3	154	3083	14	18	38	36	36
Blaeu	10	1	217	2166	16	15	32	55	29
MercMinor	21	1	170	3736	22	23	40	40	52
Dutch WORLD Totals	95	14	178	16290	18	19	39	42	39
French WORLD Totals	43	5	94	4143	13	20	26	49	40
English WORLD Totals	56	15	42	2385	40	21	36	40	42

KEY:

TOTAL ED	Total atlas editions
# AUTH	Number of different atlas authors
AVG # MAPS	Average number of maps per category of atlases
TOT MAPS	Total number of maps per category of atlases
TOT HEGE	Total number of maps of Netherlands, France & England
OTHER EUR	Total number of maps of other European countries
% HEGE	Percentage of maps of Netherlands, France & England
TOT PERI	Total number of maps of non-European periphery
% PERI	Percentage of maps of non-European periphery of edition total
% AFRICA	Percentage of maps of Africa
% ASIA	Percentage of maps of Asia
% AMER PERI	Percentage of maps of North and South America
% AMER TOT ED	Percentage of maps of North and South America of atlas edition

Appendix B-2
Dutch World Atlas Collation

2	EDITIONS	YEAR	# Maps	Koeman or Shirley	SIZE	GR BRIT	LC/UP	FRANCE	TOT HEGE	OTHER EUR	% HEGEofEURTOT	TOT EUR	AFRICA	% AFRICA OF PERI	ASIA	% ASIA OF PERI	AMERICA	TOT PERI	% PERIPH OF ED TOT	OF ED % AMER TOT	% AMER OF PERIPH
3	LANGENES Caert-Thresoor	1598	169	Lan1	115x170	4	19	16	39	87	31%	126	13	30%	19	44%	11	43	25%	7%	26%
4	P-Bertij Tab Geog Contractarum	1616	220	Lan11A	120x200	20	16	24	60	105	36%	165	15	27%	27	49%	13	55	25%	6%	24%
5	Visscher, NJ	1649	252	Vis 2	140x170				0	161	0%	161	29	32%	37	41%	25	91	36%	10%	27%
6	Visscher Atlas contractus	1677	56	Vis6	550x340	1	23	3	27	17	61%	44	1	8%	7	58%	4	12	21%	7%	33%
7	Visscher II Atlas contractus	1678	91	Vis8	560x350	1	28	3	32	47	41%	79	1	8%	7	58%	4	12	13%	4%	33%
8	de Wit Atlas	1680	26	Wit3	0	1	1	1	3	16	16%	19	1	14%	5	71%	1	7	27%	4%	14%
9	de Wit Atlas	1680	28	Wit4	0	4	3	1	8	13	38%	21	1	14%	5	71%	1	7	25%	4%	14%
10	de Wit Atlas	1680	104	Wit10	530x340	4	19	14	37	60	38%	97	1	14%	5	71%	1	7	7%	1%	14%
11	de Wit Atlas	1681	51	Wit7	0	1	23	1	25	19	57%	44	1	14%	5	71%	1	7	14%	2%	14%
12	de Wit Atlas	1681	100	Wit8	0	1	19	14	34	59	37%	93	1	14%	5	71%	1	7	7%	1%	14%
13	de Wit Atlas	1682	102	Wit9	0	4	19	14	37	58	39%	95	1	14%	5	71%	1	7	7%	1%	14%
14	de Wit Atlas	1688	21	Wit2	0	3	3	1	7	11	39%	18	1	33%	1	33%	1	3	14%	5%	33%
15	de Wit Atlas	1688	31	Wit6	0	4	3	1	8	16	33%	24	1	14%	5	71%	1	7	23%	3%	14%
16	de Wit Atlas	1688	105	Wit11	0	4	19	14	37	61	38%	98	1	14%	5	71%	1	7	7%	1%	14%
17	de Wit Atlas	1688	108	Wit12	560x340	4	19	15	38	63	38%	101	1	14%	5	71%	1	7	6%	1%	14%
18	Visscher II Atlas contractus	1689	150	Vis12	540x340	4	26	16	46	79	37%	125	6	24%	12	48%	7	25	17%	5%	28%
19	de Wit Atlas	1689	130	Wit13	0	7	19	15	41	72	36%	113	5	29%	8	47%	4	17	13%	3%	24%
20	de Wit Atlas	1689	151	Wit16	0	7	34	14	55	89	38%	144	1	14%	5	71%	1	7	5%	1%	14%
21	de Wit Atlas	1689	133	Wit18	570x380	4	35	14	53	63	46%	116	5	29%	7	41%	5	17	13%	4%	29%
22	Visscher II Atlas contractus	1690	100	Vis13	535x360	4	19	12	35	49	42%	84	5	31%	6	38%	5	16	16%	5%	31%
23	Visscher II Atlas contractus	1690	126	Vis19	550x345	4	27	13	44	59	43%	103	4	17%	10	43%	9	23	18%	7%	39%
24	de Wit Atlas	1696	140	T.Wit2b	540x380	4	38	21	63	58	52%	121	5	26%	7	37%	7	19	14%	5%	37%
25	Covens&Mortier Atlas Nouveau	1703	120	MORT-1b	655x550	3	22	17	42	63	40%	105	0	0%	5	33%	10	15	13%	8%	67%
26	Allard Atlas Major	1705	525	All1	550x370	59	49	70	178	272	40%	450	14	19%	30	40%	31	75	14%	6%	41%
27	Visscher widow	1705	40	Vis29	500x570	1	14	1	16	23	41%	39	0	0%	0	0%	1	1	3%	3%	100%
28	Aa Cartes des itiner	1707	112	Aa	240x360	1	2	2	5	0	100%	5	19	17%	53	48%	39	111	99%	35%	35%
29	Visscher widow	1708	69	Vis30	570x350	1	36	1	38	30	56%	68	0	0%	0	0%	1	1	1%	1%	100%
30	Aa Nouveau Petit Atas	1710	218	Aa	200x150	26	19	31	76	111	41%	187	6	19%	15	48%	10	31	14%	5%	32%
31	Aa Le Nouv Th du Mond	1713	95	Aa	570x430	3	7	9	19	69	22%	88	1	14%	3	43%	3	7	7%	3%	43%
32	Aa Nouv Atlas	1714	193	Aa	350x220	4	14	14	32	93	26%	125	10	15%	38	56%	20	68	35%	10%	29%
33	Aa Nouv Atlas	1714	95	Aa	360x470	4	16	14	34	46	43%	80	2	13%	7	47%	6	15	16%	6%	40%
34	Covens&Mortier Atlas Maior	1725	190	MORT-1a	655x550	7	43	21	71	101	41%	172	0	0%	7	39%	11	18	9%	6%	61%
35	Aa La Galerie agreable	1729	1546	Aa	370x250	70	152	326	548	676	45%	1224	63	20%	177	55%	82	322	21%	5%	25%
36	Covens&Mortier Atlas Nouveau	1730	56	C&M 4	590x540	1	7	4	12	23	34%	35	4	19%	8	38%	9	21	38%	16%	43%
37	Covens&Mortier Atlas Nouveau	1730	49	C&M 3	550x360	1	4	4	9	19	32%	28	5	24%	8	38%	8	21	43%	16%	38%
38	Covens&Mortier Nieuwe Atlas	1741	352	C&M 10	550x360	55	43	17	115	184	38%	299	22	42%	6	11%	25	53	15%	7%	47%
39	Tirion	1744	50	Tir2	405x270	1	13	1	15	18	45%	33	1	6%	15	88%	1	17	34%	2%	6%
40	Covens&Mortier Atlas Nouveau	1745	129	C&M 7	570x360	1	7	25	33	64	34%	97	5	16%	8	25%	19	32	25%	15%	59%
41	Leth Nouvel Atlas	1749	40	Let1	200x130	1	9	1	11	25	31%	36	1	25%	1	25%	2	4	10%	5%	50%
42	Covens&Mortier Atlas Nouveau	1757	138	C&M 8	600x420	1	10	24	35	79	31%	114	5	21%	0	0%	19	24	17%	14%	79%
43	Covens&Mortier Nieuwe Atlas	1759	742	C&M 11	570x390	28	260	35	323	318	50%	641	19	19%	37	37%	45	101	14%	6%	45%
44	Tirion	1769	109	Tir4	440x380	5	43	2	50	26	66%	76	5	15%	13	39%	15	33	30%	14%	45%
45	Covens&Mortier Atlas Nouveau	1774	43	C&M 9	560x530	3	2	1	6	24	20%	30	5	38%	3	23%	5	13	30%	12%	38%
46	AVG # MAPS PER ATLAS		170								**40%**			**18%**		**46%**			**19%**	**7%**	**36%**
47	TOTAL # MAPS IN 43 ATLASES		7305																		

