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PORTOLAN CHARTS

Among the geographical records of earlier centuries which have come down to us, none are more interesting than the portolan charts which were drawn during the years fittingly designated the period of great geographical discoveries. They attract and hold the attention by reason of their artistic features, as well as by their remarkable approach to scientific accuracy for so early a period.

To the cloister maps of the middle ages they present a marked contrast. The former strikingly exhibit the influence of ecclesiastical and classical tradition. In general, they are far from truthful in their presentation of the geographical features of the earth. Though highly interesting as reflecting geographical notions of the time in which they were drawn, they possess little value as scientific maps.

Portolan charts are based upon careful and what may be called scientific observations. It is only in recent times that there has been an improvement in the charting of the region to which most of them pertain, that is, the Mediterranean and the Atlantic coast in varying extent to the north and the south of Gibraltar. They too exhibit the geographical interests of the period to which they belong. They are the creations of seamen, navigators, explorers, chart-makers who were leaders in the
expansion of geographical knowledge which opened the New World region of Africa, of India, and of America.

This brief word concerning the origin, character, and general significance of portolan charts, the first modern scientific maps, is presented as an introduction to a descriptive list of the numerous originals belonging to The Hispanic Society of America. An inquiry into the history of portolan charts which have been preserved to our day leads immediately to a query concerning their origin. None of those extant are known to have been drawn prior to the year 1300, and the oldest example bearing date and signature is that of Pietro Visconte of the year 1311. Nordenskiöld thinks that the normal portolan chart, as he chooses to call it, that is, the one which served as a sort of original pattern, must have been constructed sometime during the thirteenth century, from numerous coast sketches such, for example, as those which may be found in a cosmographic poem by Leonardo Dati, bearing the title La sfera. The arguments in support of the assumption seem reasonable, yet the fact remains that no dated portolan chart of that century, as has been stated above, is known; neither are such sketches known as those to which Nordenskiöld refers, antedating the fourteenth century. An interesting record, however, is that to be found in a work by Guillaume de Nangis describing the crusade of King Louis IX. in 1270, noting that the King’s ships had sea charts on board. In the voyage from Aiguesmortes to Cagliari, the port selected for the rendezvous of the ships making up the expedition, they were overtaken by a storm, and at the end of the sixth day, as Cagliari had not yet been reached, the King expressed a wish to know the exact location of his ship. The pilots, we are told,
brought to him their charts, and showed to him that the port was not far distant.

Theobald Fischer has advanced the theory that portolan charts have a Byzantine origin, and Fiorini holds that Italian navigators, not long after 1000 A.D., learned from the Greeks of Constantinople how to make and how to use charts which were founded on drawings and measurements, and that in succeeding years they gradually improved them. Again the fact confronts us that no portolan chart of Byzantine or Greek origin is known, nor is the evidence of such eastern influence traceable in existing charts.

The first thousand years and more of the Christian era have left us none of the sailors’ charts which may have been employed during those centuries.

Ptolemy alone of the ancient writers alludes to the charts of seamen, and one might conclude from his references that such as he had in mind were not unlike the portolan charts which we have here under consideration. But all these too are lost.

As there appears to be a relationship existing between the ancient periplous, the Italian portolan, and the portolan chart of the period of discovery,—which chart at first was doubtless regarded as a very useful addition to the portolan, coming in time to supplant it as the knowledge of seamanship expanded,—a more extended reference to the character of the periplous and of the portolan will fittingly introduce us to the portolan chart.

The Greeks used the word περίπλος to designate a course or harbor book, literally a sailing around, a circumnavigation. It was not applied to a sea chart or to a collection of sea charts. The Italian word portolano, while not precisely synonymous, has a meaning strik-
ingly similar to this Greek word, as has also the English word *rutter*, the Portuguese *roteiro* and the French *routier*. The term portolan should not be employed, as has so frequently been done, to designate the charts which especially interest us here; on the contrary, they should be called portolan charts, and this rather than loxodrome or compass charts, as will appear later.

