Renaissance Introduction

Setting the Stage: European maps in the late Middle Ages and the Renaissance were always reflections of contemporary thought about science, philosophy and theology. As Surekha Davies concludes, from the era of the *mappaemundi* to the mid-17th century, world maps were picture-texts upon which the important, little-known and surprising aspects of history and geography, abstracted from a plurality of sources, were gathered together for easy reference. As Fra Mauro *(#249)* noted more than once, there was no room on a map of the world to record everything. The map was intentionally a selective rather than representative summary intended to help viewers distinguish one region from another, and to set historical events in a geographical context. What these maps do tell us is how this significance was conceptualized—what seemed historically important or surprising to their makers. Whether the interest in incorporating in maps greater and more accurate detail was a product of a rise in neo-Platonism or of the resurgent nominalism of the *via moderna* associated with the English Franciscan William of Occam, the fact remained that even before the great geographical discoveries changes were underway in cartography. Those changes were only accelerated by the spread of Renaissance thought and aesthetics from Italy and by the long-term economic growth that started in the first half of the 15th century. Most important to the dissemination of knowledge, including maps, was the development of mechanized printing and movable type.

The first printing mass printing in Europe, five hundred years ago, in 1472, of a simple, allegorical map was an important event in the history of communication *(see #205)*. It ranks a close second to that of printing from movable type, a development that occurred only some twenty years earlier. To appreciate properly this momentous event, we must remember that in all preceding time maps had existed only in manuscript (i.e. hand-drawn) form, often created by copyist monks in monasteries. That basic fact allows two important assertions: first, there could be only a few maps and, second, one could never be sure whether the content of a map was the work of the original maker or merely reflected the independence, or carelessness, of a copyist. Obviously, both inhibited scholarship.

With the advent of printed maps, it immediately opened the way for countless numbers of exact duplicates that, for the first time, allowed explorers and scholars easily to compare many geographical portrayals, consider their characteristics, and plan ways to produce even better images of the emerging world. No doubt it also had a very considerable psychological impact on mapmakers, since the realization that their work could be widely subject to critical review probably served as an incentive to some and an inhibition to others. To the age-old art and science of mapmaking a tremendously significant new element had been added – the printer.

The production of the printed map requires the cooperation of two contributors who differ in essential ways. As the famous map historian R. A. Skelton has pointed out, both the printer and the cartographer became professionals rather suddenly in the late 15th century, and because it has always been quite uncommon for one person to combine both activities, these two

graphic artists have had to function together most of the time. Although they have worked side by side for five hundred years, their association has changed considerably along the way.

Writers of intellectual history emphasize quite properly the importance of the invention of printing and the flood of information it let loose on the world, but usually they refer only to the printed word obtained from movable type. A map employs lines, shading and tones, patterns, some words, and all sorts of other kinds of complicated and generally unfamiliar markings. A map is an infinitely more complex thing from a perceptual point of view, and its combination of markings is not at all transparent or inherent. Consequently, while the viewer is absorbing the information contained in the display, he is also reacting in important ways, both consciously and unconsciously, to the graphic characteristics of the map.

Because of the conceptual complexity of a map, the mapmaker must not only position his symbols with care in order to make his map accurate, but he must also pay close attention to its total graphic design. Both the symbology and the entire display need to be planned carefully in order to evoke the right total image as well as to arrange the graphic priorities in proper order. Furthermore, the cartographer has the added responsibility to make the whole thing attractive enough not to repel the potential user, for maps tend to confuse many people. It is because of these fundamental factors that the working relationship between the printer and the mapmaker assumes a critical importance, for during most of the last five hundred years the printer often has had as much or more to say about these graphic matters as has the cartographer.

One introductory point is that I need to clarify what I mean by the terms "cartographer" and "printer" as they will be used here; neither is easy to define precisely. By the term "cartographer"-or "mapmaker' – I refer collectively to the person, the institution, or simply the operations involved in designing and compiling the map, in deciding the area to be covered, what names to be incorporated, the geographical data to be shown, the kinds of symbols and legend to be employed, and so on. By the term "printer" I refer collectively to the individual, the agency, or simply the activities primarily concerned with duplicating the map, in the preparation of the printing surface, the operation of the press, the making of corrections, and so on. Sometimes these activities become confused in practice, but the general distinction is sound.

As David Woodward in his *Five Centuries of Map Printing* states, the author of a manuscript (hand-drawn) map naturally labors under some graphic constraints. It is true today and it was true a thousand years ago. These constraints include his own understanding of the intricacies of graphic perception, his manual ability, and, of course, the limitations of the media with which he works whether they be vellum or paper and the reed, steel pen, or brush. Within limits he can attack the constraints by learning more about perception, by practicing, or changing his medium. Other than the sizes of skins, paper, or walls upon which to draw, he really does not have much in the way of restraints imposed upon him. Cartographically speaking, for better or worse, the manuscript mapmaker is his own master.

When the printing of maps became possible, a new element was introduced that caused a great change in this very intimate connection between the cartographer and his map. The opportunity of obtaining and distributing numerous copies exactly alike obviously made it desirable for many maps to be duplicated. However, to take advantage of this development, the

cartographer had to submit to the controls imposed by these printing processes. These constraints constituted a kind of toll or tax levied for the privilege of duplication, and they were exacted in units of versatility. These restrictions varied, depending upon the process, but they were in all cases significant. Some were constraints of a general nature such as the practicality of employing color or the much more serious problem of how to accomplish the necessary lettering on the maps. Some were more specific such as those having to do with the size and character of lines and individual symbols or the problem of how to produce the tones and patterns so necessary to the development of area symbolism, the desirable figure-ground differentiation, and the creation of the impression of a third dimension. Five hundred years ago these constraints suddenly became matters of vital importance to the cartographer. And they have been of constant concern ever since.

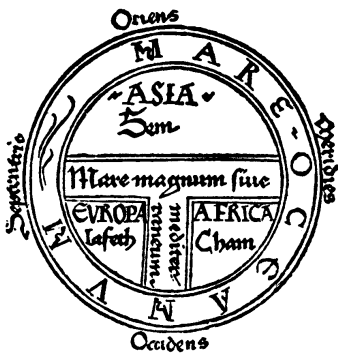
Woodcut Maps or "wood-engraving": The woodcut technique represents the simplest and most direct concept of printing: the transfer of ink from a raised surface to paper using direct vertical pressure. It is convenient to use the term "woodcut" as a generic term to include a whole class of relief prints, i.e., woodcut, wood-engraving, and metalcut, disregarding the material used for the printing surface. But when referring to specific maps, it is necessary to draw a distinction between "woodcut" and "wood-engraving."

The finished print from a woodcut is conceived as black lines on a white ground. To achieve this, the linear design on the woodblock is left in relief, with the nonprinting areas carved away with an assortment of knives and chisels. The wood used for such a printing block, preferably medium-grained but easily worked (such as apple or cherry), is commonly cut from the tree as a plank, parallel to the grain of the tree. Blocks for woodcuts are thus occasionally described as being cut "on the plank." It is important to realize that the technique is more akin to carving than engraving.

In contrast, a "wood-engraving" is conceived as white lines on a black ground. Instead of carving the wood with a flat-bladed knife or a chisel, it is engraved by pushing a burin or graver along the surface of the block. The polished cross sections or end-grain of a close-grained wood such as boxwood are particularly suitable for this type of work. Since the blocks are printed as woodcuts, the engraved lines print white and the untouched portions black. Except for small maps in books, very few maps can be described as wood-engravings in the strictest sense,

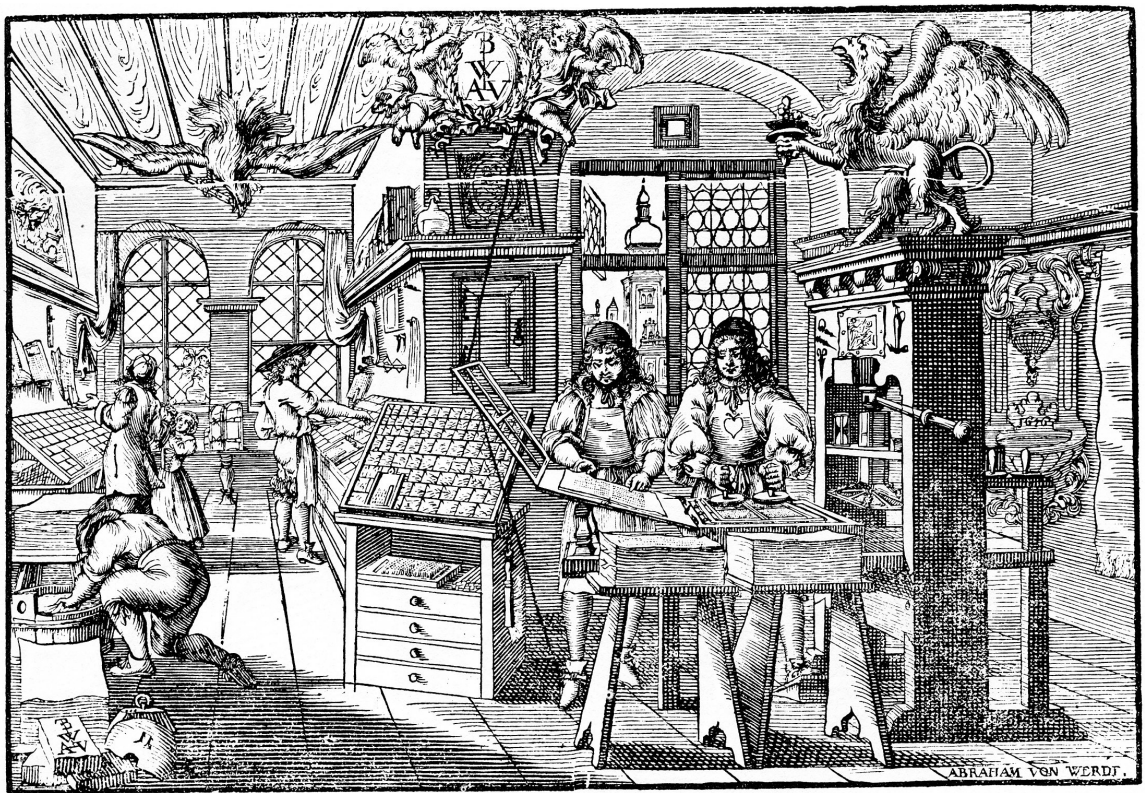
A historical sketch. While the cutting of pictures or text on wood for the purpose of block printing dates back to the eighth century CE in the Asia, it was apparently not until about 1400 that the art reached the Western world. The earliest dated European woodcuts that have yet come to light are the Brussels Madonna of 1418 (Schreiber 1108) and the Buxheim Saint Christopher (Schreiber 1349). It has been estimated that about one-third of all 15th century printed books were illustrated, and the majority of these illustrations were woodcuts.

The first known printed map in the Western world appeared in a 1472 printed edition of the dictionary of Saint Isidore of Seville. It was a simple woodcut T-in-O map of the world in the form that had been in use since Roman times *(#205, see below)* and thus achieves prominence less from its content than as its status as a "famous first." The maps in the *Rudimentum nouitiorum*



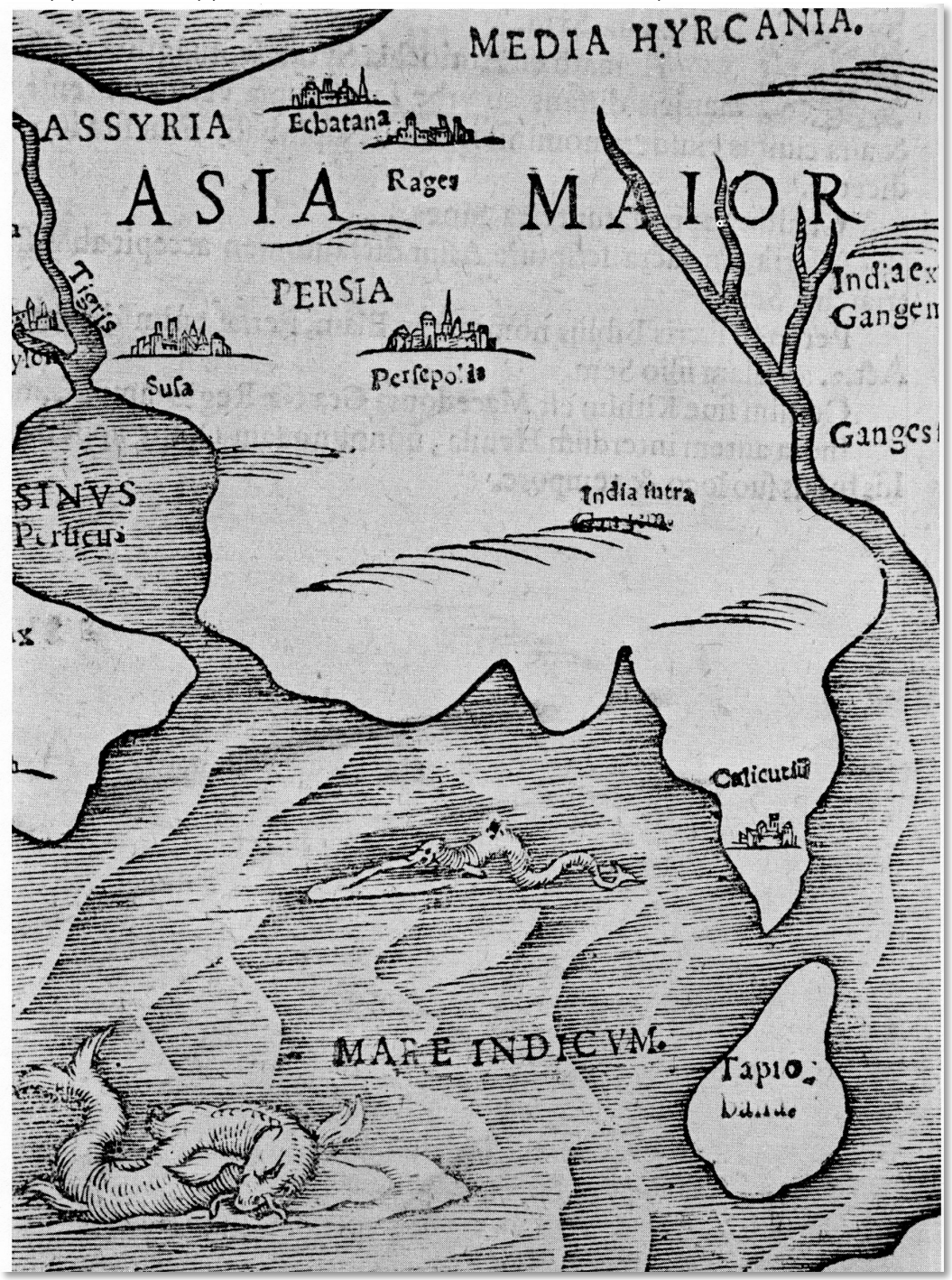
(#253) are the earliest printed maps not derived from a classical source and exhibit many cartographic and historical facets worthy of study.

The use of the woodcut technique for maps flourished from the 1470s until the middle of the 16th century. While many examples of woodcut maps emanate from regions other than central Europe during this period (for example, Paris and Venice), the main scenario of woodcut map reproduction was centered north of the Alps, in the Rhine Valley, Bavaria, and Swabia. Here there was already a strong tradition of wood-carving and a correspondingly good supply of craftsmen. The momentum of such a tradition helped to carry it through the first half of the 16th century. Further, most maps of the incunable period were intended to be printed in books, and the woodblock was well suited to this use, as it could be placed in the form with the type and both could be printed at once. The woodcut could be printed on a simple screw press as used by Gutenberg, which was in common use by printers of the period and would have been readily available for the printing of maps. The rolling press, needed for printing from copperplates, was not generally available north of the Alps until later in the 16th century.



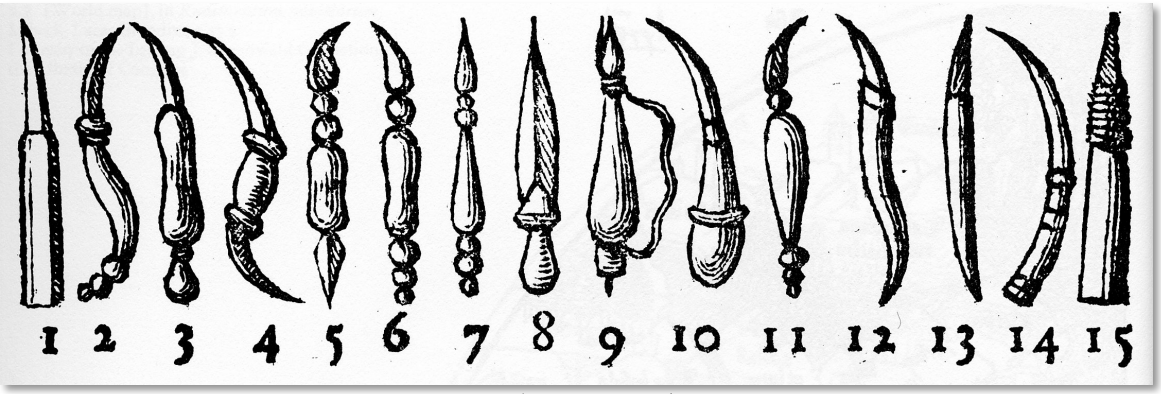
The rise of the Italian and, later, the Flemish map publishing centers in the mid-16th century effectively superseded the woodcut. Based on the *intaglio* technique of copper engraving, the new breeds of cartographers found a versatility and fineness of line in this method of engraving with which the woodcut could not compete. As the style of woodcut in general

gradually deteriorated toward the end of the 16th century, woodcut maps became increasingly sparse. Copper engraving, of course, had been used for maps as early as 1477 for the *Bologna Ptolemy,* and the quality of the engraving of the 1478 Ptolemy illustrates a very early expertise in the technique. The woodcut and the copperplate thus existed side-by-side for the first century of map printing. Copper engraving was favored south of the Alps; woodcut to the north.