EDITIONS	WORLD	ARCTICA	EUROPA	TOT EUR	GR BRIT	LC/UP	FRAN	TOTHEGE	OTHEREUR	% HEGE EURTOT	EUROPE	AFRICA	% AFRI PERI	ASIA	(CHINA)	%ASIA PERI	AMER	TOT PERI	% PERI EDTOT	% AMER EDTOT	% AMER PERI	ED TOT
before 1629	1	0	1	8	0	1	1	2	6	25%	1	1	33%	1	0	33%	1	3	23%	8%	33%	13
Coll. 1629	0	1	0	24	0	1	0	1	23	4%	0	0	0%	2	0	17%	10	12	32%	27%	83%	37
App. 1630	1	1	1	42	1	6	2	9	33	21%	1	1	7%	3	0	20%	11	15	25%	18%	73%	60
App. 1631	1	1	1	81	1	12	25	38	43	47%	1	1	7%	3	0	20%	11	15	15%	11%	73%	99
Ger. 1634	1	1	1	137	2	8	30	40	97	29%	1	1	6%	3	0	19%	12	16	10%	8%	75%	156
Dutch 2 vols.1639?	1	1	1	176	2	14	48	64	112	36%	1	4	14%	10	1	39%	13	28	14%	6%	46%	207
Dutch 3 vols.1640	1	2	1	242	2	16	48	66	176	27%	1	5	17%	10	1	37%	14	30	11%	5%	47%	276
Dutch 4 vols. 1645	1	2	1	298	58	15	48	121	177	41%	1	5	16%	10	1	35%	15	31	9%	5%	48%	333
Dutch 6 vols.1655	1	2	1	353	58	17	48	123	230	35%	1	5	11%	10	17	57%	15	47	12%	4%	32%	404
Latin 11 vols.1662	1	8	1	508	59	28	58	145	363	29%	1	13	21%	10	17	43%	23	63	11%	4%	37%	581
AVG PERCENTAGE										29%			13%			32%			16%	10%	55%	217
TOTAL # OF MAPS																						2166