We have no information that the seamen of antiquity were in possession of instruments by which to direct their courses in the open sea. The sun and stars might guide in cloudless weather, but a cloudy sky brought terror to the sailor who had ventured upon a course which led beyond the horizon of known coast lines. Coasting was with the ancient mariners the more common practice, and more useful to them than a seafarer's chart, which might be employed in navigating from port to port across a trackless and unknown sea, would be a written description of the seas over which they were prepared to travel and the coasts they had to visit,—a description of the harbors, the shoals, the currents, the winds, and the facility for anchorage.

Of coastwise navigation in antiquity a few accounts have been preserved to us. The story of Nearchus' voyage from the mouth of the Indus to the Euphrates, in the time of Alexander the Great, is the story of an expedition which was regarded as one of great daring, and worthy the highest praise, but many of the incidents of the expedition show how meagre at that time was the knowledge of real seamanship. The apostle Paul's journey from Caesarea to Rome was in large part a coastwise journey, and its incidents vividly set forth the dangers and hardships of early navigation. One wonders that so long a time was required for the expedition of the
Emperor Justinian to pass from Constantinople to the north coast of Africa, but this expedition, requiring three months, was not directed over the shortest course; instead it too was a coastwise journey, in so far as was possible, leading among the islands of the Ægean, along the coast of Laconia, to Sicily, to Malta, thence across the open sea to Tunis. In each of the expeditions referred to, the periplus must have been the pilot’s guidebook rather than the chart.

It is generally accepted that the oldest known periplus is that ascribed to Scylax of Caryanda. Neither the exact year nor the exact century can with certainty be given as the time of its composition. Herodotus relates in Book IV., chapter xlv., of his History, that “the greater part of Asia was explored by Darius, for he wanted to know where the river Indus, the second of all rivers in which crocodiles are found, flows into the sea, and to this end he sent out several trustworthy men, among them Scylax of Caryanda.” We cannot, however, be certain that the Scylax here referred to is the author of the periplus. Some of the records, contained in this periplus relate to geographical facts which belong to a time later than that of King Darius, while others in it allude to an earlier day. To all appearances, the greater part of it must have been written shortly before the time of Alexander the Great, and from the standpoint of Macedonia or Greece, seeing, as Kretschmer has noted, the author refers to a road from Corinth on the west coast over the isthmus to “our sea” as forty stadia in length. It includes the entire circuit of the Mediterranean, with a few omissions, beginning at the Pillars of Hercules on the European coast, tracing this coast eastward to the Tanais, thence
around Asia Minor and the African coast to a point opposite that of departure, and terminating at the island of Cerne, which island, it is stated, is twelve days' coasting beyond the Pillars of Hercules where the "parts are no longer navigable because of shoals, of mud, and of seaweed." The information given is confined to the immediate coast regions with attention directed to the physical features of the land, to the peoples, the rivers emptying into the sea, to the harbors, headlands, and shoals, with an occasional reference to inland cities in close touch with the coast. The distance from port to port is given, it being stated at the conclusion of his reference to the European coast that one hundred and fifty-three days are needed for a coastwise journey from west to east, and that five hundred stadia might be recorded as a day's sail.

The following quotations will serve to indicate the character of this periplus, which is not a document of great literary worth, though it has a unique value for the history of geography:

"I shall begin," says the author, "at the Pillars of Hercules in Europe, and shall continue to the Pillars of Hercules in Libya, and to the land of the great Ethiopians. The Pillars of Hercules stand opposite to each other, and the distance between them is one day's sail. Not far distant lie two islands by name Gadeira. On one of these is a city which is distant one day's sail. Beyond the Pillars of Hercules which are in Europe, there are many trading stations of the Carthaginians, also mud, and tides, and open seas." He notes that the Iberians are the first peoples to be met with in Europe, and refers to a Greek town which is called "Emporium," adding that "its inhabitants are colonists who came from
the city of Massilia.” “Seven days and seven nights are necessary for coasting along the country of the Iberians.” Referring to the Ligurians, it is noted that they are to be found “beyond the river Rhone as far as Antium. Here lies the Greek city and port Massilia, also the colonies of Massilia, Taurnois, Olbia, and Antium. It requires four days and four nights of coasting from the river Rhone to Antium. The entire region from the Pillars of Hercules to Antium is very rich in harbors.” Concerning Libya, it is stated that it lies beyond the Conopic mouth of the Nile. “The first peoples to be met with are the Adymachidæ. From Thonis the journey to Pharos, which is a desert island, is 150 stadia. In Pharos, there are many harbors, but the ships get drinkable water at Marian. From Pharos to this port is a short sail. Here is also a peninsula and a harbor. To this point is 200 stadia. Beyond lies the Bay of Plinthine. From the mouth of the Bay of Plinthine to Leuce Acte requires a sail of one day and one night, but if you should sail around the head of the bay twice as much time would be required. One next comes to the city of Apis, and as far as this point the country is governed by the Egyptians.” In this wise the entire Mediterranean coast region, with minor omissions, is followed with attention directed to the time required in day and night sailing to pass a designated territory, to the inhabitants of the regions passed, to the towns, especially those of Greek origin, to the geographical features, with an occasional reference to the manners and customs of the peoples. If a chart accompanied the periplus of Scylax, there is left to us no knowledge of it.