An example of a woodcut map in
Itinera Filiorum Isreal ex Aegypto by Heinrich Bünting 16th century

Part of the original wood block used to print A New Map of England and Wales with ye Roads & Distances of ye Principal Towns in Measur'd Miles from London [ca. r800?] Note that the words are engraved in a "mirror image" (i,e, backwards)



Wood-cutting tools

Copperplate Printing. The process of metal engraving was known and practiced in antiquity by goldsmiths in decorating the objects they produced. In order to preserve a copy of a design engraved on an object, the incised lines were filled with lampblack and the design then transferred to paper. In due course, this simple expedient was adapted to printing graphic material on paper; the earliest known dated print is one of a series in the *Passion of Christ* printed in 1446 in Berlin. The application of this process to the production of maps occurred first in 1477 when the twenty-six maps in the Bologna edition of Ptolemy were printed from engraved copper-plates. This single event led to the inauguration a new era with far-reaching consequences in the development and diffusion of geographical knowledge.

As mentioned earlier, before the introduction of printing, maps were limited to hand-drawn copies, which severely restricted the diffusion of information. Such manuscript maps allowed the cartographer great flexibility in presenting geographical data, but they were subject to error in reproduction. Woodblock printing tended to reduce errors of reproduction and increased the spread of information, but the nature of the material imposed severe restrictions on the amount and kind of data that the cartographer could present.

Copperplate printing reduced the limitations imposed by manuscript copies or woodblock printing and enhanced the utility of the map for the graphic presentation of geographical information. Among other things, as listed by Coolie Verner (in "Copperplate printing" in Chapter 3 *of Five Centuries of Map Printing*):

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1. Maps printed from metal plates could be larger than those from woodblocks. This provided space for the cartographer to include more detailed geographical data.
2. The flexibility and fineness of an incised line encouraged greater precision in the representation of details so that maps became more precise.
3. The relative ease with which metal plates could be altered accelerated the introduction of new or amended data by eliminating the need to prepare a completely new map.
4. Metal plates had a longer useful printing life, which resulted in the reduced cost of a single copy; maps became more nearly within the reach of everyman.
5. Because the act of preparing and printing maps from metal plates required specialization, the production and use of maps was divorced from letterpress, consequently their appeal was not limited only to that segment of the population that was literate. As a result, geographical knowledge was more widely diffused among all segments of the population. Along with specialization came the establishment of efficient procedures for the preparation and printing of metal plates.

Printing from metal plates is an *intaglio* process in contrast to the relief process of woodblocks. *Intaglio* printing from metal plates was accomplished through line engraving, dry-point, etching, mezzotint, or similar methods of incising lines in a plate. The plate used for printing could be any relatively soft metal including gold, silver, iron, zinc, or pewter. For the production of maps, copper has been the preferred metal and line engraving the most useful *intaglio* method The selection and preparation of a copperplate was a complex and laborious procedure. At first, map plates were small, but the advantage of size quickly became obvious so that plates got larger and larger.

After the plate had been prepared it was heated and rubbed with a white "virgin-wax" that was spread evenly over the plate by stroking it with a feather. When this had hardened the plate was ready to receive the design.

The material to be engraved on the plate had to be drawn on the white wax in reverse. This was done in several ways. One approach was that the drawing was to be laid face down on the plate and the back rubbed with a burnisher or traced with a pencil that transferred the design to the wax coating.

An alternate method of transfer involved preparing transparent paper by coating fine paper with Venetian varnish and tracing the map. A form of carbon paper was then used to transfer the design to the plate. If the original drawing was expendable it could be varnished directly so that the drawing would show through and could be traced from the back.

When the transfer to the plate was completed, the paper was carefully removed in order to preserve the original drawing that was often the only copy available and would be needed by the engraver to refer to as he worked.

With the design transferred to the wax surface of the plate, the next step was that of incising the lines to be printed. This could be done either by etching or by engraving. In etching, a needle is used to scratch through a wax coating and acid is applied that eats away the metal to produce the lines to be printed. This process was not satisfactory for maps since an etched plate

could not produce as many impressions as an engraved plate and the workman had less precise control over the lines to be printed. For the most part, etching was reserved for decorative features. Some mapmakers used etching for marginal decorations. At other times it was used for the decorative cartouche.

Line engraving produced the most satisfactory print. This was accomplished by running the point of a *graver* along the line to be printed to remove some of the metal and create a recess in the plate to hold the ink for printing. A skilled engraver could exercise a masterly control over his tool to produce a variety of effects. As Woodward notes:

There was considerable versatility in the thickness of line controlled by the engraver. The burin could be leaned slightly to one side to produce a thicker line, and such a leaning was natural in the engraving of curves, a slight thickening of line is often observable on curved engraved lines.

It is both in the thickening of lines at curves, and in the pointed character of the ends of lines that the copper line engraving can be distinguished from the etching, which has lines of relatively regular thickness and ends which are rounded.

In cutting the plate it was usual to follow a traditional sequence in the order in which certain elements in the design were cut. The outline is first engraved, and then the writing, and afterwards the ornament consisting of rocks, woods, water, contours, &c. each class of work being usually done by a different person.

In larger shops where several engravers were employed the different elements of the design were executed by different individuals who specialized in a certain aspect of the map (lettering, water, contours, flora, fauna, cartouches, hills/mountains, etc.. This may, in part, account for the many maps that do not include an engraver's signature. These shops engaged a number of different engravers, with some of the plates bearing one name for the geographical material and another for the decorative cartouche.

The basic tool of the engraver is the *burin* or *graver*. This consists of a steel shank shaped and sharpened on one end with the other capped by a round woodblock. This block was shaped to fit snugly into the palm of the hand and the fingers stretched along the shank to control the cutting point. The tools in use today are not noticeably different from those in use in earlier periods.

Some workmen designed and made gravers to their own specifications and, in time, a variety of specialized tools were created to produce special effects. Among such were the *tint tool*, the *scattper*, and the *threading tool*. These produced tone through shading and stippling. Occasionally, a stippling effect was achieved with the roulette, a small wheel with spikes on its circumference, which was rolled back and forth over the copperplate.

Since there were conventional symbols to designate such things as towns or villages, some of these were made in the form of punches to produce symbols repeated frequently. The lettering on maps was usually cut by the graver, because of the variations in size and the space available.

The amount of time required to cut a plate depended upon the size and complexity of the map and the efficiency of the publishing establishment. In Augsburg, it took Kauffer three years to engrave the twenty-five plates for Muller's Bohemia published in 1722. Samuel Hill of Boston

completed the *Plan of the City of Washington* in something under two months. There were two virtually identical plates engraved, normally identified as the Philadelphia and Boston plates. Although the engravers of the Philadelphia plate said that they could engrave the plate in eight weeks, they actually took nine months, but this delay was due more to intransigence than anything else. Gregory King took three months in 1679 to engrave a two-sheet reduction of John Adams's large map of England and Wales (*Angliae totius tabulae ... 1677*). The total size of the engraved surface of this map was 68.8 x 97.5 cm (27Ys x 38~ in).

In the Preface to *Johnston's National Atlas*, published in 1844 and containing forty-six folio maps, is the note:

> The intimate acquaintance of the Editor with the best methods of engraving, has secured for his drawings more than usuall exactness in their transfer to the plates, which have been entirely engraved within the last five years,-a much shorter period of time, it is believed, than has sufficed for the production of any Geographical work of equal extent ... [and] ... the employment of a succession of workmen almost day and night ...

The cost of producing an engraved plate was considerable, and it varied with both the size of the plate and the complexity of the map. Gregory King charged John Adams £26.8s to engrave two plates." Petty's Ireland cost £1,000 to be engraved in 1675 in Amsterdam." In 1742, Emanuel Bowen indicated that a plate 69 x 56 an (27 x 22 in) would cost £10.10S for " ... close work, such as the map of England ... " and £3.10S for " ... open work such as sea charts of ye coast.

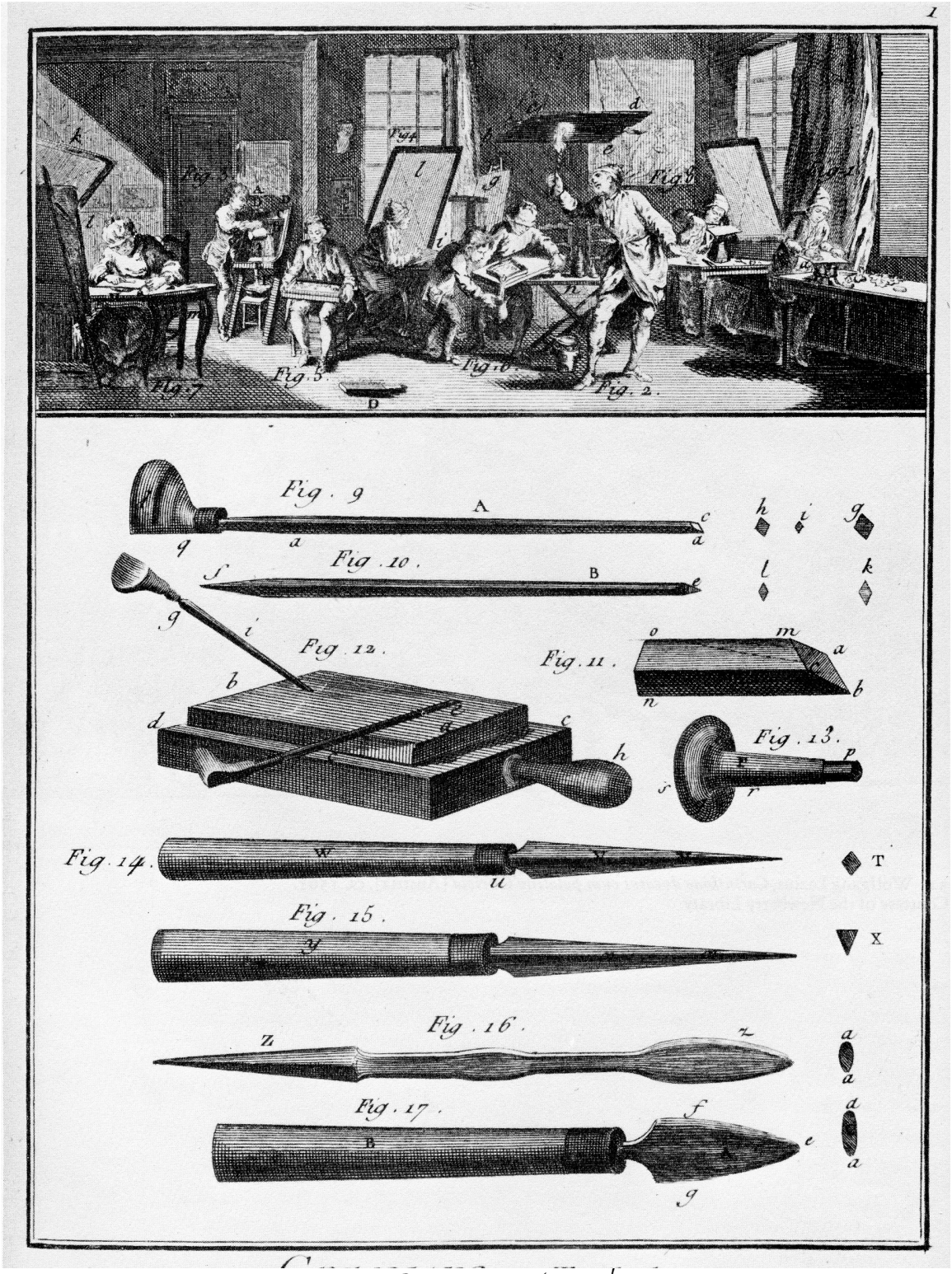
The price charged varied with the workman. William Faden quoted a price of 50 guineas (£52.1?S) for Thomas Jefferson's plate (60.2 cm [24~ in] square), but Samuel Neele actually cut it for £28.16s'9d. In Philadelphia, in 1792, James Thackara and John Vallance charged $420 for a map of Washington, while Samuel Hill, in Boston, charged only $150 for an identical map only slightly smaller."

In discussing the production of his great four-sheet map of Scotland, Aaron Arrowsmith noted: " ... before I was in possession of the first impression (Five Hundred Copies) I had expended in Copper, Engraving, Paper, Printing and Colouring, £2,050, including about £100 lost by a cancelled plate ... "

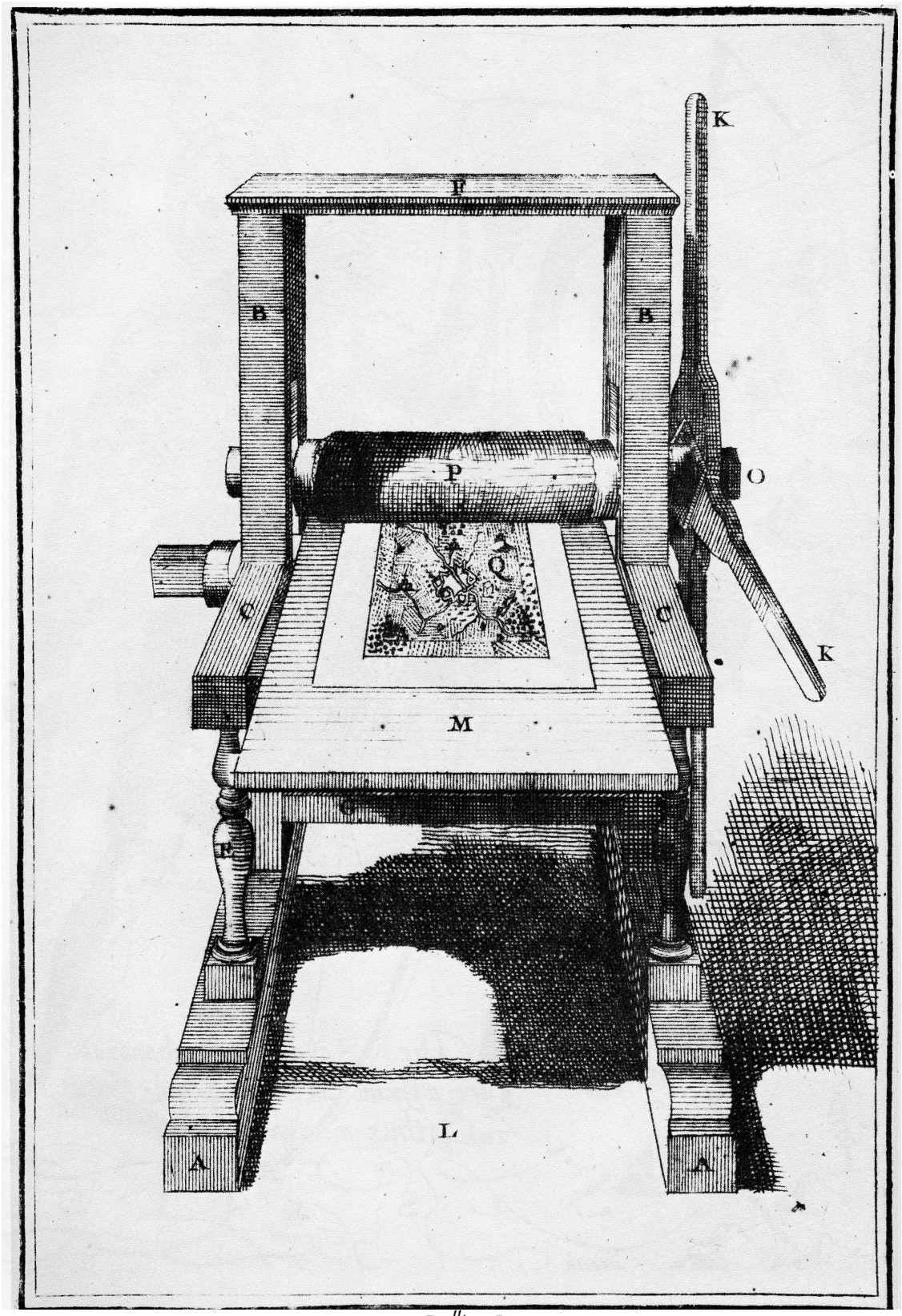
His nephew John estimated that a plate prepared for the Royal Geographical Society for use in the Journal would cost about £5.15S for "drawing, cop, & engraving. The thirteen maps by John Arrowsmith in volume 8 of the Journal cost £197. 3· o. at an average cost of some £15. 3S.2S