Blaeu World Atlas Collation (adapted from Keuning 1959)

EDITIONS	GR BRIT	LC/UP	FRANCE	TOT HEGE	OTHER EUR	% HEGE ofEURTOT	TOT EUR	EUROPE	AFRICA	% AFRI PERI	ASIA	% ASIA PERI	AMERICA	TOT PERI	% AMER PERI	% PERI ED TOT	% AMER ED TOT	ED TOT
1585	0	4	12	16	35	31%	51	0	0	0%	0	0%	0	0	0%	0%	0%	51
1589	0	0	0	0	22	0%	22	0	0	0%	0	0%	0	0	0%	0%	0%	22
1595;1602	16	4	12	32	69	32%	101	1	1	33%	1	33%	1	3	33%	3%	1%	108
1606	16	4	15	35	76	32%	111	1	6	23%	13	50%	7	26	27%	18%	5%	141
1607;fr.1607;1608	17	4	16	37	79	32%	116	2	6	23%	13	50%	7	26	27%	18%	5%	147
fr.1609	17	4	16	37	80	32%	117	2	6	23%	13	50%	7	26	27%	18%	5%	148
1611;1612;1613; fr.1626;1616;161	17	4	16	37	83	31%	120	2	6	23%	13	50%	7	26	27%	17%	5%	151
fr.1619;1623;fr.1626	17	4	22	43	83	34%	126	2	6	23%	13	50%	7	26	27%	17%	4%	157
1628;fr.1628	17	4	22	43	83	34%	126	2	6	23%	13	50%	7	26	27%	17%	4%	157
fr.1630; 1630;1631;1632	18	10	23	51	84	38%	135	2	6	23%	13	50%	7	26	27%	16%	4%	166
app.fr.1633	2	12	27	41	45	48%	86	1	1	6%	4	25%	11	16	69%	15%	11%	104
fr.1633 2vol.	19	15	47	81	117	41%	198	2	6	17%	14	39%	16	36	44%	15%	7%	239
ger.1633	9	6	22	37	112	25%	149	1	1	8%	7	54%	5	13	38%	8%	3%	165
dutch1634	13	14	28	55	98	36%	153	1	5	20%	9	36%	11	25	44%	14%	6%	183
engl1636	20	12	29	61	98	38%	159	1	5	16%	12	38%	15	32	47%	16%	8%	195
app.ger.1637	16	11	23	50	57	47%	107	0	4	21%	6	32%	9	19	47%	15%	7%	128
app.dutch 1637	15	5	19	39	52	43%	91	0	3	33%	5	56%	1	9	11%	9%	1%	101
1638	21	18	55	94	181	34%	275	2	6	16%	14	37%	18	38	47%	12%	6%	318
dutch1638	16	17	42	75	137	35%	212	1	6	19%	10	32%	15	31	48%	13%	6%	248
AVG PERCENTAGE						36%				18%		38%			36%	14%	5%	154
																		3083

Mercator/Hondius/Janssonius World Atlas Collation (adapted from Keuning 1947)