In addition to this oldest and most elaborate of all known periploi, certain early descriptions of limited
Sea by Arrian, who at one time was a prefect of Cappadocia. His description is given in a letter to the Emperor Hadrian. It could hardly have been intended as a pilot's guide-book, though it contains valuable information for those who had occasion to navigate the Black Sea coasts. To the above may be added a fragment by Marcian, probably of the fifth century of the Christian era, which includes a part of the Asia Minor coast, and an anonymous periplus of the Black Sea valuable for its record of distances not only in stadia, but also in Roman miles.

Among those interested in the preparation of charts and sailing directions for seamen, a place of importance is held by Marinus of Tyre. Strangely enough, our knowledge of him and his work is confined to what we may gather from the works of Ptolemy, who lived in the second century of the Christian era. In chapters vi–xx of Ptolemy's geography, Marinus' contributions in this field are critically treated, and from what is there stated, we are justified in inferring that he had carefully examined numerous itineraries and accounts of voyages, that he had prepared a chart to include the regions he described, and that he gave particular attention to the coasts in his work, which was primarily intended for navigators. Ptolemy tells us that in his own work he improved upon that of Marinus, although he gives to the Tyrian full credit for what he had done. We probably have in some of the Ptolemy maps the representations of Marinus. There is reason for believing that there were marine charts passing under the name of Marinus of Tyre, in the second century of the Christian era, which charts were in use by the pilots of the
Mediterranean, the Black, and the Red seas, though such charts seem to have disappeared shortly thereafter.

The Greek periploi were probably employed throughout the Roman period, since in Latin literature no reference is found to original sailing directions for mariners.

A periplus, not second in importance to that of Scylax, and perhaps nearly eight hundred years later, is the so-called Byzantine Stadiaemos. Neither the date when originally written, nor the author is known. It is preserved to us only in part in a manuscript of the tenth century, belonging to the Royal Library of Spain, and once the property of Constantine Laskaris, who, after the middle of the fifteenth century, fled from Constantinople on the coming of the Turk. It has been assigned to the fourth or the fifth century, but internal evidence seems clearly to show that in the form in which it has come down to us there are additions and alterations of later date. The author gives us to understand that it was constructed on the written and the verbal reports of navigators, and that he had set out to present a very exact periplus of "The Great Sea," including a statement of distances from port to port, from island to island, how best to approach them or to direct the course in passing them. It distinguishes between harbors and mere places of anchorage; it indicates whether a port designated is suitable for large or for small vessels, and occasionally states what notice should be taken of the winds in making an approach. Often the details are minute in describing the physical features of certain harbors and coasts, in giving information concerning localities where potable water may be obtained, in pointing out the several important landmarks, such as temples,
castles, or other buildings, sand hills, rocks, small islands, headlands, or forests, with an occasional warning that great care should be exercised in navigating certain waters. Apparently it included in its original form the entire Mediterranean and Black Seas. Starting at Alexandria, which city therefore is suggested as the home of the author, it followed the coast to the Pillars of Hercules in Africa, then from the same starting point to eastward, continuing to the Pillars of Hercules in Europe.