The introduction of printing from incised metal plates produced a major alteration in the printing trade. When maps were printed from woodblocks the block was locked into the form with the standing type so that both text and illustrations were printed in a single operation at the press. Metal plates, on the other hand, required a different kind of press and a different procedure to produce the printed map. Although the similarities were numerous, the differences were sufficient to lead to the development of specialization in the production of prints from metal. Letterpress was printed on a flatbed press with static perpendicular pressure applied to a sheet of paper laid over the form of type. Metal plates, on the other hand, were printed on a roller press in which dynamic pressure was applied to the plate and paper progressively so that the ink was squeezed from the incised lines on the plate and transferred to the paper. The preparation

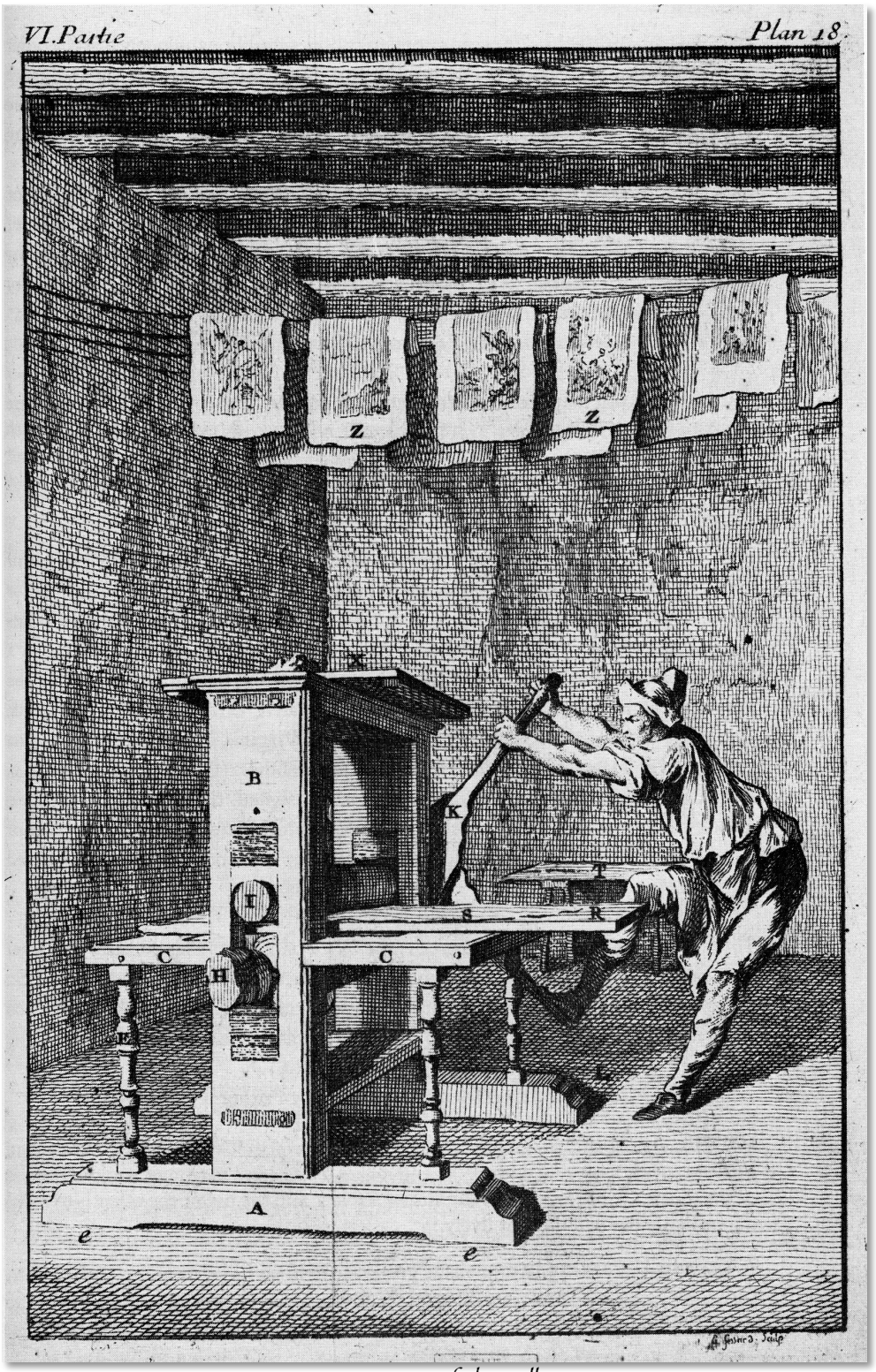
of ink for printing involved grinding the pigment and its suspension in an oil base of suitable consistency. The best pigment was German Black produced in Frankfurt, Germany.



Copper engraving tools



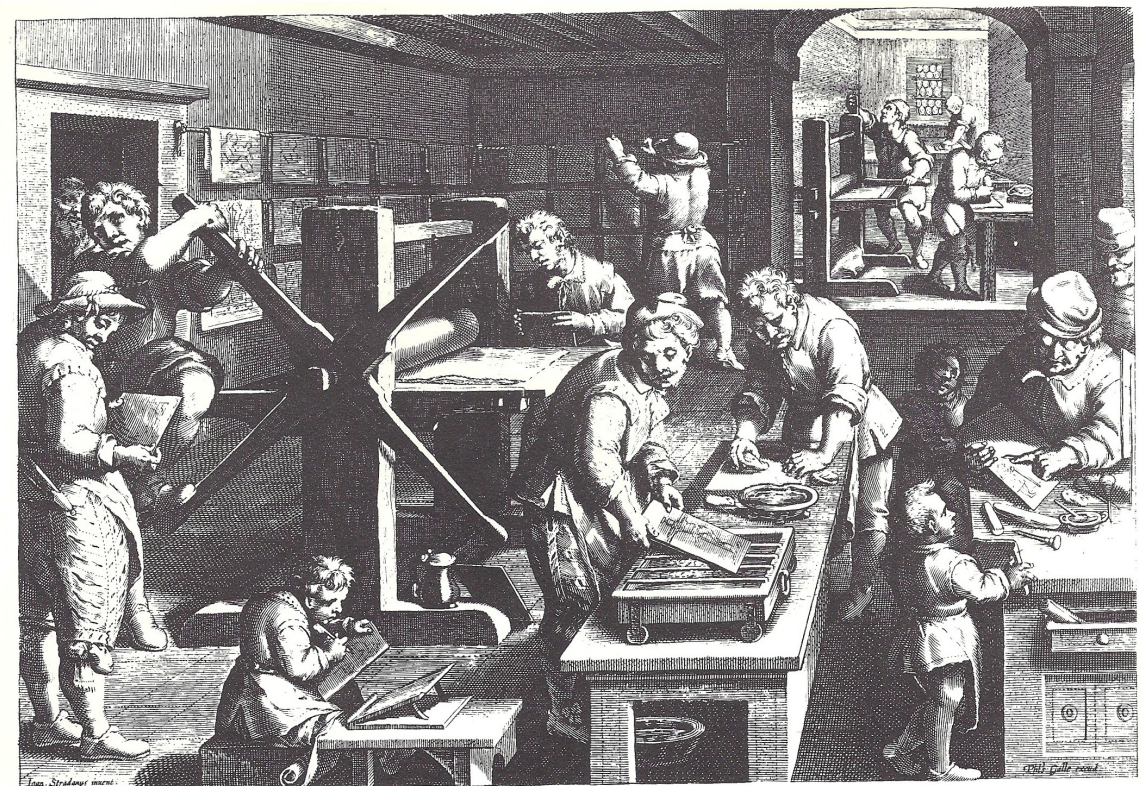
Rolling Press



Operation of the rolling press

The prepared pigment was combined with some weak oil very slowly and ground as dry as possible. This was then mixed with some strong oil and ground again until it was " ... extreme roping and clammy, like a very thick Syrup." Newly engraved plates with deep incisions required a thicker ink made of more of the strong oil but worn plates or those not cut deeply required less of the strong oil.

The paper to be used in printing needed to be dampened to insure that it would melt into the incised lines to absorb the ink from the plate. Each sheet of paper was passed through clean water two or three times depending on the thickness of the paper. It was then laid on a smooth board. When all of the required sheets had been dampened and stacked together a second smooth board was placed atop the pile and heavily weighted with stones. This ensured an even dampening of all the sheets and forced out any excess water. By the next morning the paper was ready for use. Some kinds of paper would shrink more than others so that different impressions from a single plate may be found to vary slightly in size. Although this variation may not be pronounced, it could be sufficient to mislead the unwary into assuming that different plates of an identical map were used.



In preparation for inking, an inking ball is made of good soft and fine linen half worn out and rolled into a close hard ball about five inches in diameter and three inches thick, and the engraved plate is heated "pretty warm." The ball is dipped in the ink and by" ... sliding, pressing, dappling in sundry ways ... over all the engraved surface of the plate, you make the black enter and pierce into all the incised lines. When this is completed the surface of the plate is carefully wiped clean

with a soft rag. A further cleaning is achieved by rubbing the plate with a clean rag on the ball of the hand until the plate is polished except for the ink trapped in the incised lines.

A charcoal brazier was used to heat the plate while it was being inked. This is a part of the process that renders the business extremely injurious to the health of the workmen, in consequence of the noxious vapor arising from the charcoal.

After inking and cleaning the plate is again heated until it is warm:

> The plate, thus prepared, is next laid on the plank of the press, and upon it is placed the paper, well moistened after the manner described .... Two or three folds of flannel are then brought over the plate, and things thus disposed, the press is set in motion by pulling the arms of the cross, by which means the plank bearing the plate and paper is carried through between the rollers, which, pinching very forcibly and equally, press the moistened and yielding paper into the strokes of the engraver, whence it draws out a sufficient portion of the ink to display every line of the intended print.

The passage of the plate between the rollers must be made gently and roundly, and not by jolts and joggs, that the print clean without blurs, spots, or wrinkles. When the plate has passed through the rollers, the paper is removed and hung to dry and the plate is inked again for the next print.

A large shop would have crews working at each side of the press inking plates and two plates were usually worked at the press simultaneously. A normal press run consisted of one hundred impressions in a day. In 1742, Emanuel Bowen noted that one hundred was a day's work at a cost of six shillings. In 1792, in Philadelphia, Mr. Scott indicated that the same number of impressions in a day cost $3.33 while John Arrowsmith in 1847 noted his cost at six shillings for a hundred in a day.

The printed paper is hung to dry with weights attached at the bottom to prevent the paper from wrinkling as it dries. After the day's run is finished the prints are stacked with interleaves to protect the printed surface, which dries more slowly than the paper, and the stack is weighted with rocks. The plate is cleaned carefully with olive oil to remove the ink from the incised lines and then wrapped in clean paper for storage,

The addition of color to a printed map was always considered an asset as much for its decorative quality as for its utility in transmitting information. Color was generally added to an impression by hand. The art of coloring maps developed as a subspecialty in the trade either within a map publishing house or independently. The application of color to an impression by hand was a fairly common practice, and certain conventions were established with respect to the use of color. The best known work on the art of coloring maps is contained in a book by John Smith published in 1769 that not only describes the conventional code but also provides instructions for mixing and applying color to printed maps. As the geographical content of maps became more precise, the use of color became increasingly more restricted.

Over time the process of printing maps involved the combined efforts of a group of specialized artisans that included dedicated experts in lettering, line engraving, production of ink and paper, map colorizing, copper preparation, printing press design, cartography, etc. The desirability of copperplate engraving for printing maps resulted in the development of a new industry that had these highly specialized roles for its members. As shown above, the production

of a map printed from an engraved metal plate involved a number of different tasks. An individual entrepreneur could and did perform every task required to produce a map, but specialization of roles occurred so that a number of constituent specialties developed that often became independent establishments.

There were several distinct patterns for the publication of maps that can be catalogued in terms of the primary role in the trade.

Cartography. Every map begins with the cartographer who can present geographical information in visual form. The cartographer usually prepared the original draft, which was then copied for the printer by draftsmen. Some cartographers are known only by the manuscript maps and charts that they made, and many of these never appeared in printed form. It is only recently that research has begun to clarify the role of the cartographer in publishing maps.

Some noted cartographers were also engravers and published their own charts. This pattern may be considered to be the origin of the map and chart trade and is found to persist in every century. Men like Gerhard Mercator, John Thornton, Herman Moll, and John Arrowsmith were equally skilled as cartographers and engravers, so that they could publish their own work.

In many cases, shops established by cartographers were self-sufficient with respect to the production of maps. In spite of having their own craftsmen at hand, some cartographers found it necessary to engage independent engravers to cut plates. It was not often that the cartographer could also handle letterpress printing. Where this was essential it was usually done by an

established printer. Eventually, some firms started by cartographers grew to where they could handle all aspects of printing and publishing as is characteristic of modern firms.

Engraving. Although some firms had their own engravers, there were also many engravers who maintained independent establishments and worked for mapmakers as well as others. It was not unusual for an engraver to begin working in a cartographer's shop and then move out on his own. In some cases they became important publishers of cartographic material.

Printing. Although the map printing trade began with cartographers who were also engravers and publishers and this pattern persisted through the centuries, there were some publishers with no skills in the production of printed maps. These firms usually started with letterpress printing and moved into maps and charts in order to consolidate both letterpress text and map printing for geography books, atlases, sailing directions, or marine atlases. In general, these firms depended upon independent cartographers for the drafts of the maps they published but maintained their own staff of engravers and printers. They maintained a complete establishment capable of producing everything from letterpress to engraved plates including the final binding of the finished product.

Practices. The engraved copperplate had a flexibility that led the map trade into many curious business and technical practices that are not yet identified or clearly understood. One major concern of the publisher was that of prolonging the useful life of the plate. The useful life of a copperplate cannot be asserted with conviction since there is virtually no reliable data to indicate the number of impressions that could be pulled from a given plate. According to the map historian R.A, Skelton: "It is estimated that 2,000 to 3,000 impressions might be taken from a plate or block without serious wear; yet by careful husbandry and (if necessary) by retouching of the incised lines the life of a copper plate could be and often was, prolonged to a phenomenal span." On the other hand, Vittorio da Zonca'" noted in 1607 that a copperplate would provide one thousand impressions when carefully used,

There are many maps known to have been printed at intervals over a phenomenal span of time. Some John Speed maps were printed from the same plates from 1611 to 1770, yet this is not necessarily reliable evidence since the number of impressions pulled from the plates is not known. A plate lightly used could well provide usable impressions for well over a century while one used extensively might last but a short time.

The procedures followed in preparing the plate originally and in the printing would materially influence plate life so that only the very best plates correctly handled could be expected to have a lengthy usable life. An uneven surface resulting from inadequate polishing would limit the number of successful impressions from a plate. Too many corrections or alterations would weaken the copper so that it could not survive extensive use.

Perhaps the most important matter was that of presswork. Improper pressure on the rollers, an uneven pull, or inadequate padding over the plate would result in plate damage. When plate wear reached the stage where legible impressions were no longer printed, it was possible to prolong plate life somewhat by recutting the incised lines. These and other curious practices not specified do indeed make the early printed map a bibliographical monstrosity and emphasizes the

growing recognition of the importance of the study of form as well as content in the history of cartography.

Besides the greater distribution of maps as the result of the printing press, the use of maps increased for various additional reasons, some demographic, some economic, some political, availability/affordability, but whatever the source the process continued through the 16th century. In 1400 few Europeans used maps but by 1600 they were essential in many professions. Whereas maps were rare in 1500 they were familiar objects of everyday life by 1600. Their numbers grew exponentially." The reasons for the transformation include the Renaissance interest in Antiquity and so in classical mapping; the growing interest in quantification and measurement; rising literacy so maps could be and were used, for example, in court cases to do with land ownership; after 1517 the Protestant Reformation which gave an impetus to the mapping of Biblical events; the ability to reproduce consistent copies with the potential for widespread distribution through print and the expanding role of the state which found, starting with Italian city-states in the 15th century, more uses for maps in military enterprises and for administration. The voyages of discovery and the need to represent additions to geographical knowledge along with the need for states to assert their status relative to other states in the new found lands promoted the production, use, and preservation of maps. The new uses of maps meant changes in their character, in some cases in unexpected ways. It is the changes that were beyond or different from the scientific aspects, beyond the drive for accuracy and consistency, which have recently and correctly become principal topics for historians.