EDITIONS	LANG	# Maps	Koeman or Shirley	SIZE	GR BRIT	LC/UP	FRANCE	TOT HEGE	OTHER EUR	% HEGE ofEURTOT	TOT EUR	AFRICA	% Africa OF PERI	ASIA	% ASIA OF PERI	AMERICA	TOT PERI	% PERIPH OF ED TOT	% AMER OF ED TOT	% AMER OF PERI
1676	DUTCH	207	Me206	220x285	16	21	30	67	140	42%	207	5	16%	11	48%	15	31	15%	7%	48%
1635	ENGL	192	T.HON-1d	290x205	14	20	32	66	126	45%	192	6	20%	9	50%	15	30	16%	8%	50%
1637	ENGL	192	T.HON-1e	290x205	14	20	32	66	126	45%	192	6	20%	9	50%	15	30	16%	8%	50%
1639	ENGL	192	T.HON-1f	290x205	14	20	32	66	126	45%	192	6	20%	9	50%	15	30	16%	8%	50%
1608	FREN	146	Me 187	175x220	32	18	28	78	68	59%	146	8	21%	16	38%	15	39	27%	10%	38%
1613	FREN	146	Me190	165x220	32	18	28	78	68	59%	146	8	21%	16	38%	15	39	27%	10%	38%
1614	FREN	146	Me191	175x220	32	18	28	78	68	59%	146	8	21%	16	38%	15	39	27%	10%	38%
1630	FREN	142	Me196	185x245	30	21	27	78	64	61%	142	11	26%	18	31%	13	42	30%	9%	31%
1630	FREN	180	Me198	210x280	31	31	56	118	62	48%	180	8	20%	17	39%	16	41	23%	9%	39%
1636	FREN	150	Me202	210x280	31	31	56	118	32	57%	150	8	20%	17	39%	16	41	27%	11%	39%
1735	FREN	283	Me207	280x440	18	23	30	71	212	30%	283	19	28%	24	36%	24	67	24%	8%	36%
1609	GER	152	Me188	180x230	19	9	15	43	109	57%	152	7	26%	10	37%	10	27	18%	7%	37%
1630	GER	143	Me197	185x240	21	14	25	60	83	60%	143	6	23%	10	38%	10	26	18%	7%	38%
1631	GER	143	Me199	180x230	14	12	15	41	102	60%	143	5	22%	9	39%	9	23	16%	6%	39%
1651	GER	214	Me204	185x230	24	19	27	70	144	40%	214	6	20%	9	50%	15	30	14%	7%	50%
1607	LATIN	152	Me186	165x215	41	17	28	86	66	57%	152	18	38%	15	31%	15	48	32%	10%	31%
1610	LATIN	154	Me189	170x230	41	17	28	86	68	56%	154	18	38%	15	31%	15	48	31%	10%	31%
1621	LATIN	152	Me193	175x220	41	17	28	86	66	57%	152	18	38%	15	31%	15	48	32%	10%	31%
1628	LATIN	146	Me194	180x235	14	12	15	41	105	59%	146	5	22%	9	39%	9	23	16%	6%	39%
1632	LATIN	178	Me200	220x275	32	33	54	119	59	48%	178	8	17%	18	43%	20	46	26%	11%	43%
1634	LATIN	143	Me201	190x230	14	12	15	41	102	60%	143	5	22%	9	39%	9	23	16%	6%	39%
1673	LATIN	183	Me205	180x240	17	14	28	59	124	47%	183	2	7%	16	38%	11	29	16%	6%	38%
AVERAGES		170								52%			23%		40%			22%	8%	40%
TOTAL MAPS		3736																		

Mercator Minor Atlases (adapted from Koeman 1974)