It is especially interesting to find that instead of limiting the periplus to a continuous description of the coast of the mainland, a periplus of many of the islands is given, notably of Cyprus and Crete, with which descriptions the Stadiazmos is concluded. Numerous directions are given for sailing from island to island, or from mainland to island, that is, for crossing the sea diagonally; also for sailing in various directions from certain points, as from Rhodes in no less than twenty-five directions, or from Delos in sixteen directions.

Such statements as the last suggest a possible explanation for the introduction of crossing points as they appear later on the portolan charts, though on these charts the radiating points, it is true, have not generally been placed at conspicuous ports, but appear rather to have been inscribed regardless of any particularly important geographical centres.

The Stadiazmos is an exceedingly valuable record for the study of the historical geography of the coast regions covered and may well be considered the most important document known, linking in a sense the older Greek periploi with the later Italian portolans.

A brief extract will serve further to indicate its
character. “1.—Sailing westward from Alexandria to Chersonesus is 70 stadia. Here is a harbor for small vessels. . . . 13.—From Phenicus to Hermæa is 90 stadia; anchor here with the cape on your right. There is water here in a tower. 14.—It is 20 stadia from Hermæa to Leuce Acte; nearby is a low island which is distant two stadia from the land. Boats carrying merchandise can anchor here, entering by the west wind, but near the shore below the promontory there is a wide roadstead for vessels of all kinds. Here is a temple of Apollo, a famous oracle. Near the temple there is water.”

In the periplus of Cyprus, which is a part of the Stadiasmos, we find, for example: “297.—Acamas to Paphos, with Cyprus on the left, is 300 stadia. The city is located toward the south. It has three harbors which are accessible with all winds, and a temple of Aphrodite. . . . 304.—From Pedalium to the islands is 80 stadia. Here is a deserted town called Ammochostus; it has a harbor, and may be approached by all winds, but there are low rocks at the entrance. Enter with care!”

In the directions for the circumnavigation of Crete, we find such information as the following: “336.—From Biennon to Phalassarna is 160 stadia. Here is an anchorage, a market-place, and an old city. The island Insagura is distant 60 stadia towards the east. It has a harbor and near the harbor a temple of Apollo. Here is also another island at a distance of 3 stadia, called Mese; it has an anchorage. The third island is called Myle. The channel is deep. It has a market-place.”

If to the above periploi of the Mediterranean we add the account of the expedition of Hanno of 465 B. C.
along the coast of Africa, perhaps as far as Sierra Leone, which account contains much information of interest, not unlike in character that given by the periplus of Scylax, and the Ora Maritima of Avienus, describing in like manner the Atlantic coast of West Europe, we have practically all in the way of directions for seamen that is preserved from antiquity.

The middle ages having little or nothing of value to present—a few scattered extracts from earlier writers, a few maps of no special value to navigators,—we may, therefore, pass directly to a word concerning the Italian portolans.

The Italian portolan, as has been stated, resembles the Greek periplus in style and composition. This suggests that these later sailing directions are a development from the former. Such a relationship, however, is not at all easy to establish, since no example is known clearly representing the transition. There is, moreover, in the Italian portolan that which gives it the appearance of a new and an independent production. Very many of the places along the coasts have names other than those in the early periploi; a large number of new names appear; many of the old ones are omitted, which fact suggests that places once known as important had ceased to be so considered; distances are given in miles instead of stadia, and direction is usually recorded.

The number of portolans known antedating 1500 is not large. In all there are about sixteen, some of these being mere fragments, others are very nearly complete for the regions under consideration, and most of them are in manuscript. Those coasts may be said to be included in the Italian portolans which Italian traders were accustomed to visit, that is, the coasts and islands of the
Mediterranean, the Atlantic coast of Europe as far as Flanders, the south coast of England and Ireland, with the Atlantic coast of Africa to the vicinity of Cape Bojador, including the Canary Islands. It is interesting to note that these are the coasts included in the great majority of the portolan charts, with additions, as geographical knowledge expanded, until they became in some instances world charts.

The latest Greek periplus of importance—the Stadiasmus—is of the fourth or fifth century; the oldest of the medieaval portolans is of the eleventh century, and is to be found in the Ecclesiastical History of Adam of Bremen, being rather an imperfect sketch of the coast from the mouth of the Maas River to Acre in Palestine. The text of this portolan, together with the text of the others known, may be found in a critical work by Kretschmer, Die italienischen Portolane des Mittelalters, pp. 233-552.