When viewed with the advantages of hindsight, it seems evident that the expansion of Europe in the 15th century marked the beginning of an entirely new phase in the relations of Europe with the outer world. The upcoming discovery, exploration, conquest, and settlement of North and South America were in themselves dramatically different from anything that had gone before. The earlier discoveries made in North America by the Vikings, and possibly others, had only, so far as is now known, touched the fringes of the continent; their achievements were almost certainly unknown to the 15th century navigators of the Atlantic, and even if they had been, would not have prepared anyone for the immense and complex reality of the Americas, or for the equally profound intellectual adjustment to the idea of a new world. The 16th and 17th century phases of European expansion would involve large-scale conquests of territory in the Americas, and also see the beginning of large-scale and continuing transfers of population from Europe. Here was something substantially new.

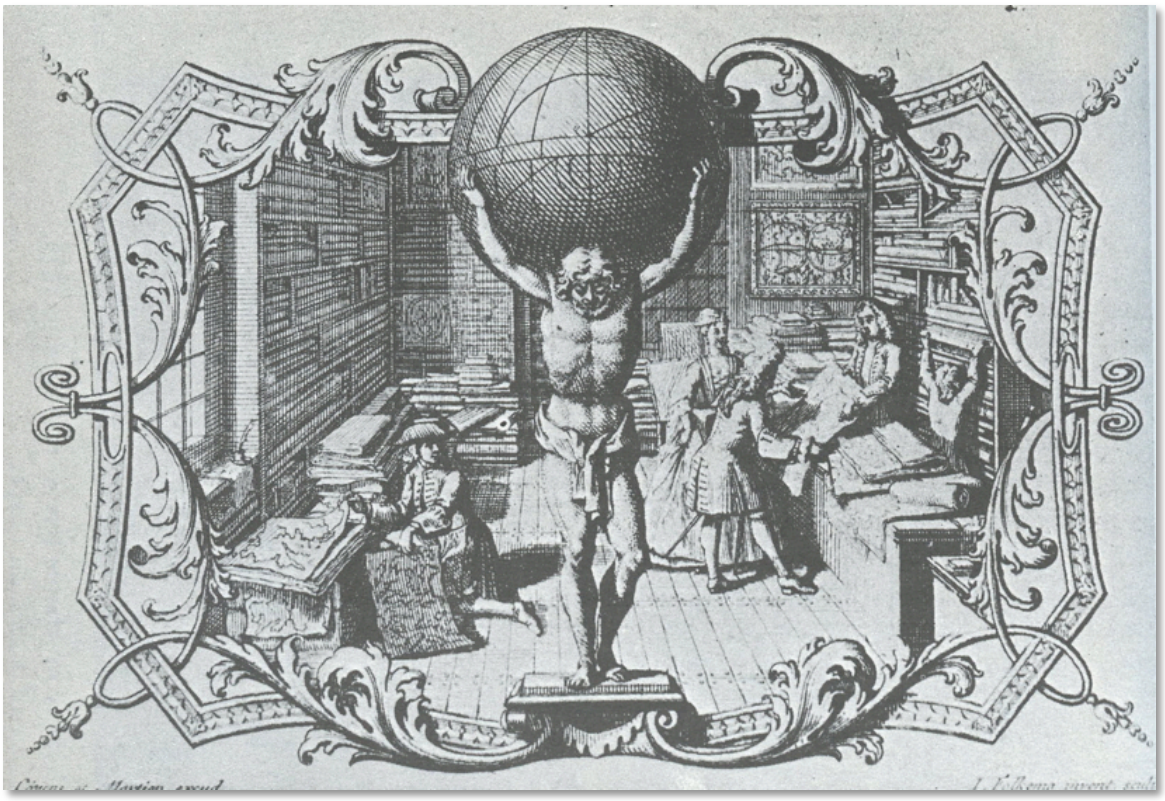
Francesca Fiorani writes in her chapter *Mapping and voyages,* that it is fundamentally human to need to know the places that we inhabit and to dominate them through mapping. In the process of mastering the geography of our world, we define our place within it and our relations to others. If the need to represent the surrounding space is universal, how to map it, what to include and what to omit, is always a selective cultural process that involves choices. Renaissance mapping is traditionally associated with the beginning of modern cartography, and its history has often been reduced to documenting the gradual conquest of mathematical accuracy in the representation of a world of expanding borders. Early European voyages beyond the Mediterranean Sea and the rediscovery of Ptolemy's *Geographia*, the foundational text for

locating places precisely on a cartographic grid, date from the late 14th century. But Ptolemy's mathematical geography, which has become the dominating concern of modern cartography, coexisted in the Renaissance with the verbose descriptions of places that other ancient authors had presented in their geographical texts and which have disappeared from modern maps. As cultural artifacts, maps participated in major cultural trends of the Renaissance period, from humanism to the exploration of trading routes and the emergence of the printing press, as well as in religious expeditions and the formation of overseas dominions. Their techniques and conventions of representation emerged in relation to the intentions of their makers and the expectations of their patrons and users. In this process of defining the practices of Renaissance mappings and the conventions of cartographic representations, humanists, nationalism, and conquests play significant roles.

European expansion in the East (Asia) during the 16th and 17th centuries did not, except for the Spanish conquest of the Philippines, lead to the acquisition of large areas of territory, but was marked by the creation of commercial empires held together by naval supremacy at sea, and by the holding of strategic points such as Goa, Malacca, and Macao. None-the-less the scale of European activities and the amount of wealth they generated were far in excess of anything achieved by European merchants in Asia in the 13th and 14th centuries.

Let me make one thing clear, regardless of the time period, each cartographer has a PURPOSE for making their map. What they choose to include or exclude, and how they present the geographical information is all based upon their PURPOSE for making the map. Such purposes could include didactic – teaching or informational; political – promote their countries geographical aspirations, territorial claims, etc.; religious, historical, administrative, speculative, etc. Therefore it is with this understanding that one should evaluate a map. Which means that design of a map was not always meant to scientifically display the latest and best geographical information. This is true for maps made anywhere – Christian Europe, Islamic countries, Buddhist-Taoist-Brahmanic-Hindu Asia, etc.

Renaissance Introduction



In the Renaissance, mapping was not an independent discipline or a distinct profession but an integral component of geography, the study of the earth. A complex endeavor, mapping required the skills of such diverse disciplines and crafts as philology, surveying, computation, mathematics, geometry, drawing, painting, engraving, printing, the making of instruments, and the knowledge of Greek and Latin. Because only rarely did one single person master the full array of skills required to make maps, Renaissance mapping resulted from the close collaboration of humanists, artists, merchants, and printers, who were all obsessed with the measurement of the universe, the visualization of the Earth's globe, the philological exegesis of ancient texts, and the trade of exotic goods. Based in Florence, Venice, Ferrara, Rome, Genoa, Naples, and Mantua as well as in Paris, Seville, Lisbon, Nuremberg, and later also in London, Antwerp, and Amsterdam, these heterogeneous groups of mapmakers operated within a European network of relations that often intersected with the network of the republic of letters, the courts of rulers, the councils of the church, the associations of merchants and bankers, and the mercenary armies of European powers. Each center and group was under a different rule, pursuing cartography with different objectives in mind and often keeping news of travels and lands jealously guarded from others, but nonetheless legal and illegal exchanges abounded in cartographic matters. Images destined for a restricted public in the Middle Ages, maps became one of the most favored forms to represent the world in the Renaissance. By the end of the 16th century millions of maps representing the whole world, continents, individual countries, regions, and cities were produced in Europe. It has been calculated that only a few thousand manuscript maps existed in the years 1400–1472, but that their number jumped to about 56,000 from 1472 to 1500, while millions of maps were

produced from 1500 to 1600. The emergence of the printing press contributed to this unprecedented diffusion of maps, which were sold as individual prints but also used as illustrations in bibles, history books, classics, and contemporary texts. Maps came to be used for a variety of purposes. Objects of learning and delectation, they were collected and displayed in audience halls, libraries, and studies. They were even painted in city residences, villas, and princely palaces. They were used as visual aids in estimating the daily reports on European wars and in establishing merchandising franchises. Some were visual aids to study the bible and the classics, to learn history, or to facilitate the contemplation of the divine through the study of nature.

The mapmakers' need to repeat information that they claimed not to believe may have been a way of signalling that they knew their classical sources, that they had had a proper education. A number of the cartographers considered here, including Ortelius and Mercator, were closely involved in humanist scholarship. Rehearsing ancient geographical ideas on one's map was a way of showing that you knew the history of your discipline—the cartographic equivalent of an introductory survey, in which you relate the twists and turns of scholarly thinking that preceded your own.

Surekha Davies asks: "To what extent did something new take place in the Renaissance?" Occasional references to proof and reliability of sources on medieval maps show that mapmakers had long been grappling with these issues, and that the East was a particular problem, since it was truly wondrous but—and indeed, wondrous and therefore—unbelievable. What was new in the Renaissance was the citation of, literally, chapter and verse, when providing details of a textual authority: once printed books began to appear, more regular systems of referencing began to emerge.

Since maps and geographies were themselves read widely in this period for ethnographic as well as topographic information, they in turn shaped ideas about distant places. Mapmakers had to grapple with the problem of assessing the reliability of travelers who, as a popular proverb recounted, could lie with impunity since their claims could not be tested.

The phrase "voyage of discovery" suggests a bold venture into the unknown, questing after knowledge where none exists. Yet the reality of many of history's most important voyages of "discovery" is that they have been undertaken on the basis of steadfast belief in one or more geographical illusions. Indeed, for as long as history has been recorded, journeying into the complete unknown has been a subject of paralyzing fear. It is why it took Europeans so long to "discover" the extent of Africa: what lay beyond the horizon was almost completely unknown but for the possibility of monsters, boiling oceans and a miserable death lost at sea. Contrast this with Columbus who in one fell swoop crossed the Atlantic to "discover" the Americas—a feat far more remarkable than the gradual unveiling of the African littoral because had Columbus not "discovered" land where he did, he would have found himself stranded in a seemingly endless stretch of Ocean that took in the better part of 150° of longitude. But if these were the possible outcomes of a voyage into the unknown, why would Columbus have taken the risk? What made him special? The answer is straightforward: as far as Columbus was concerned, he was not sailing into the unknown. Columbus was thoroughly convinced he was embarking upon a comparatively

short ocean-crossing to the lands of eastern Asia. Thus, it was not that Columbus was uniquely brave or bold; it was that he was lucky enough to subscribe to a geographical illusion that happened to intersect with geographical realities. As Clark Firestone memorably wrote, "The gains of fable are writ large in the history of modern exploration. Error was the guiding star of discovery. A vain fancy was the most precious cargo of the caravels, as it was the keenest weapon of the conquistadors."

Examples of significant expeditions pursuing geographical preconceptions are too numerous to list—just consider the dozens of expeditions embarked in pursuit of the *North-West Passage*, the Lands of *Prester John*, or the *Mountains of the Moon* and the wellspring of the Nile. These geographical preconceptions inspired explorers to journey into the unknown—but, then, that is the point: through the accretions of lore, no explorer ever ventures into a geographical vacuum. The geographical "unknown", so-called, is populated by myth, rumor, misapprehension, conjecture and fancy. The unknown is never a blank slate.

The burst of activity that characterized Renaissance cartography was due to a set of concomitant factors. It built on the long-standing western tradition of representing the earth visually and verbally. Although ancient maps were unknown until the late 15th century, medieval maps of the world, the Mediterranean and the Holy Land were well documented and continued to be made throughout the 16th century. Medieval *mappaemundi* [world maps] represented the three known continents of Europe, Africa, and Asia schematically, often placing Jerusalem at the center of the globe, and were mainly intended as memory-images to visualize and recall encyclopedic time/space knowledge. Charts of the Mediterranean recorded coastlines, ports, and directions of navigation (rhumb lines); their origin is still hotly debated but it is plausibly due to the interactions of Islamic, Pisan, Genoese, and Venetian sailors and mapmakers in the 13th century. Maps of the Holy Land, the first area of the world to be represented individually in Western maps, served for biblical studies but also for planning pilgrimages, crusades, and commercial expeditions. Also popular were geographical descriptions of the world and its regions included in ancient texts, among which Pliny's *Natural History*, Macrobius' *Commentarius in somnium Scipionis* [Commentary on the Dream of Scipio], Solinus' *Collectanea rerum memorabilium* [Collection of Remarkable Things], and Martianus Capellas' *De nuptiis Philologiae et Mercurii* [On the Marriage of Philology and Mercury] held authoritative status, while the 14th century travel reports written by merchants' and missionaries' journey to *Cathay* were favored reading of early humanists, nobles, clergy, and bankers across Europe.

Equally important for the diffusion of maps in the Renaissance were the rediscovery of ancient geographical texts by Pomponius Mela, Ptolemy, and Strabo, and the journeys of European travelers beyond the Mediterranean Sea and in central Africa. The recovery of these geographical texts coincided with defining moments in the early history of humanism, while the texts themselves rapidly generated a widespread interest that exemplifies the different motivations coexisting in Renaissance mapping and the wide-ranging cultural relations from which it emerged. More importantly, these texts were systematically read against each other, in the effort to reconcile their contradictory information on the shape of the world, the size of continents, and the extension of oceans. They were also read in conjunction with contemporary

modern travel reports from northern Europe, the Atlantic, and Africa, which related that these lands were not uninhabited but situated beyond the world known by the ancients. Initially the recovery of ancient geographical knowledge and early travels were independent pursuits, carried out by different people for different purposes. Eventually they came to interact in such significant ways that by the late 15th century the study of ancient geography and the recording of modern voyages became part and parcel of Renaissance mapping. Indeed, the Renaissance notion of mapping as a mathematical and descriptive record of the entire world emerged from the practice of comparing ancient texts to modern voyages.

As put forth by Peter Whitfield in his book *New Found Lands, Maps in the History of Exploration (1998)*, in reality European exploration, during what we may call its "classic period", or the Renaissance, between 1500 and 1900, is the story of the growth of knowledge, geographical knowledge that was recorded, centralized and used as never before. But "discovery" is a relative and misleading term, and perhaps the most persistent and subtle legend is that exploration and discovery are synonymous, whereas the lands or routes "discovered" during this period were of course already inhabited or known for centuries before Europeans arrived. "Newly-discovered" routes across the Pacific and Indian Oceans, the Sahara Desert, or through the Rocky Mountains invariably represented knowledge simply borrowed from native peoples. The *discoverer* of a certain land, or the route to it, may have been simply the first to record his discovery and incorporate it within the body of knowledge. In order to do this he had obviously to find his way home again, therefore the first duty of an explorer was to survive; but the rivers and mountains which challenged his powers of endurance were already home to indigenous peoples, therefore the term *Encounter* is a more accurate one than *Discovery*.

The vital difference in these historic Renaissance encounters, compared with earlier encounters, was that knowledge once acquired by Europeans was recorded in map form and became part of a conscious world geography. Men in Lisbon, Seville, Amsterdam or London had access to knowledge of Mexico, India, Canada or Brazil, while the native peoples knew only their own immediate environment. The Europeans' true discovery was that all this knowledge could be merged into an accurate map of the world, which in turn became a vital tool of political power. The breakthrough which enabled them to achieve this synthesis was their mastery of the sea, for the great navigators linked the oceans and the continents in a way that was unprecedented in world history, and they arrived in their new-found lands as the possessors of unique skills and revolutionary knowledge. Historically, this explosion of knowledge must be seen in the context of the intellectual revolution that we call the Renaissance, but the immediate motives of the European explorers were overwhelmingly worldly - rapacious, mercenary, military and imperial.

Other advanced cultures during this period like those in Asia: China, India, and the Americas: the Aztecs, Incas, while interested in trade and territorial conquest, were not motivated to venture out past their own limited "world" due either to lack of technology and/or need/desire to acquire exotic goods. In India a long period of conflict between rival kingdoms had not prevented a cultural flowering in literature, temple-building and especially science (with mathematics probably more advanced than anywhere in the world), yet any movement to explore the wider world by land or sea was totally absent. The brilliance of the Sung period made China

technically the most advanced civilization of its time, but one consciously confined within its own borders, with little curiosity about the perceived *barbarians* beyond. The American peoples were isolated not only from the rest of the world but also from each other, their ethnic identity having fragmented into a myriad of tribes and nations. The same is true of African and Polynesian peoples, whose pre-literate culture prevented the emergence of any formal geographic sense. In all of these cultures there was no escape from the perception that "The World" was simply limited to "Our World". To cross over from one world to another - if that were physically possible - would mean to be at the mercy of the unknown: barbarians, face the hostile sea or seemingly insurmountable land barriers. And of course it was equally impossible intellectually, for no man could set out to explore regions of the world of whose very existence he was ignorant. The crucial motive for exploration was missing, which is a distinct sense of the known and the unknown, and the challenge of bridging those two realms. It is precisely that sense which is mirrored in the map, displaying the borderland between the known and unknown regions of the world. Again, according to Whitfield, in the post-classical era, this kind of cartographic awareness was absent: there was no conceptual model of a world map awaiting completion.

The age of the great European voyages, when it dawned, was characterized by motives that were unmistakably worldly and political. Yet these political goals came into focus only as part of an intellectual revolution, which included the discovery of Ptolemy's geography and the techniques of navigation. The challenges consciously accepted by the protagonists of the Age of Discovery/Encounter could only be understood in geographical terms. A knowledge or at least a theory of world geography was essential as they defined their aims, and essential to the means they used to achieve them.