Appendix B-3
French World Atlas Collation

EDITIONS	YEAR	# Maps	Archive	GRBRIT	LC/UP	FRAN	TOT HEGE	OTHER EUR	% Heg of EUR TOT	TOTEUR	AFR	% AFRI TOT PERI	ASIA	% ASIA TOT PERI	AMER	TOTPERI	% Peri ED TOT	% Amer OF ED TOT	% Amer OF PERI
Sanson Cartes gen'l du Monde	1658	113	1658 VA	6	2	14	22	62	26%	84	8	28%	9	31%	12	29	26%	3%	41%
Sanson Cartes gen'l du Monde	1665	166	1665 VB	15	3	14	32	105	23%	137	8	28%	9	31%	12	29	17%	2%	41%
Sanson Cartes gen'l du Monde	1667	200	1667 VD	15	3	14	32	128	20%	160	10	25%	17	43%	13	40	20%	2%	33%
Jaillot Atlas Nouveau	1681	46	1681 1Aa	1	4	6	11	29	28%	40	1	17%	3	50%	2	6	13%	7%	33%
Jaillot Atlas Nouveau	1681	46	1681 1Ab	1	8	10	19	24	44%	43	1	33%	1	33%	1	3	7%	7%	33%
Jaillot Atlas Nouveau	1684	46	1684 1B	1	19	5	25	18	58%	43	1	33%	1	33%	1	3	7%	7%	33%
Jaillot/Mortier Atlas Nouveau	1689	80	Shir T.Jai-1c	1	49	6	56	24	70%	80	0	0%	0	0%	0	0	0%	0%	0%
Jaillot/Mortier Atlas Nouveau	1692	99	Shir T.Jai-1d	5	22	14	41	54	43%	95	1	25%	1	25%	2	4	4%	3%	50%
Jaillot Le Atlas Francais	1695	100	1695 IIA	1	16	37	54	41	57%	95	1	20%	1	20%	3	5	5%	3%	60%
Jaillot Le Atlas Francais	1695	174	1695 IIE	1	15	53	69	101	41%	170	1	25%	1	25%	2	4	2%	2%	50%
Jaillot Le Atlas Francais	1695	121	1695 IIC	0	0	71	71	34	68%	105	4	25%	6	38%	6	16	13%	2%	38%
De Fer Atlas Royal	1695	24	Fer IIIA T.MORT-2a	1	3	6	10	10	50%	20	1	25%	1	25%	2	4	17%	13%	50%
Jaillot Le Atlas Francais	1698	135	1698 IIB	1	22	43	66	64	51%	130	1	20%	1	20%	3	5	4%	2%	60%
Jaillot Le Atlas Francais	1700	142	1700 IIF	1	17	44	62	75	45%	137	1	20%	1	20%	3	5	4%	2%	60%
Jaillot Le Atlas Francais	1700	186	1700 IIG	1	21	62	84	97	46%	181	1	20%	1	20%	3	5	3%	2%	60%
Jaillot Le Atlas Francais	1700	67	1700 IIH	1	3	43	47	15	76%	62	1	20%	1	20%	3	5	7%	4%	60%
Jaillot Le Atlas Francais	1700	112	1700 III	1	11	28	40	67	37%	107	1	20%	1	20%	3	5	4%	3%	60%
Jaillot Le Atlas Francais	1700	100	1700 IID	1	4	45	50	45	53%	95	1	20%	1	20%	3	5	5%	3%	60%
De Fer Atlas Curieux Vol 1	1700	24	T.Fer-3A	1	2	6	9	9	50%	18	1	17%	1	17%	4	6	25%	13%	67%
De Fer Atlas Curieux Vol 2	1701	27	T.Fer-3A	0	4	2	6	19	24%	25	1	50%	0	0%	1	2	7%	11%	50%
De Fer Atlas Curieux Vol 3	1702	35	T.Fer-3A	0	2	16	18	17	51%	35	0	0%	0	0%	0	0	0%	0%	0%
De Fer Atlas Curieux Vol 4	1703	31	T.Fer-3A	0	0	0	0	19	0%	19	2	17%	5	42%	5	12	39%	10%	42%
De Fer Atlas Curieux	1703	112	Fer 1B	2	10	24	36	55	40%	91	4	19%	6	29%	11	21	19%	3%	52%
De Fer Atlas Curieux Vol 5	1704	38	T.Fer-3A	0	3	0	3	34	8%	37	0	0%	1	100%	0	1	3%	8%	0%
De Fer Atlas Curieux Vol 6	1705	28	T.Fer-3A	0	0	16	16	10	62%	26	0	0%	0	0%	2	2	7%	11%	100%
De Fer Atlas ou Recueil des Cartes	1709	88	Fer IIB	0	4	30	34	44	44%	78	2	20%	2	20%	6	10	11%	3%	60%
De Fer Suite de la Atlas Cur	1716	52	Fer 1C	0	0	40	40	9	82%	49	0	0%	0	0%	3	3	6%	6%	100%
De Fer Suite de la Atlas Curieux Pt. 1	1716	118	Fer 1D	0	0	100	100	15	87%	115	1	33%	1	33%	1	3	3%	3%	33%
Der Fer Suit de la Atlas Curieux Pt 2	1716	249	Fer 1D	4	17	6	27	199	12%	226	4	17%	5	22%	14	23	9%	1%	61%
De l'Isle [NO TITLE OR Atlas Nouveau]]	1725	37	T.Del-1a	0	0	7	7	18	28%	25	2	17%	2	17%	8	12	32%	8%	67%
De l'Isle [NO TITLE]	1725	78	T.Del-1b	1	1	24	26	44	37%	70	0	0%	0	0%	8	8	10%	4%	100%
De l'Isle [NO TITLE]	1732	94	T.Del-1c	1	1	23	25	45	36%	70	5	21%	10	42%	9	24	26%	3%	38%
De l'Isle [NO TITLE]	1732	94	T.Del-1d	1	1	23	25	50	33%	75	6	32%	4	21%	9	19	20%	3%	47%
De l'Isle [NO TITLE]	1732	95	T.Del-1e	1	1	23	25	45	36%	70	5	20%	10	40%	10	25	26%	3%	40%
De l'Isle [NO TITLE] (partial)	1732	46	T.Del-1f	0	0	0	0	24	0%	24	6	27%	6	27%	10	22	48%	7%	45%
De l'Isle [NO TITLE]	1744	107	T.Del-1g	1	1	24	26	58	31%	84	4	17%	6	26%	13	23	21%	3%	57%
De Fer Atlas ou Recueil des Cartes	1748	113	Fer IID	4	1	44	49	50	49%	99	2	14%	4	29%	8	14	12%	3%	57%
De l'Isle [NO TITLE]	1755	106	T.Del-1h	1	1	26	28	48	37%	76	5	17%	12	40%	13	30	28%	3%	43%
Jaillot [NO TITLE]	1628-88	68	Shirley T.Jai-1a	3	4	3	10	52	16%	62	2	33%	2	33%	2	6	9%	4%	33%
Jaillot Atlas Nouveau	1689-90	78	Shirley T.Jai-1b	5	15	5	25	45	36%	70	2	25%	2	25%	4	8	10%	4%	50%
De Fer Atlas Royal	1699-02	114	Fer IIIC	1	15	17	33	75	31%	108	2	33%	1	17%	3	6	5%	3%	50%
Jaillot Le Atlas Francais	1700-21	86	1700 IIJ	1	6	34	41	41	50%	82	1	25%	0	0%	3	4	5%	3%	75%
De Fer Atlas ou Recueil des Cartes	1709-28	100	Fer IIC	3	5	29	37	52	42%	89	2	18%	2	18%	7	11	11%	3%	64%
Jaillot/Mortier Atlas Nouveau	ND	168	Shir T.Jai-1F	4	11	23	38	117	25%	155	3	23%	8	62%	2	13	8%	2%	15%
AVG. # OF MAPS PER ATLAS		94							40%			20%		26%			13%	4%	49%
TOTAL # OF MAPS IN THE 44 ATLASES		4143																	