The following somewhat free translation of passages contained in the Parma-Magliabecchi portolan of the early fifteenth century will serve to illustrate the character of these Italian harbor books prepared for seamen.

"45.—From Carminar to Cartagena is 20 miles—northeast by east. Cartagena is a good port at all seasons, before which port there are islands a mile distant. You may pass between any of these islands and the mainland which forms a point. As you enter the port, beware of shoals. Sail close to the middle of the channel, but towards the northeastern shore, where you may anchor. Beware of sailing too close to a shoal recently discovered on the east side. Enter the port, keeping the mainland about two prows' lengths distant, where you have six and six and a half fathoms of
water. About the year 1445, it is said, a ship was wrecked here during a calm, though the vessel did not strike a rock. The landmark of Cartagena is a high bald mountain on the east. On the west lies another mountain. Between is the entrance to Cartagena. Near the entrance lies an island, and you may pass between this and the mainland. Passing the island, you enter deep water, and a good anchoring-place.”

“54.—From Sallo to Barcelona is 60 miles east-northeast, quarter east. Barcelona is a city with a shore which lies toward the east having a roadstead with a depth of 22 paces, in front of the city. On the southeast by south of Barcelona is a low place called Lobrigato. In departing, steer to the east from the shore, taking notice of a castle which rises from a depression leading toward Sallo.

The landmark of Barcelona is a high, abrupt, and isolated mountain called Monserrate. When you are northeast of this, continue in that direction, and you will observe a low mountain with a tower on it called Mongich (Montguich). Here is Barcelona.”

“56.—From San Filio to Palamosa is 10 miles east-northeast, quarter east. Palamosa is a good port facing a tower where you may anchor. In case you come from the east, take care of a shoal that is close to the point. From Palamosa to the anchoring-place of Acqua Fredda, 12 miles east-northeast, quarter east. Do not approach nearer the land than one and a half miles by the beacon. The landmark of this bay is a high mountain, bald and cut sheer to the sea, with islands in the distance.”

It may be noted that the portolans make their appearance with the awakening of the commercial activities
in the coast cities of Europe, notably in the Italian cities, about the tenth or eleventh century, and that for a period of two or three centuries, they served the mariners as a necessary guide in navigation, just as did the periploi in the earlier day. But the quickened commercial activities, coupled with the discovery and use of the compass, were calculated to lead to a speedy substitution of the chart for the portolan, and portolan charts make their first appearance in what it seems proper to call a very advanced state of development in the years of transition from the thirteenth to the fourteenth century. The stages and the processes of that development we do not know with certainty. We may, however, rest assured that there is a very close relationship between the compass and the portolan chart, as such charts multiply very rapidly in the years following the application of the compass to navigation, but we cannot be quite sure that they owe their origin to the use of the compass. It seems, therefore, not appropriate to call these charts compass charts as has often been done, if thereby we mean to imply that they are based fundamentally on information acquired through the use of the compass. Though the crossing lines may indicate sailing directions, they have not the real character of loxodromes, since they were not constructed on those scientific principles which enter into real loxodrome charts, and furthermore it may well be doubted that the earliest charts of this character were furnished with crossing lines. The term loxodrome chart is likewise not conclusively an appropriate name for them. We may say, in short, that we find in them some of the elements of the simple loxodrome chart, that is, one crossed with lines running from port to port to indicate sailing direc-
tions; the elements of a compass chart in which the compass has played a part in determining location and direction; the elements of the ancient periplus—the oldest known pilot-book for navigators; the elements of the mediæval portolan, which is a more elaborate description than is the former of coasts and harbors and sailing directions; and that we find in the portolan the chief corner-stone on which rest the charts here under consideration—hence we may very appropriately call them portolan charts. It may be further stated by way of explanation that Carta nautica is the term which is generally employed by Italian scholars in referring to these charts. With them the word portolano signifies only a coast or harbor-book. The chart-makers themselves, in referring to their work, most frequently used the word carta. On the oldest dated portolan chart, we find the legend “Petrus Vesconte de janua fecit ista carta anno domini MCCCXI,” and in a legend on the first chart of his atlas of 1313, we find the word tabulas employed. In a chart dated 1605, Maiolo uses the term carta nauticatrix. Occasionally the word employed by a chart-maker to refer to his work is merely the personal pronoun, as “Vicentius Prunes in civis Majoricarum me fecit anno 1597.”