This is not to say that individuals from these other cultures did not venture forth and find new lands outside "their world". A list of just some of the non-European explorers purported by some historians to have actually crossed the Atlantic prior to Columbus include West Africans the from Mali Empire, 800 B.C.E. – 1311 C.E. *(recreated by Dr. Alain Bombard, 1952 & Hannes Lindemann, 1955)*, the Phoenicians, 480 B.C.E. *(recreated by Thor Heyerdahl in 1970)* and the Chinese Admiral, Zheng He, 1421. These often nameless explorers, and potentially many others, remain nameless and unrecorded because they either did not return to their original country, and/or they left no written account of their "discovery". This is also true for the unrecorded trans-Atlantic voyages by some Romans in 64 A.D./CE, the Irish in 565, the Vikings during 982-1355, the Welsh (Prince Madoc) 1171 and Prince Henry Sinclair and the Zeno brothers in 1395. Some of these adventurers were simply sailors who were blown off course in a storm and had no way of returning. Others who may have returned were not able to record their journey either textually or graphically, or if so, these records have been lost. Therefore, besides the technological advancements that enabled Europeans to "discover" new lands, they also made the effort to record those travels both textually and cartographically.

So what motivated Europeans more than the other advanced cultures of this time period? Asia (China and India) offered all of the luxury items desired by the ever-affluent European states: silk and spices only available from this part of the world, pepper, fruits, fragrances, oils, porcelain, gold, silver, shells, glass works, brass, pearls. Trade with Asia had been controlled by

the "middle men" Arabs and the Venetians (either over the Silk Road (until recently controlled by the Mongols), or by sailing through the Indian Ocean). The Spanish, Portuguese, Danish, French, British all wanted to avoid these "middle men" and looked to sailing around Africa, Northwest or West of Europe to find a direct route to the Far East - to trade, colonize and convert. None of these were motivating factors for the Indians, Chinese, Aztecs, or Incas.

Martellus World Map, 1489 (#356) from his Insularium illustratum
British Library, Add MS. 15760, fols. 68v-69r, London, England; 46.5 x 30 cm/18.3"x11.8"

If one had to name the most influential book in European history written between say 1200 and 1600, the choice might well fall not on the works of Thomas Aquinas or Dante, of Machiavelli or even of Copernicus, but on the Venetian Marco Polo's narrative of his journey to China. By unveiling Chinese civilization to Europe - its social magnificence, its technical inventiveness, its great cities and its fabulous wealth - Marco Polo created the motivation for the *Age of Discovery/Encounter*, and all the consequences that flowed from it. When they turned their eyes beyond the shores of Europe, the navigators of the 15th century and their patrons were not seeking new lands: they were seeking new routes to countries already known by report and reputation, and the most enthralling of these reports was that of Marco Polo, whose own eastern journey became the most powerful single inspiration for the European era of exploration.

But the impetus to find alternate routes to these treasures actually begins with two second century geographers, Claudius Ptolemy and Marinus of Tyre and carried forward in the

13th century by Roger Bacon and Albertus Magnus, in the 14th century by Paolo Toscanelli and Pierre d'Ailly, in the 15th century by Martin Behaim, Henricus Martellus and the *Laon* globe and finally executed by initially Christopher Columbus in 1492.

Part of the reason it took Europe so long to fully "discover" America as a separate continent was the fact that Columbus' first encounter with it in 1492 actually revealed to his contemporaries only a fractional part of this continent and was evidently insufficient for determining its actual cosmographic status. The full cartographic picture of America that we now have could not have possibly been available to anyone back then, as it presupposes, for example, the subsequent "discoveries" of Vespucci and Magellan in South America, Balboa and Pineda in Central America, Corte-Real and Verrazano in the North Atlantic, and Bering and Cook in the North Pacific. Yet part of the delay was also a result of the fact that the process of discovery presupposes a certain readiness to accept that what one discovers may require changing the way one sees the world. This kind of readiness to challenge the classical tri-continental image of the world (Europe/Africa/Asia) was something Columbus and many of his contemporaries obviously did not have.

For several decades after Magellan's 1520 voyage, Europeans continued to show the Pacific on the map as a relatively narrow expanse, to fill it with imaginary islands or a hypothetical landmass to the south, or to keep the Americas linked to Asia across the northern hemisphere. To do otherwise would have been to accept any or all of a number of ideas that contradicted the prevailing wisdom, such as the fact that Ptolemy had underestimated the circumference of the Earth, or that Ptolemy and Scripture were wrong in their belief that land predominated over water on the surface of the globe, or that the New World was indeed best understood as 'America,' the 'fourth part of the world.' All of these ideas, of course, would eventually be accepted, but not quickly, and not without a period of anxious effort to jam Magellan's discovery, and its implications, into existing intellectual cartographic frameworks.

Outside of Spain, the culture of denial was rampant. To some extent, this was due to the paucity of accurate information. Neither the logbook of the *Victoria's* pilot, with its latitudes and distances, or the maps their cosmographers constructed from that data, was allowed to circulate in print. The printed sources, meanwhile, were either vague or inaccurate when it came to the necessary numbers. For example, although the first edition of Antonio Pigafetta's eye-witness chronicle of the Magellan expedition (Paris 1525) included lurid details about the horrors of the Pacific crossing, and even suggested that this was a voyage to 'never again be made,' it also contained a printer's error that fudged the longitudes in a way that allowed readers to hold onto their view that the Pacific as a narrow oceanic basin.

Vagaries of this kind, moreover, had to be assessed in light of new knowledge arriving from other places. One of these was Mexico, which was conquered by Hernan Cortes during the same years that the *Victoria* was making its way around the world. While Magellan's Pacific suggested that America was separate from Asia, the glittering cities of Mexico recalled the East Asian civilizations described by Marco Polo, suggesting that the opposite was true. Reconciling what seemed to be competing information proved to be no small task. The solution proposed tended to favor established ideas about the world's geography over the potentially revolutionary

implications of Magellan's discovery. During the second quarter of the 16th century, it actually became more rather than less common, among European mapmakers, to depict the New World as a part of Asia rather than as a separate continent.

It actually took another 271 years before the absolute separateness of North America from Asia was conclusively demonstrated by the explorer James Cook. However, many European cartographers even during the early part of the 16th century already envisioned the two as indisputably detached from each other. Despite the total lack of any empirical evidence, they nevertheless preserved on their maps and globes, beginning with Martin Waldseemüller's original 1507 image of North America as absolutely distinct and separate from northeast Asia. Consider also, for instance, the maps, globes, and gores of Johannes Schöner (1515, 1520), Simon Grynaeus (1532), Joachim von Watte (1534), Gerardus Mercator (1538), Batista Agnese (1542), Sebastian Munster (1544), Gemma Frisius. (1544), and Michele Tramazzino (1554) world maps, as well as the ca. 1515 *Paris* globe and the Georg Hartmann (1535) and Francois Demongenet (1552) globe gores. They all portray America as fully detached from Asia even in the far north - an absolutely insular fourth continent totally surrounded on all sides by the ocean just as Martin Waldseemüller first envisioned it back in 1507.

Despite Waldseemüller's tremendous influence on the way Europe came to view America, not until the late 18th century did it have any conclusive evidence that it was indeed fully detached from Asia even in the far north. For nearly three centuries European cartographers were basically promulgating on their globes and world maps an audacious cosmographic theory which, given the actual geographical information that was available to them, had no basis whatsoever in reality!

It is not easy for 21st century readers to appreciate the challenges faced by 16th century cartographers, especially when trying to depict little-known parts of the world. They had to rely on a number of sometimes fictional, sometimes faulty, and often speculative and contradictory sources for their information. Some material was obtained by word of mouth, but most sources reached them via manuscript copies, sometimes in unreliable translations, or in printed versions based on manuscript originals. The misreading and miscopying of place-names was frequent. It is vital when investigating problems on early maps and charts to compare as many variant depictions of the areas concerned as possible, especially their varying inscriptions, as recorded by previous, contemporary, and later cartographers alongside their sources when identified. Added to these challenges is the reality that there was no standard spelling in any language and many letters were liable to be confused. For instance, the letters *l, f,* and *j,* often undotted, and *f*, the long *s*, were commonly confused. The letters *y, j,* and *i* were virtually interchangeable in spelling. The usually undotted letter *i* meant that three in a row could be read as *iii*, or the number three, or as *ui, iu, ni, in*, or *m*. The letter *u* was often used where *v* is used today, and sometimes *v* for *u*; the lower case *u* was capitalized as *V* but because the manuscript *u* and *n* were virtually indistinguishable, *V* could be a capitalization of a lower case *u* or of a lower case *n*.

How did explorers and their patrons understand their expanding world and their place in it? What were they really seeking, and how did they believe they could achieve it? How did they balance the known and the unknown in their minds? Historical maps are vitally important in

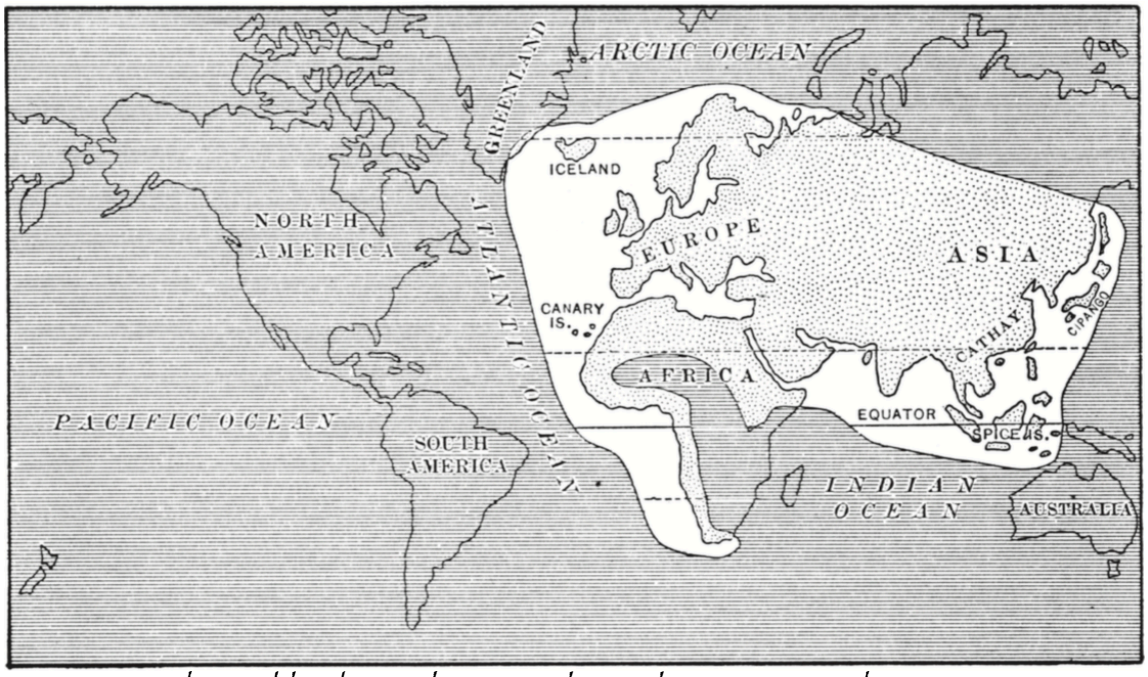
answering these questions, and the selected old maps presented here attempt to display the geographical ideas of the explorers themselves, through the maps which they used or the new maps which they made. Many excellent books on exploration have been written using modern maps to trace the voyages and journeys, but this can be unsatisfactory for several reasons. First, modern maps obviously show a modern view of the world, clear, precise and complete, not the explorer's own view with its blank spaces and uncertainties. Second, we often do not know the exact routes of the early explorers, and the paths so clearly traced on the map may be misleading. And third, contemporary maps often show features which contemporaries believed were there - legendary cities, islands or straits - whose supposed existence was crucial to the explorers' whole course of action. Thus the maps of a given historical period serve as a revealing index to contemporary knowledge, belief and motivation.

And yet these maps and theories do not only reflect actual geographical realities, they very often also portray the purely speculative, empirically unsubstantiated ideas of the people who originated them. In so doing, however, they sometimes help generate amazingly correct new cosmographic visions even when there is no evidence yet to support them. Long before his theory was indeed proved to he correct, Waldseemüller had already provided Europe with a most compelling first image of an absolutely insular America. As we shall see later, that was also true of the purely conjectural— though, prophetically enough, empirically correct—image of a narrow strait separating North America from northeast Asia generated by Venetian cosmographer Giacomo Gastaldi 167 years before Bering actually reached it.

Pre-Columbian influences: the following writers and cartographers presented theories and concepts that led Columbus and many Europeans to envision a smaller tri-continent (Asia, Europe, Africa) world.

- Roger Bacon (13th century)
- Albertus Magnus (13th century)
- Maro Polo text (14th Century)
- Claudius Ptolemy (14th century translations and maps; see monograph #119)
- Pierre d'Ailly map and text (1410)
- Paolo Toscanelli (1470)
- Henricus Martellus maps (1489 and 1490, #256)
- Martin Behaim globe (1492, #258)

Behaim Globe 1492
detail of the Atlantic Ocean, Zipangu [Japan] on the left, real and mythical islands such as Antilia and St. Brendan's island center and right (see monograph #258)

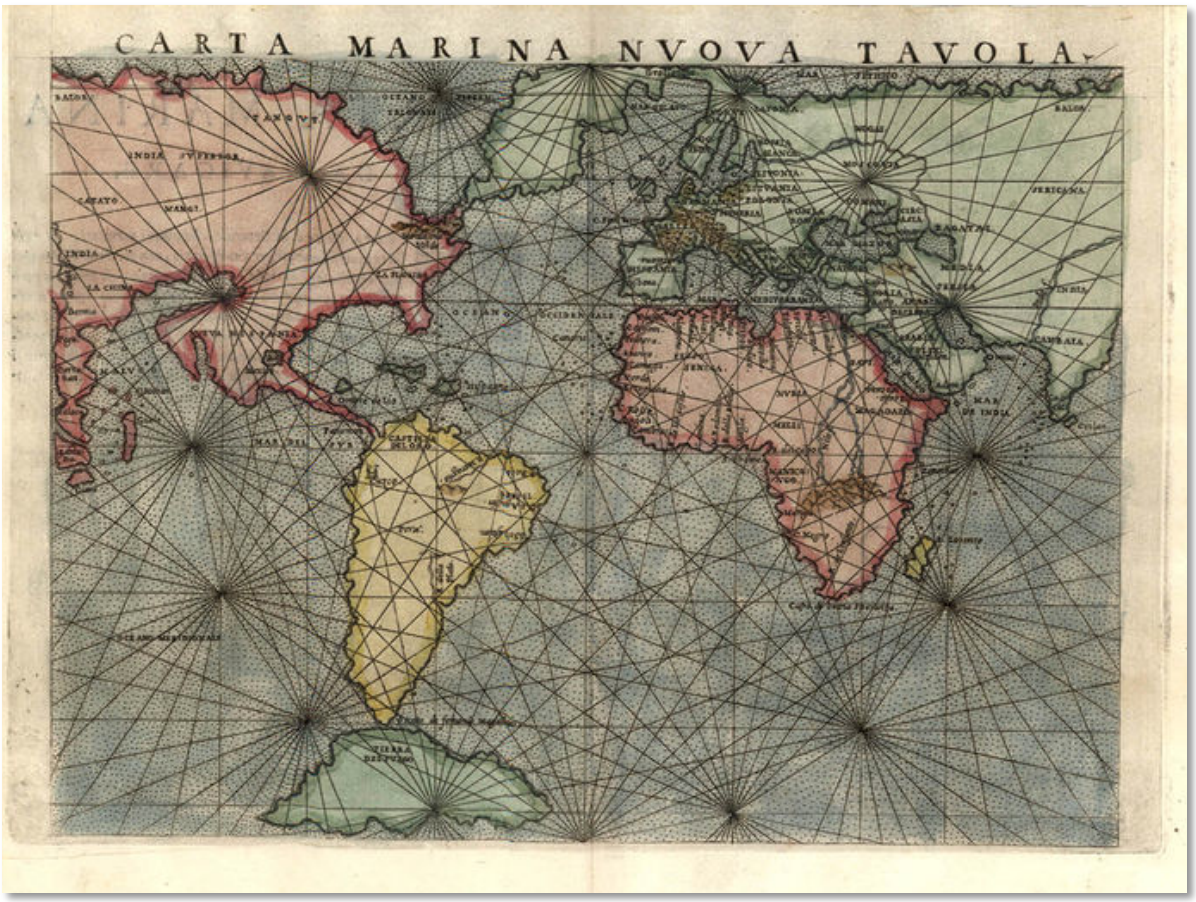


The world as known by most educated Europeans in the 1490's

Renaissance Introduction

The following maps and globes, created under conditions of limited available information, perpetuated the tri-continent world concept for nearly 300 years after Columbus' initial 1492 voyage by creating maps and globes that overtly, explicitly displayed an integrated America and Asia:

- Alessandro Zorzi's three sketch maps (1506)
- Giovanni Matteo Contarini's world map (1506)
- Johannes Ruysch's world map (1507)
- Francesco Rosselli's marine chart of the world (1508)
- Martin Waldseemüller's world map (1516)
- Franciscus Monachus, 1529
- Lopo Homem and Antonio de Holanda Atlas Miller planisphere (1519)
- Paris Gilt globe (ca. 1528)
- Nancy globe (ca. 1530)
- Oronce Fine's world map (1531)
- Oronce Fine's cordiform world map (1534/1548)
- Nuremberg globe gores (ca. 1535)
- An anonymous map from ca. 1535
- Paris Wooden Globe (1535)
- Caspar Vopel's globe gores (1536/1543)
- Giacomo Gastaldi* *Carta Marina Nova Tabula [A new sea chart (of the world]* (1548)
- Giacomo Gastaldi/Matteo Pagano's *Dell Universale world map* (1550)
- Francesco Ghisolfi Portolan Atlas: World (1550)
- Giorgio Calapoda, *Florentine Goldsmith's map* (1555)
- Giovanni Vavassore's 1558 copy of Caspar Vopel's 1545 world map
- Haggi Ahmed's world map (1559)
- Paolo Forlani* (1560, 1562, 1565)
- Girolamo Roscelli's *Orbis Descriptio* (1561)
- Benito Arias (1571)
- Giovanni Cimerlino's world map (1566) *copy of Oronce Fine's 1534/48 map*
- Tommaso Porcacchi world map (1572)
- Georg Braun's world map (1574)
- Mario Cartaro* globe and globe gores (1579)
- Giacomo Franco's cordiform world map (1586) *copy of Oronce Fine's 1534/48 map*
- Matheus De Chiara, Portolan Atlas, world map (1599)

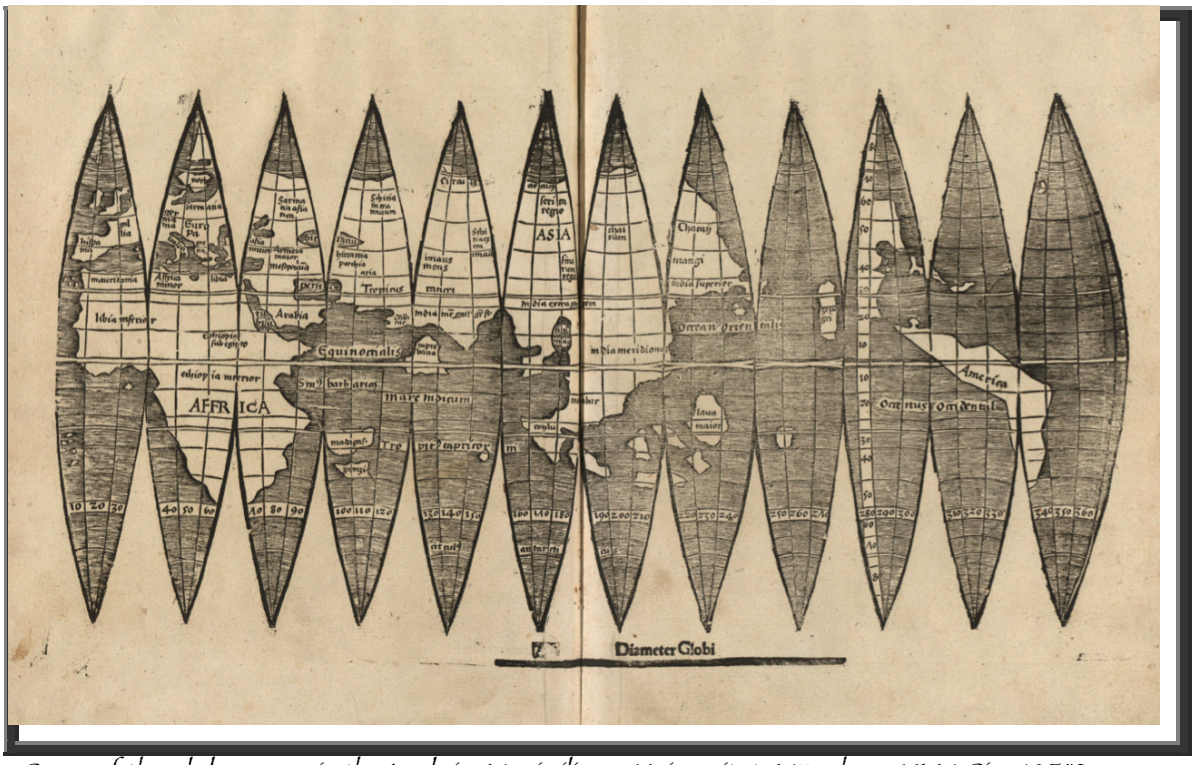


Carta Marina Nuova Tauola by Girolomo Ruscelli, 1561, 18.5 x 24.0 cm (#387)

While there were many maps produced in the early 16th century that portrayed the new discoveries as separate and distinct from the Asian continent, the following early 16th century cartographers took the risk and applied their analytical skills against the available known data to portray the new discoveries as absolutely distinct and separate from northeast Asia and their leadership exerted influence on the others:

- Nicolo Caveri world map (1502-04)
- Martin Waldseemüller's * world map (1507)
- Lenox/Jagiellonian globes (1503-07)
- Bernard Sylvanus world map (1511)
- Johannes de Stobnicza western hemisphere (1512)
- Henricus Glareanus* world map (1513)
- Tross globe gores by Louis Boulengier (1514)
- Leonardo da Vinci globe gores (1514)
- Paris globe (ca. 1515)
- Johannes Schöner's globes (1515, 1520, 1533)
- Giovanni Vespucci world map (1523)

- Pietro Coppo's *De Summa Totius Orbis* (1524)
- Juan Vespucci world map (1526)
- The Paris Green (Quirini) Globe (1515-1528)
- Diego Ribero's *Carta Universal. . . Propaganda, Second Borgian edition* (1529)
- Girolamo de V errazano world map (1529)
- Simon Grynaeus world map (1532)
- Joachim von Watte world map (1534)
- Gerardus Mercator world map (1538)
- Batista Agnese world map (1542)
- Gemma Frisius world map (1544)
- Sebastian Munster's *Die Nüw Welt [The New Islands],* (1546)
- Michele Tramazzino world map (1554)
- Georg Hartmann globe gores (1535)
- Francois Demongenet globe gores (1552)



Copy of the globe gores in the Ludwig-Maximilians-Universitat, München, ULM Cim. 107#2. Courtesy of the University Library of Munich

Ambiguous maps that "hedged their bets" because of the lack of concrete evidence and thus were non-committal about where the new discoveries should be placed.

- Juan de la Cosa's portolan world chart (1500)
- Cantino world map (1502)
- *The Kuntsmann II (a.k.a. The Four Finger)* world map (1502-06)

- Edward Wright's Wright-Molyneux chart of the world (1599)

Philippe Buache's 1780 map portraying the mythical Mer de l'Ouest [Western Sea] in present-day Canada and the Strait of Anian

Printers and editors engaged in fierce competition to publish the most updated maps and travel reports. Armed with the rich heritage of ancient geographical knowledge and news from recent voyages, Renaissance editors, scholars, and mapmakers aimed at completing the work of ancient geographers: to map the world that ancient geographers did not know, and to describe the entire terrestrial globe both mathematically and graphically. This process of integrating ancient geography with modern voyages was pervasive in Renaissance mapping, affecting many different kinds of manuscript and printed maps made both for the wider public and for selected viewers. Maps that differed in terms of purpose, medium, context, and technique shared nonetheless a syncretistic approach to their visual and verbal cartographic sources. This kind of syncretism, rather than the search for cartographic accuracy, characterized Renaissance mapping, as it can be elucidated through the analysis of printed editions of Ptolemy's, *Geography,* manuscript nautical charts, and printed world maps.

Among the Europeans, nobody knew better the lands of the New World and the routes to reach them than the Iberians, but this does not mean that such knowledge was acquired or dominated only by the Portuguese and Spaniards. Many foreigners, especially Italians, were decisive for the expansion travels, with the emblematic cases of Christopher Columbus, Amerigo

Vespucci, and Sebastian Cabot. The Iberian monarchies, through their officers and institutions, tried to control the spread of geographic information that could spike competing initiatives. In the case of maps, the challenge of keeping them secret was divided between the need of knowing the maritime routes across the Atlantic, to ensure the spread of Spanish ships, and using maps to legitimize territorial claims, which demanded that they were made public. Thus, two types of knowledge about the explored areas emerged, one backed by the cosmographers and another by the pilots, said Alison Sandman.

The cosmographers, especially in their role as producers of maps, focused on information, such as the location of places, distances, sizes, and shapes, data that originally had to be obtained onsite and required some cosmographical skill so that they could be arranged in a map. The pilots, meanwhile, were concerned with how to get from one place to another, which demanded not only data about potential distances, longitudes, and latitudes, but also details about winds, currents, and ports of entry. This detailed knowledge of navigation spaces could only be gathered through a long experience at sea.

The officers in charge of keeping certain information obtained from maritime explorations secret developed different strategies for the two types of knowledge. Since the aspects valued by cosmographers — associated with theoretical and systematic knowledge — were more useful for diplomacy and less useful for navigation, they were simultaneously emphasized and publicized, and the attempts to control them were thus closer to a careful dissemination than actually keeping the secret. At the same time, the experimental knowledge of the pilots, whether it was at the individual level or arranged in maps and itineraries, should remain a secret.

The trading of the maps demonstrates that the control of the Spanish Crown and its officers failed to keep the general information out of reach of several European powers, which competed against Portugal and Spain. The work of spies, merchants, and also humanists interested in updated information about the explored territories tried to evade the Iberian control. These agents, who often and simultaneously had different roles, were at the origin of the transaction of maps.

The control over the knowledge about the New World, in turn, would be associated with a science that was then defining its contours. According to Klaus Vogel, in the 15th century, many of the cosmographers, creators of maps and globes, and authors of cosmographic treaties had higher education, knowledge of Latin — sometimes, also of Greek — and many were also theologians. As early as during the 16th and 17th centuries, the number of cosmographers coming from the fields of mathematics, natural philosophy, and physics increased. They started to work not only in the great European courts, but also in the small courts, trading companies, universities, and academies. This young, emerging science, dominated by the cosmographers, who later started to be called geographers, was responsible for the construction of a geographic knowledge of the New World that prompted expeditions and conquests.

Naming the New Discoveries. In a Latin preface to the *Cosmographia Introductio* Waldseemüller indulged his name-coining propensity:

> Toward the South Pole are situated the southern part of Africa, recently discovered, and the islands of Zanzibar, Java Minor, and Seula. These regions

> [Europe, Asia, Africa] have been more extensively explored, and another or fourth part has been seen by the attached charts; in virtue of which I believe it very just that it should be named Amerige ["ge" in Greek meaning "land of"], after its discoverer, Americus, a man of sagacious mind; or let it be named America, since both Europa and Asia bear names of feminine form. *(see monograph #310)*

Antonio Rios-Bustamante wrote in *Mapline* (issue number 93 Summer 2001, pages 6-8).that early maps of the continents of North and South America used a variety of nomenclature including *Mondus Novus, Terra Nova, Terra Firme, Tierra de Florida, Tierra de Cuba,* for the continents before the name *America* was universally accepted. Some of these names appeared on one or two maps, others had a broader diffusion for a period of time.

The series of published maps using the names *America Mexicana* and *America Peruana* begins with the Petrus Plancius map *Orbis terrarum typus de integro multis in locis emendatus auctore Petro Plancio* of 1590. In 1596 Theodore Bry also used this nomenclature in his map *America sive Novus Orbis*. There is also a 1576 map, *America Peruana*, by Gerrard De Jode depicting South America with this nomenclature for the southern continent. In all, well over forty published maps dating from 1590 to about 1690 used these names. Upon reflection it is logical that during this period these names were being used as the main titles for the continents, as during that period, Mexico and Peru were the best known geographical entitles on the northern and the southern continents of the Americas.

To verify this hypothesis, Antonio Rios-Bustamante examined geographical reference works of the period to see if they provided evidence supporting this viewpoint. A major period reference source, *The Great Historical, Geographical and Poetical Dictionary* by Louis Moreri, confirmed his supposition. Originally published in France in 1681, it was translated, expanded and published in English in 1694. Volume one of the dictionary specifically states in the entry under *America*:

> America or the West Indies, one of the four parts of the habitable America or the West Indies, first discovered by Christopher Columbus, a Genoese in 1492. And from Americo Vaspucci a Florentine first called America. ...This vast continent is devided into the Northern and the Southern America. The Northern, which is also called *America Mexicana* from Mexico, is bounded by the Pacific Sea, and *L'Estreche d'Anian* to the west and south, to the east by the Bay Mexico, and the North Sea, and to the north by the whole Arctic frozen regions yet unknown; containing Canada or New France, *Estotiland*, Florida, New England, New Denmark, New Spain, or the Kingdom of Mexico, comprehending Yucatan. Nicaragua, Nueva-Galicia, Michoacan, Guatimala, and Honduras, New Granada, Virginia, the Isle of California,, Cuba, Hispaniola, and innumerable others called the Antilles. The Southern America, which is also called *Peruvian America* has to the North the North Sea, to the east the *Aethiopic Ocean*, to the south the *Magellanic Sea*, and the *Straights of Magellan* and *Maire*, and to the west the Pacific Sea. The Regions of Southern America are Brazil, Chili, Guiana, *Terra*

> *Magellanica, New Andaluscia*, New Granada, Paraguay, Parana, Parria, Popajan, the Kingdom of Peru, the *Terra Firma*,Tierra Del Fuego, Tucuman, Venezuela. The Spaniards have within their Dominions, which are the largest part of America, 5 Arch-Bishopics, and have 34 Bishopics… .

Undoubtedly there are more maps or map editions of the same period which will be found which used this nomenclature. This then constituted an alternative geographical nomenclature for many maps of the early Baroque period.

Chinese Cartography

More than eighty years before the Portuguese voyages of Vasco da Gama (1497-99) and Cabral (1500-01), and Columbus' voyages (1492), the admiral Zheng He began leading expeditions of ships from China through the Indian Ocean to as far as the eastern coast of Africa - this at a time when European ships had yet to round the southern tip of that continent The longest of Zheng's voyages spanning more than 9,600 kilometers (5,965 miles) each way, about one and one half times the length of Columbus' trips across the Atlantic. Such long distance journeys were not unusual in Chinese history. In the second century B.C., the general Zhang Qian was dispatched on a diplomatic mission westward to the Yuezhi people and reached as far as Afghanistan. In succeeding centuries, Chinese writers produced a vast corpus of geographic literature, from accounts of foreign lands to descriptions of the entire empire to gazetteers of particular localities. As Joseph Needham pointed out more than sixty years ago in volume 3 of his *Science and Civilisation in China* (1954), the geographic records in the dynastic histories and Chinese geographic literature would not have been possible without the accumulated observations of countless travelers and explorers.

Much of the literature on Chinese geography since Needham began his seminal work on the history of Chinese science have tried to make it resemble that of the West. This is perhaps nowhere so true as for the subject of Chinese mapmaking. It can be and has been written that Chinese cartography was a science that strove, for mathematical accuracy. Insofar as it was a mathematical science, it was eventually surpassed by that of the West, but not until the 15th century or so. Until that time, the quantitative tradition is said to have been stronger in China.

The Chinese cartographic historian Cordell D.K. Yee states that there is no denying the meticulousness with which imperial China gathered geographic information about its own territories and contiguous areas. There is also no denying that the Chinese had by at least the 12th century laid the foundations for a mathematical cartography-one predicated on the belief that geographic knowledge depended on the ability to measure the earth. From the universalist perspective, what kept traditional Chinese cartography from advancing as far as European cartography was a conception or the earth as essentially flat. A coordinate system similar to latitude and longitude thus could not develop, nor could techniques of projection for the transference of points on a spherical surface to a plane surface.

The imposition of modern Western ideas of what constitutes a map has hindered the understanding of the Chinese version by making traditional Chinese mapmakers resemble modern

mapmakers, or lesser versions of them. They do not have to, and the evidence suggests that they ought not to. Their aims and were different from those of modern Western cartographers. In the history of cartography, at least, it may be time to restore the sense of "otherness" that once held sway in discourse about China. Traditional Chinese cartography was different from its modern European counterpart. It did more than its mathematical European counterpart in restoring this sense of "otherness".