Appendix B-4
English World Atlas Collation

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
2	EDITIONS	YEAR	# Maps	Shirley	SIZE	GR BRIT	LC/UP	FRANCE	TOT HEGE	OTHER EUR	% HEGE of EUR TOT	TOT EUR	AFRICA	% AFR PERI	ASIA	%ASIA PERI	AMERICA	TOT PERIPH	% PERI OF ED TOT	% AMER OF ED TOT	% AMER OF PERI
3	Speed Prospect	1627	22	Shir	440x320	1	1	1	3	11	27%	14	1	13%	5	63%	2	8	36%	9%	25%
4	Speed Prospect	1631	22	Shir	435x330	1	1	1	3	11	27%	14	1	13%	5	63%	2	8	36%	9%	25%
5	Speed Prospect	1646	22	Shir	420x310	1	1	1	3	11	27%	14	1	13%	5	63%	2	8	36%	9%	25%
6	Speed Prospect	1665	22	Shir	440x320	1	1	1	3	11	27%	14	1	13%	5	63%	2	8	36%	9%	25%
7	J Seller Atlas terrestris	1676	48	Shir	530x355	1	0	0	1	28	4%	29	3	16%	6	32%	10	19	40%	21%	53%
8	Speed Prospect	1676	31	Shir	455x345	1	1	1	3	14	21%	17	1	7%	6	43%	7	14	45%	23%	50%
9	J Seller Atlas minimus	1678	53	Shir	120x85	1	1	1	3	11	27%	14	13	33%	13	33%	13	39	74%	25%	33%
10	Morden Geography Rectified	1680	65	Shir	210x165	1	2	1	4	18	22%	22	14	33%	15	35%	14	43	66%	22%	33%
11	Morden Geography Rectified	1681	66	Shir	135x160	1	2	1	4	17	24%	21	14	31%	15	33%	16	45	68%	24%	36%
12	J Seller New sys geogr	1685	27	Shir	120x150	3	1	1	5	18	28%	23	1	25%	1	25%	2	4	15%	7%	50%
13	J Seller Atlas terrestris	1687	16	Shir	530x350	2	1	1	4	9	44%	13	1	33%	1	33%	1	3	19%	6%	33%
14	Morden Geography Rectified	1688	78	Shir	210x175	4	2	1	7	21	33%	28	16	32%	17	34%	17	50	64%	22%	34%
15	J Seller Atlas terrestris	1689	115	Shir	150x210	13	1	2	16	54	30%	70	10	22%	14	31%	21	45	39%	18%	47%
16	J Seller A Bk of Geography	1691	52	Shir	120x85	1	0	1	2	11	18%	13	13	33%	13	33%	13	39	75%	25%	33%
17	Gordon Geogr Anatomiz'd	1693	16	Shir	170x110	3	1	1	5	8	63%	13	1	33%	1	33%	1	3	19%	6%	33%
18	Morden Geography Rectified	1693	78	Shir	205x175	4	2	1	7	21	33%	28	16	32%	17	34%	17	50	64%	22%	34%
19	Moll Thesaurus geographic	1695	58	Shir	320x220	4	5	8	17	37	46%	54	1	25%	1	25%	2	4	7%	3%	50%
20	Gordon Geogr Anatomiz'd	1699	17	Shir	180x120	3	0	1	4	9	44%	13	1	25%	1	25%	2	4	24%	12%	50%
21	Morden Geography Rectified	1700	81	Shir	210x175	4	2	1	7	24	29%	31	16	32%	17	34%	17	50	62%	21%	34%
22	Morden Atlas terrestris	1700	78	Shir	165x120	4	2	1	7	21	33%	28	16	32%	17	34%	17	50	64%	22%	34%
23	Moll Sys of geography	1701	42	Shir	315x230	3	2	1	6	25	24%	31	1	9%	1	9%	9	11	26%	21%	82%
24	Moll 24 Maps	1707	24	Shir	200x320	0	2	3	5	19	26%	24	0	0%	0	0%	0	0	0%	0%	0%
25	Moll Compleat Geographr	1709	45	Shir	320x220	3	2	1	6	17	35%	23	6	27%	7	32%	9	22	49%	20%	41%
26	Moll Atlas manuale	1709	43	Shir	200x140	3	2	1	6	15	40%	21	6	27%	7	32%	9	22	51%	21%	41%
27	Senex [no title]	1711	20	Shir	690x525	2	2	1	5	11	45%	16	1	25%	1	25%	2	4	20%	10%	50%
28	Senex [no title]	1711	20	Shir	695x540	2	2	1	5	11	45%	16	1	25%	1	25%	2	4	20%	10%	50%
29	Senex English Atlas	1714	29	Shir	725x585	2	5	2	9	14	64%	23	2	33%	2	33%	2	6	21%	7%	33%
30	Moll [no title]	1714	22	Shir	655x320	4	1	3	8	9	89%	17	1	20%	2	40%	2	5	23%	9%	40%
31	Moll Atlas geographicus	1717	102	Shir	230x175	0	3	4	7	50	14%	57	8	18%	14	31%	23	45	44%	23%	51%
32	Senex New Genl Atlas	1721	35	Shir	560x390	4	3	2	9	15	60%	24	1	9%	3	27%	7	11	31%	20%	64%
33	Moll Compleat Geographr	1723	44	Shir	355x250	3	1	1	5	17	29%	22	6	27%	7	32%	9	22	50%	20%	41%
34	Senex [no title]	1728	41	Shir	680x540	2	5	2	9	26	35%	35	2	33%	2	33%	2	6	15%	5%	33%
35	Moll Atlas minor	1729	64	Shir	230x340	4	2	1	7	23	30%	30	7	21%	9	26%	18	34	53%	28%	53%
36	Moll [no title]	1730	29	Shir	650x340	5	2	1	8	12	67%	20	1	11%	2	22%	6	9	31%	21%	67%