Additionally, Cordell Yee observes that to a certain extent, then, the history of cartography in China resembles that of Europe, but not in the way previously claimed. In general, traditional Chinese cartography did not anticipate the products of modern mathematical cartography. This becomes clear when one compares Chinese and European maps from the 16th century and later. European maps became increasingly similar in appearance, a development often supposed to be an indication of their increasing objectivity. In contrast, Chinese maps were characterized by diversity. Chinese cartography did not sever its connection with the arts, even after Europeans introduced their methods into China in the late 16th century. The persistence of traditional methods in China until the end of the 19th century suggests that Chinese cartography was not waiting to be modernized. The strength of that tradition also suggests that the European pattern of development need not be taken as a norm by which to gauge cartographic achievement. The split between the so-called "two cultures" - the sciences and the arts - perhaps need not have taken place.

This disjunction is clear on post-Renaissance European maps, on which pictorial modes of representation are reserved for decorations: cartouches for tides, graphic scale, narrative descriptions, or vignettes from the social life of the region represented. Such designs were almost literally marginalized - they appeared along the edges or in areas of the map that otherwise would have been unused. The space for decoration, in other words, was often where cartographic information was not being conveyed. On traditional Chinese maps pictorial representations had a more central role. The mapmaker saw art - poetry, calligraphy, and painting - as essential to the task. To such a practitioner, a map is a fusion of image and text, of the denotative and the expressive, of the useful and the beautiful. In the 20th century, modern mathematical cartography displaced traditional techniques and put an end to this idea of maps. Whether this was progress remains an open question.

Although the post-1500 achievements were very impressive, they were, in J. H. Parry's expressive phrase, *a discovery of the sea*. The world may have been circumnavigated, and voyages across the Atlantic and in the Pacific became routine, if often very hazardous undertakings, but exploration of the land lagged far behind. Even though, for example, the Grand Canyon of Arizona was seen by one of Coronado's officers as early as 1540, the exploration of North America was not really completed until the early 19th century. Similarly, the Portuguese exploration of the coasts of West and East Africa was not followed immediately by the occupation of territory on a large scale: that too was a feature of the 19th century. As late as the mid-19th century basic features of Africa, such as the true sources of the Nile and the geography of much of the continent to the north and south of the equator, were quite unknown. In Asia the island empire of Japan, whose description by Marco Polo had aroused the interest of

Christopher Columbus, remained substantially unknown to outsiders until it was forcibly opened by United States naval power in the 1850s; while the journeys of Sir Marc Aurel Stein in China and central Asia at the beginning of the 20th century were a deliberate attempt to retrace the steps of Marco Polo in a way that no European had been able to do since the 14th century.

Summation

The slow pace of intellectual adjustment in 16th century Europe to the implications of the new discoveries has been remarked upon by many scholars; there was even a surprising lack of interest among the literate public in reading about the new world. The result was the preservation of traditional ideas, whether in the form of the continued use of scientific writings like the 13th century *De Sphaera Mundi*, or in the repetition of tales of the wonders and monstrous races of the east. The world map drawn in about 1500 by Juan de la Cosa *(#305),* who had accompanied Columbus on his second voyage in 1493, included such customary details as *Gog and Magog,* and the *blemmyae* of the deserts of Libya, men with faces on their chests like the anthropophagi of Othello. Juan de la Cosa probably did this partly out of deference to custom and to fill up blank spaces, but a more thoroughgoing example of the preservation of old ideas can be found in the *Margarita Philosophica* by George Reisch, the confessor of the emperor Maximilian, which was written in about 1496, and published in the first of a number of 16th century editions in 1503. This contained many of the long-familiar legends and fantasies, while at the same time contriving to omit any mention of the Portuguese voyages of the 15th century. There were also examples in the 16th century of the wonders of the East being transferred to the new world, where they were supplemented by new ones, such as the *Fountain of Youth, El Dorado*, and the *Seven Cities of Cibola*. The mixture of fact and fiction, and the reluctance to adjust existing ideas in the light of new information are very reminiscent of the way in which medieval Europe had viewed the world.

The medieval expansion of Europe is a phenomenon deserving of study in its own right, and the evidence that has been presented is sufficient to show that it was a complex and persistent movement involving a surprisingly large part of the landmasses of the world over a very long period of time. Even if there were no observable connection between this and the overseas expansion of the 15th and later centuries, it would still be significant. But there were in fact close connections between the two periods at many levels. The revival of international commerce in the 11th century was a powerful incentive for overseas expansion then, and remained so despite the economic slump of the 14th and early 15th centuries, and the barriers placed in the way of European merchants after the collapse of the Mongol dominions in Asia. The rise of Turkish power may have complicated these ambitions, but it did not prevent their fulfillment so long as trade with the ports of Syria and Egypt remained possible. A few individuals from Europe also continued to overcome all the difficulties, and to penetrate a considerable distance into Asia. The Venetian traveler Nicolo Conti was one example, while the Genoese merchants, Hieronimo di Santo Stefano and Hieronimo Adorno, were in Calicut in India only a year or two before the arrival there of Vasco da Gama in 1498. The Portuguese desire to trade directly with India was the ambition of a poor country to seek new sources of wealth and to do so at the expense both of Islamic and Christian middlemen: in this sense the Venetians were as much the rivals of Portugal as were the

Moslems who controlled Egypt and the Indian Ocean trade routes. The opening of a sea route to India may not have been an immediate priority for Henry the Navigator, and for other Portuguese leaders at the beginning of the 15th century, but it is likely that India was in their minds both because of the vague way in which it was defined, and because they were not put off by any knowledge of the great distance to be travelled by sea in order to get there.

The Portuguese interest in Africa was initially the product of the traditional trading links between the Iberian peninsula and North Africa, of the many previous attempts to conquer Moslem-held territory there, and of the knowledge that gold existed somewhere in a part of West Africa which was not accessible to Europeans by the Saharan trade routes. There was really no fundamental inconsistency in Portuguese policy towards North and West Africa in the 15th century. The Portuguese exploration of the coast of Africa, and indeed the whole of their expansion towards India can also be seen in terms of the crusading ideal that had flourished in varying forms since the 11th century. So too can the voyages of Columbus who was also driven by the desire to extend the bounds of Christianity. Both he and the Portuguese were concerned to search for allies against the world of Islam, preferably Christian ones such as Prester John, who was still being actively sought at the end of the 15th century, but others if necessary: the letter of credence that Columbus bore to the Great Khan is an example of a policy which had its roots in the diplomatic missions of the 13th century (see separate monograph on Prester John).

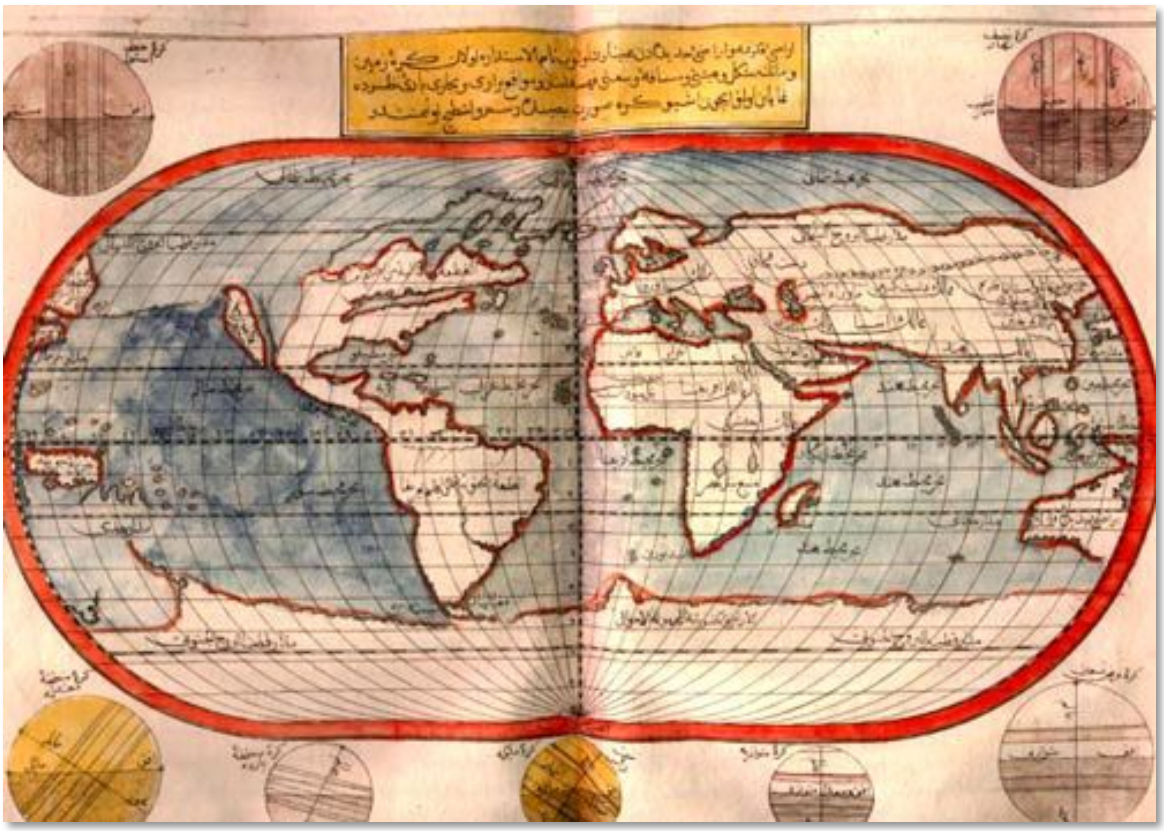
The techniques of navigation and the types of ship available to the 15th century explorers were in many respects little better than those of their 13th and 14th century predecessors. Individual courage and length of experience counted for as much as new methods. The voyages in the Atlantic during the 15th century had no close relation to those of the Vikings in earlier centuries, but they certainly were related both to the 14th century discoveries of island groups such as the Canaries and the Azores, and also to the persistent belief in the existence of other islands like *Frisland, Hy-Brasil, Daculi, Brendan, Satanazes* and *Antilia*. The pre-1492 rumors of the existence of land across the Atlantic which were recorded in the 16th century by Las Casas may owe something to hindsight, but there is no doubt that in the 15th century there was an intense interest in the Atlantic which long preceded the first voyage of Columbus. Columbus may have been the first navigator since the Vikings known to actually to cross the Atlantic, but it is unlikely that he was the first to make the attempt.

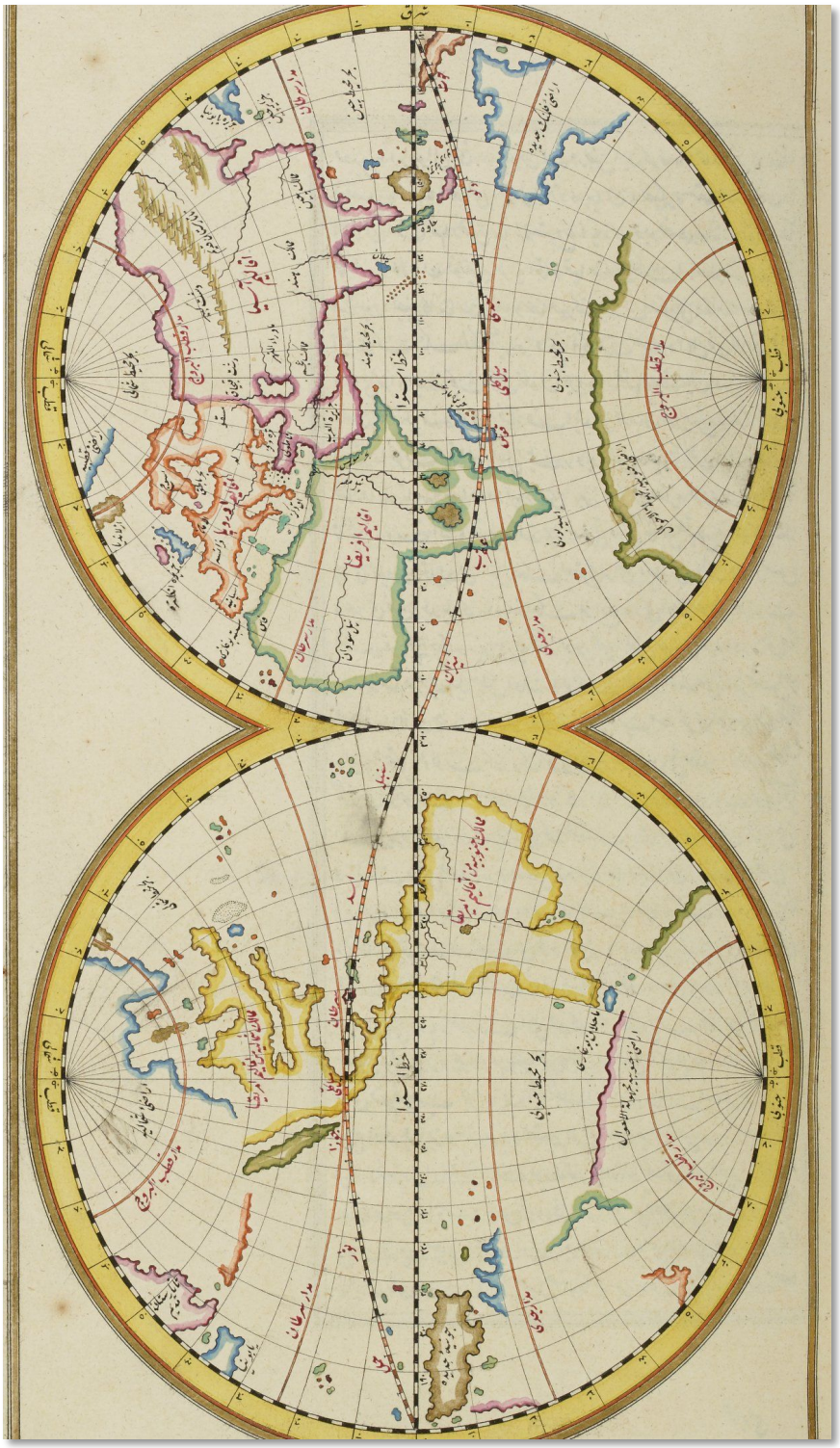
Above all it was in the realm of ideas that a close link existed between the 15th century expansion of Europe and that of the earlier centuries. Without such ideas as the legend of Prester John, or previous knowledge of both the real and imaginary characteristics of India, or the information about the Far East gained during the rule of the Great Khans, or continuance of the crusading ideal, the 15th century expansion of Europe would have been quite literally inconceivable. Seen against this background, the motives ascribed to Henry the Navigator by his biographer Azurara, who depicts him as a latter-day crusader, seem comprehensible, and probably not far from the truth. The contribution made to the expansion of Europe by the intellectual movement of the Italian Renaissance is tenuous and hard to define, but Italy did make a very important contribution to the 15th century discoveries through the long experience of its navigators, shipbuilders, cartographers, and instrument makers, and through the financial

resources and business acumen of its merchants and bankers. It was entirely appropriate that this New World should have been discovered by a Genoese, and named after a Florentine.