Appendix B-5

WORLD ATLAS MAP COLLATION BIBLIOGRAPHY

Bibliographic listings of atlases collated by country of origin (Dutch, French and English) and arranged chronologically by date of publication.

Dutch World Atlases

Dutch world atlas collations were performed on the previously-published collations published on Blaeu (Keuning 1959), the Mercator/Hondius/Janssonius atlases and Mercator minor atlases (Keuning 1947b). These earlier collations were adapted to the categories of periphery and European hegemons (Netherlands, France and England).

The bibliography of the collated category of Dutch world atlases 'Other' is listed below with the source in brackets. Pastoureau (1984), Koeman (1967-1974) and Shirley (2004) are the primary sources for map descriptions in individual atlases and will permit identification of the atlases collated according to periphery and European hegemons. Specific atlases may be located in archives world-wide – the reader is advised to search for an individual atlas first in the identified bibliography where an atlas's archival location may be given.

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Wit, Frederick de. (1680?). *Atlas.* Amsterdam: Frederick de Wit. [Koeman Wit 8].

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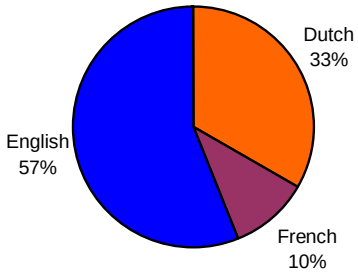
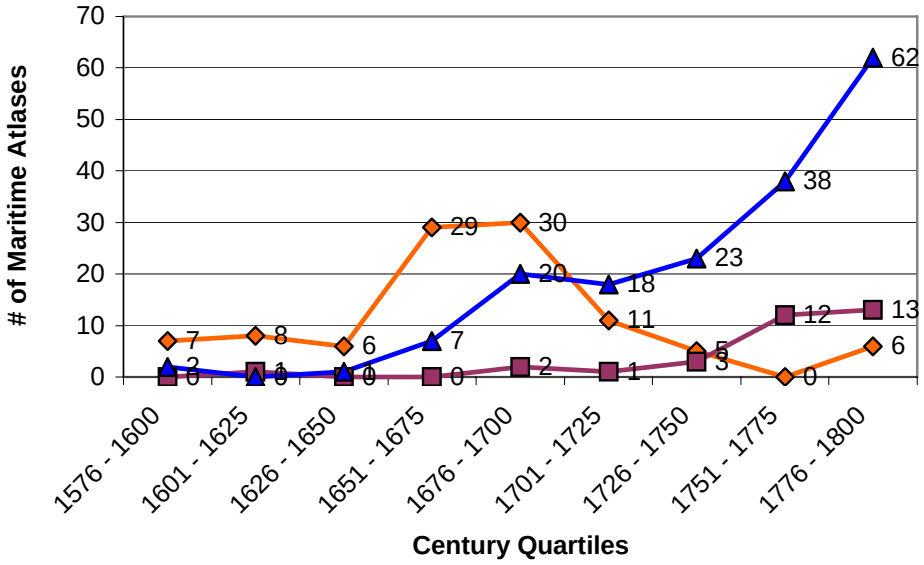
APPENDIX C

Appendix C-1
British Library Maritime Atlases by Country of Origin
(collated from Shirley 2004 Vol 2)

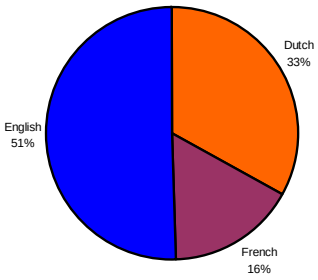
	Dutch	French	English	TOTALS
1576 - 1600	7	0	2	9
1601 - 1625	8	1	0	10
1626 - 1650	6	0	1	9
1651 - 1675	29	0	7	38
1676 - 1700	30	2	20	54
1701 - 1725	11	1	18	30
1726 - 1750	5	3	23	32
1751 - 1775	0	12	38	51
1776 - 1800	6	13	62	92
	102	32	171	325