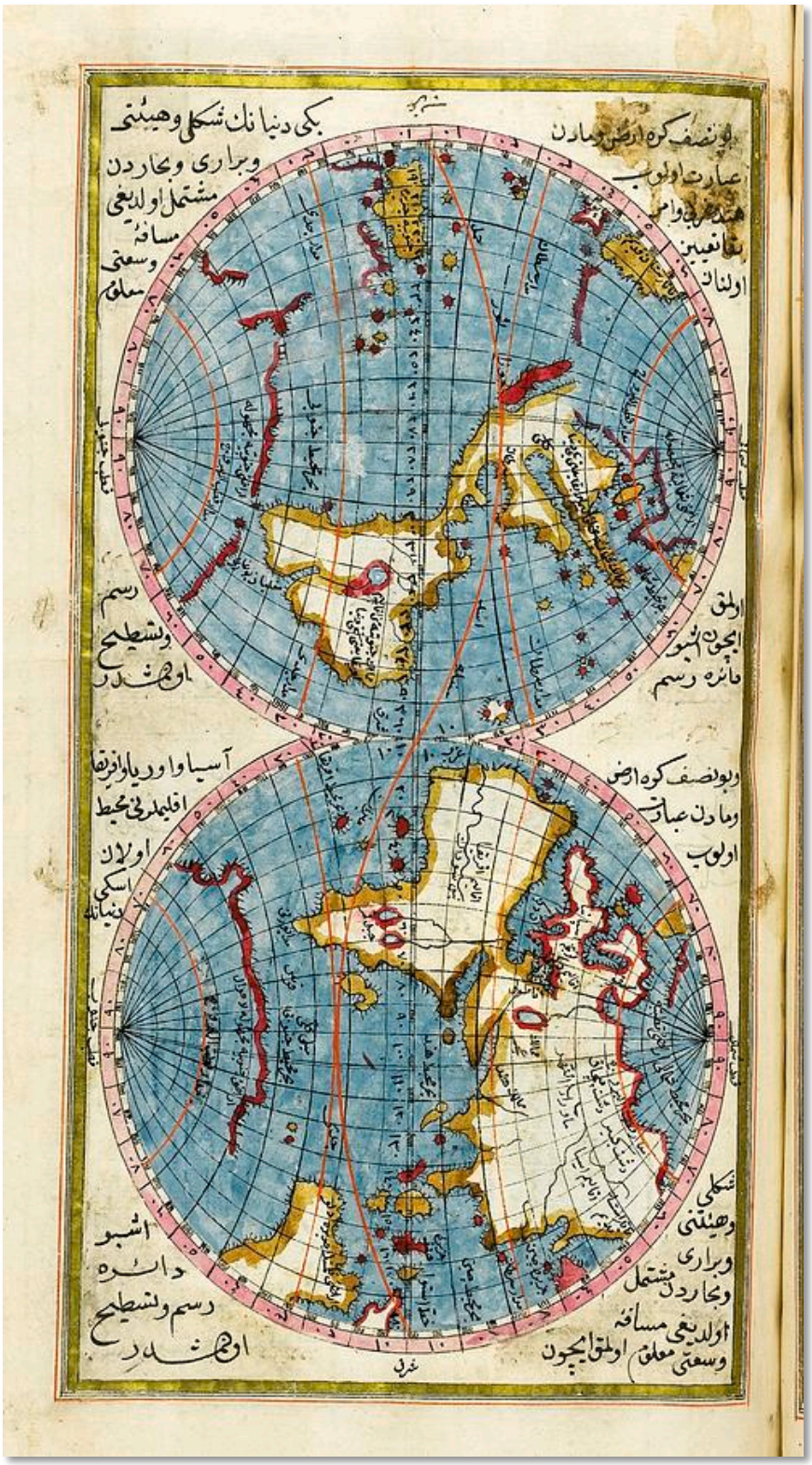
For all the future importance of the New World, it might be argued that the medieval expansion of Europe ended as it had begun, with the continent of Asia. It had started in the 11th and 12th centuries with the penetration by European merchants and crusaders of the western fringes of Asia in Syria and Palestine, and had continued in the 13th and 14th centuries with the travels to distant Mongolia, India and China by merchants, missionaries and, envoys. Many of the 15th century voyages of discovery, whether westwards across the Atlantic, or to the south around Africa and into the Indian Ocean, had Asia as their ultimate destination. Both Columbus and Cabot hoped to find the land of the Great Khan, and after them came others seeking a shorter passage to the East either around or through the Americas. When, in 1535, Jacques Cartier found his path westwards barred by rapids on the St Lawrence River above the site of the future city of Montreal, he named them Sault La Chine, the Chinese Rapids. A hundred years later, in 1634, a French courier des bois, Jean Nicolet, was sent west to investigate rumors of a great inland sea from which a waterway led to Asia, and reports of a yellow-skinned people, who could only be Chinese, living on its shores. When Nicolet reached Green Bay on Lake Michigan he thought the cliffs ahead of him must be the coastline of China, landed, and donned a robe of Chinese silk. No Chinese dignitary came to greet him, only the local tribe of Indians. Had he but known it, Jean Nicolet was in a sense the last of the European envoys to the Great Khans, whose paths had crisscrossed Asia in the 13th and 14th centuries, and whose successors had helped to open the sea routes to the East and to the New World in the 15th.

Renaissance Introduction



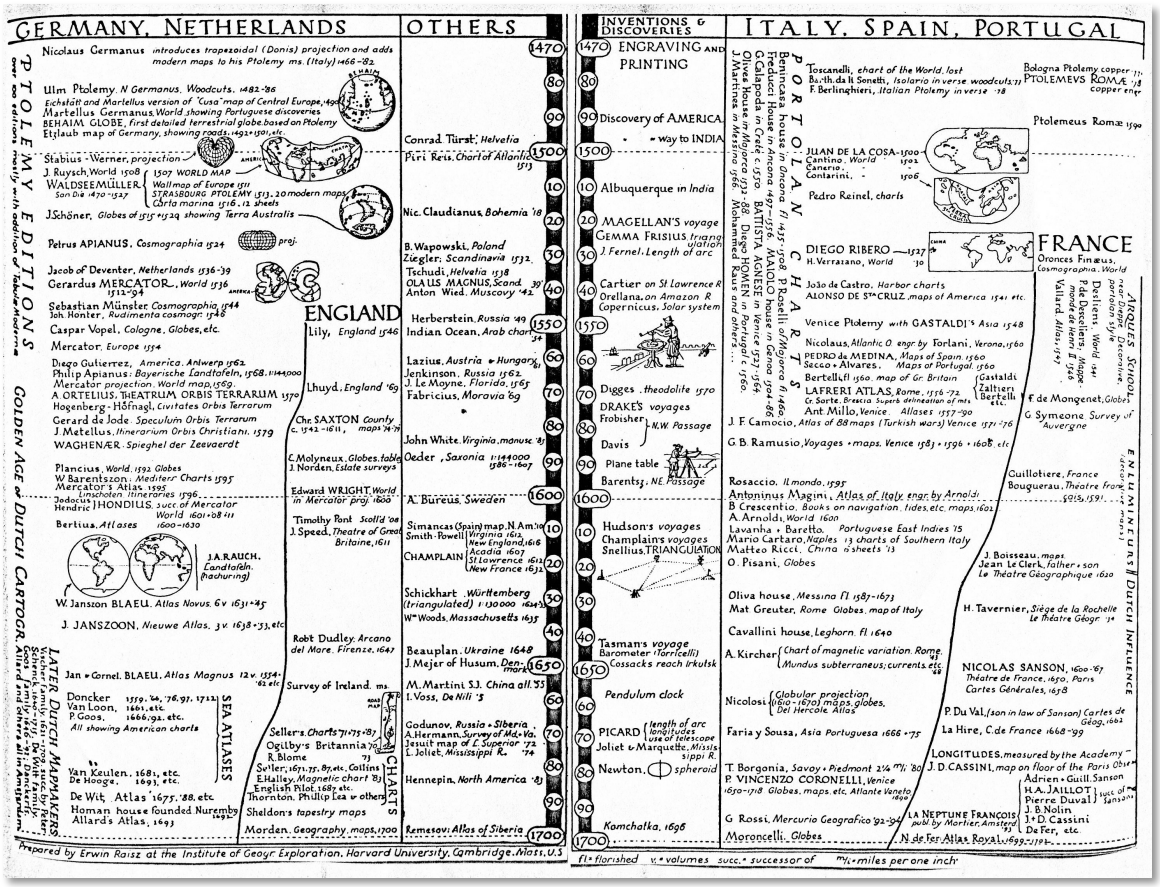


Katib Celebi, 1729

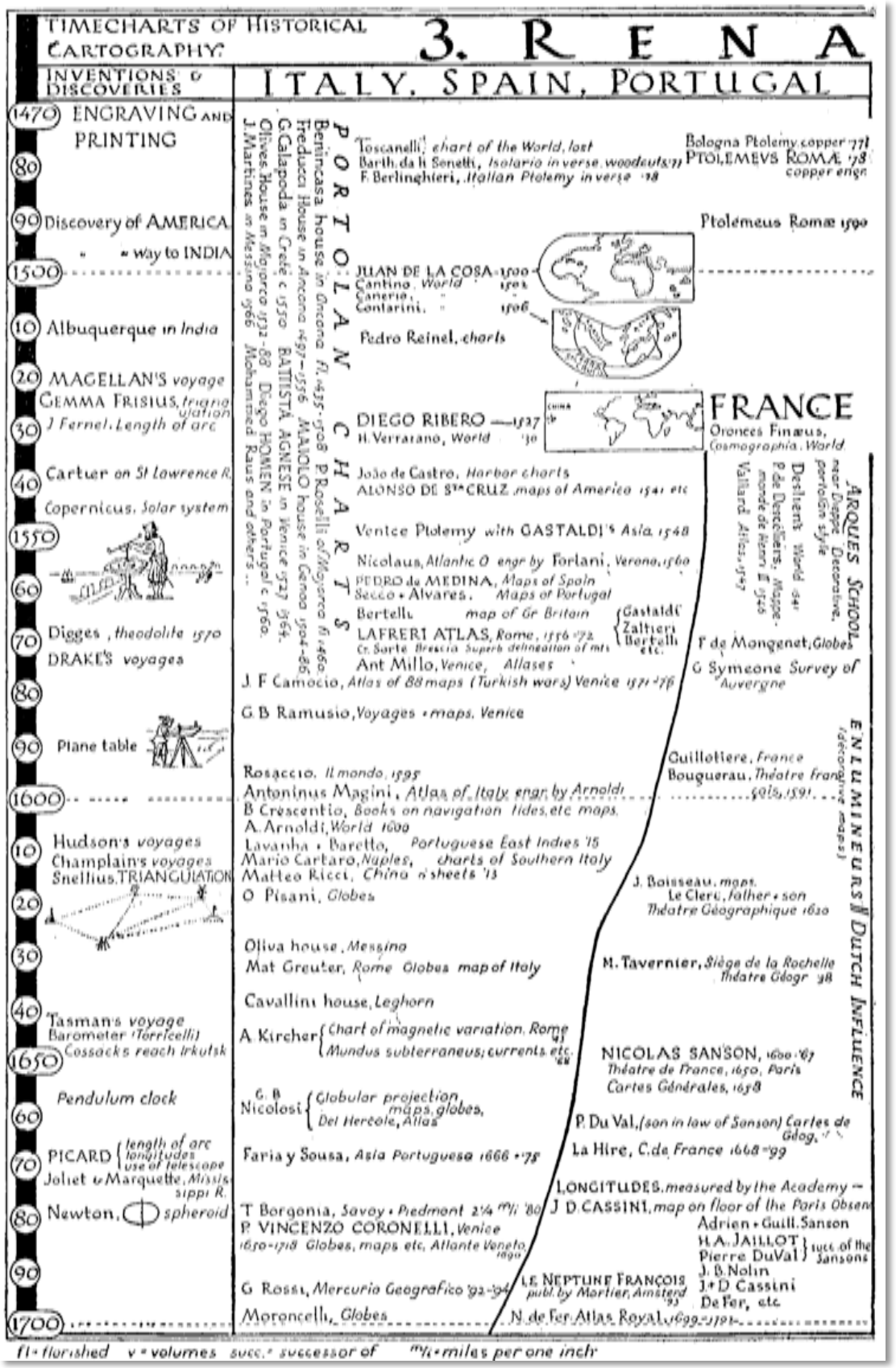


Turkish/Ottoman 1234/1819

Renaissance Introduction



Time Chart for Renaissance Cartography by Erwin Raisz


TIMECHARTS OF HISTORICAL CARTOGRAPHY
3. RENA
INVENTIONS & DISCOVERIES
ITALY, SPAIN, PORTUGAL
1470 ENGRAVING AND PRINTING
80
90 Discovery of AMERICA
" " Way to INDIA
1500
10 Albuquerque in India
20 MAGELLAN'S voyage
GEMMA FRISIUS, triangulation
30 J Fernel, Length of arc
40 Cartier on St Lawrence R.
Copernicus, Solar system
1550
60
70 Digges, theodolite 1570
DRAKE'S voyages
80
90 Plane table
1600
Hudson's voyages
10 Champlain's voyages
Snellius, TRIANGULATION
20
30
40 Tasman's voyage
Barometer (Torricelli)
Cossacks reach Irkutsk
1650
Pendulum clock
60
70 PICARD { length of arc, longitudes, use of telescope
Joliet & Marquette, Mississippi R.
80 Newton, spheroid
90
1700
PORTOLAN CHARTS
Benincasa house in Ancona fl. 1455-1508
Freducci House in Ancona 1497-1516
G. Calapoda in Crete c 1550
Olives House in Majorca 1532-88
J. Martines in Messina 1566
P. Rosselli of Majorca fl 1460
MAROLO house in Genoa 1504-86
BATTISTA AGNESE in Venice 1537-1564
Diego HOMEN in Portugal c 1560
Mohammed Raus and others...
Toscanelli, chart of the World, lost
Barth. da li Seneth, Isolario in verse, woodcuts '11
F. Berlinghieri, Italian Ptolemy in verse '18
Bologna Ptolemy copper '71
PTOLEMEVS ROMÆ '78 copper engr
Ptolemeus Romæ 1590
JUAN DE LA COSA 1500
Cantino, World 1502
Canerio, " "
Contarini, " 1506
Pedro Reinel, charts
DIEGO RIBERO 1527
H. Verrazano, World '30
FRANCE
Oronces Finæus, Cosmographia, World
João de Castro, Harbor charts
ALONSO DE STA CRUZ, maps of America 1541 etc
Ventce Ptolemy with GASTALDI'S Asia 1548
Nicolaus, Atlantic O engr by Forlani, Verona, 1560
PEDRO de MEDINA, Maps of Spain
Secco & Alvares, Maps of Portugal
Bertelli, map of Gr Britain
LAFRERI ATLAS, Rome, 1556-72
Cr. Sorte Brescia Superb delineation of mts
Ant Millo, Venice, Atlases
{Gastaldi, Zaltieri, Bertelli etc.
J. F Camocio, Atlas of 88 maps (Turkish wars) Venice 1571-76
G. B Ramusio, Voyages & maps, Venice
Rosaccio, Il mondo, 1595
Antoninus Magini, Atlas of Italy engr by Arnoldi
B Crescentio, Books on navigation tides, etc maps.
A. Arnoldi, World 1600
Lavanha & Baretto, Portuguese East Indies '15
Mario Cartaro, Naples, charts of Southern Italy
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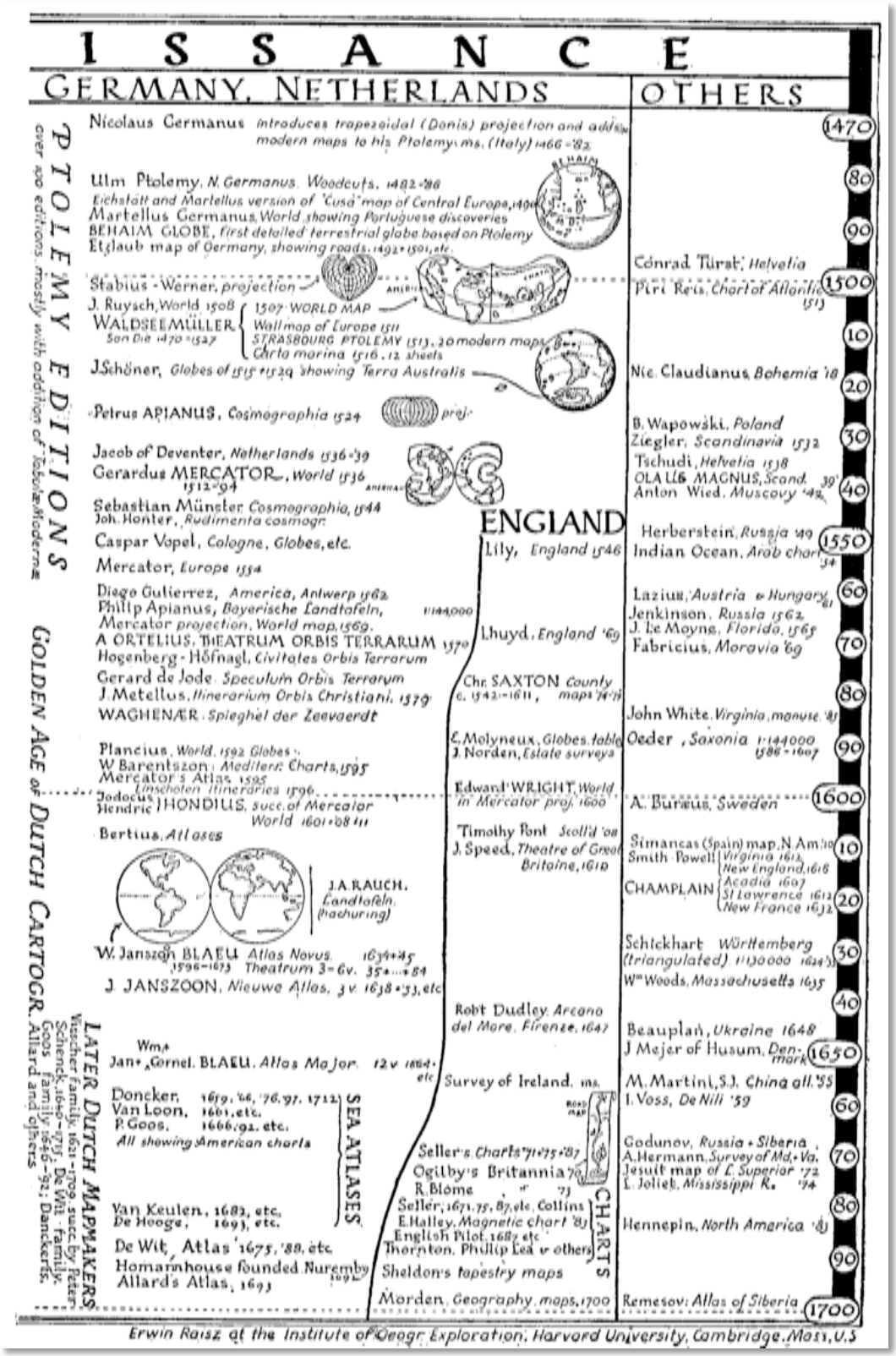
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