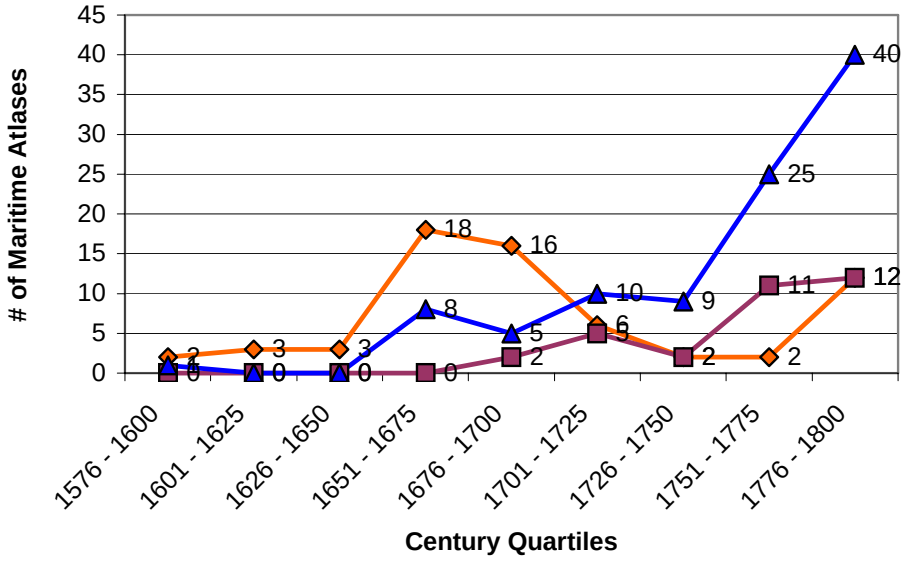




Appendix C-2
Library of Congress Maritime Atlases by Country of Origin
(adapted from Akerman 1991: 310: Figure 4.3.e)

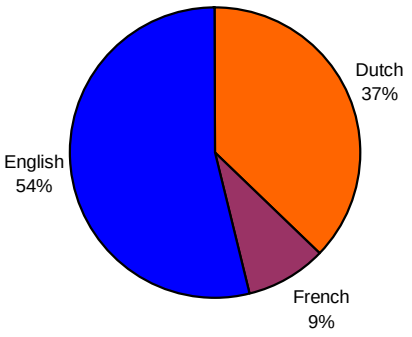
	Dutch	French	English	TOTALS
1576 - 1600	2	0	1	3
1601 - 1625	3	0	0	3
1626 - 1650	3	0	0	3
1651 - 1675	18	0	8	26
1676 - 1700	16	2	5	23
1701 - 1725	6	5	10	21
1726 - 1750	2	2	9	13
1751 - 1775	2	11	25	38
1776 - 1800	12	12	40	64
	64	32	98	194

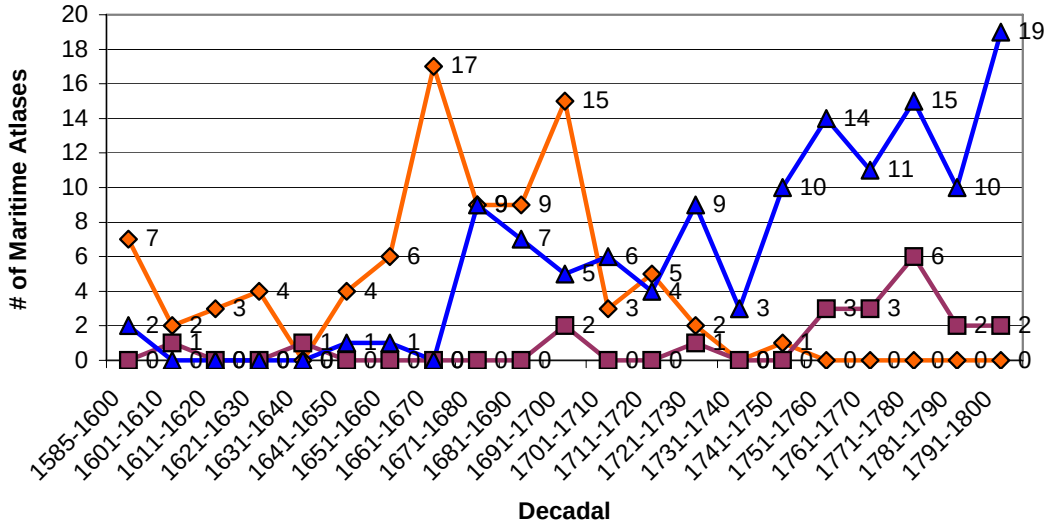




Appendix C-3
British Library Maritime Atlases of Atlantic Periphery by Country of Origin
(collated from Shirley 2004 Vol 2)

	Dutch	French	English	TOTALS
1585-1600	7	0	2	9
1601-1610	2	1	0	3
1611-1620	3	0	0	3
1621-1630	4	0	0	4
1631-1640	0	1	0	1
1641-1650	4	0	1	5
1651-1660	6	0	1	7
1661-1670	17	0	0	17
1671-1680	9	0	9	18
1681-1690	9	0	7	16
1691-1700	15	2	5	22
1701-1710	3	0	6	9
1711-1720	5	0	4	9
1721-1730	2	1	9	12
1731-1740	0	0	3	3
1741-1750	1	0	10	11
1751-1760	0	3	14	17
1761-1770	0	3	11	14
1771-1780	0	6	15	21
1781-1790	0	2	10	12
1791-1800	0	2	19	21
	87	21	126	234





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