Portolan charts have been preserved in very large number, of which number near one hundred antedate 1500. In the sixteenth century unaltered in their fundamental character but more highly decorated than those of the fourteenth century, and having additional details, they become far more numerous. With a few exceptions, they are the work of Italian and Catalan chart-makers, a fact which is especially true of the earlier examples. Herein is a most significant witness of the leadership exercised
by the seamen of the Italian and of the eastern Iberian Peninsula; a leadership held for near half a millennium, beginning as early as the eleventh century, and continuing until America had been discovered, Africa had been circumnavigated, and the water route to the Indies had been made known.

In general they are drawn on parchment, as has been stated above, that is, on sheep skin, goat skin, or calf skin, but in time paper came to be used, after which the number of charts of this general character, with additions of numerous details for the interior regions, was greatly increased by means of the printing-press.

They are preserved in two forms, either in single sheets, or in sheets bound together, as an atlas, and these atlases, in a few instances, contain as many as twenty or twenty-five charts. In size the sheets vary from 11 x 15 cm. in the very remarkable charts of the Tammar Loxoro atlas of the fourteenth century to 70 x 148 cm., the size of the large single sheet chart drawn by Pareto in the fifteenth century. The larger world charts, as the Canerio, were drawn on two or more parchment sheets, which were securely joined together. In the case of the single sheet charts, the size, it seems, was most often determined by the size of the skin on which it was drawn, it being true in most cases that the entire skin was used, even the neck being retained, which fact accounts for the peculiar and apparently unnecessary extension of the sheet usually on the left. In the portolan atlases, the several leaves were often made of two sheets or skins pasted together on the rougher surface, leaving the smoother surface for the drawing, which surface received the colors to much better advantage.

These charts, as before stated, include in general the
regions which are referred to in the portolans. The single sheet charts embrace the Mediterranean, and the Atlantic coast of Europe which terminates in the north either at Cape Finisterre or the Scandinavian Peninsula, with a part of the Baltic Sea and the British islands. In the east they include the Black Sea, in the south a part of the Red Sea and the north coast of Africa, with the Atlantic coast of this continent to a point near Cape Bojador.

In the atlases the Mediterranean is usually divided into three sections with one chart for each; one chart includes the Black Sea, and one or two set forth the Atlantic coast regions.

If additional charts were added they usually included a world chart, one or two for the African coasts, one perhaps for the British islands, one for the Baltic, and one or more for the southern Asiatic coasts. A superior example of an enlarged though early portolan atlas is that recently issued by The Hispanic Society of America in facsimile, being a reproduction of a British Museum manuscript, and edited by the author of this monograph.

Portolan charts are projectionless, that is, they do not appear to have been drawn according to mathematical principles or rules, though they were probably based upon measurements and careful calculation. Their striking approach to accuracy, especially for the Mediterranean region, is, as before stated, one of their most remarkable features. No two are alike, and yet they have so many features in common that it appears they are copies of a common original, or that there has been a conscious imitation by each chart-maker as he has set himself to his task of chart-making.

It is well established that most Roman maps were
oriented with the south at the top, an arrangement which is to be met with in the majority of Arabic maps. Maps of the early mediæval centuries have the east at the top, and on the uppermost border a representation of the earthly paradise, as if to give this prominence, it being perhaps the chief factor in determining the orientation. Portolan charts, with rare exception, are oriented with the north at the top, an idea which has since prevailed in all map construction. Herein one seems to find evidence of the influence of the compass in chart construction.

A critical examination will show that in the draughting the chart is turned slightly to the left, the amount being near one point of the compass. As a result of this, geographical localities, on the right of the chart for example, are placed relatively too far to the north. Although there is in this fact the suggestion that the compass had been employed in their construction, or in making the observations on which they are based, and that the declination of the needle had exerted an influence, it may be noted that an acceptable argument has been advanced showing that Constantinople on maps since the time of Ptolemy had been placed too far north by at least two degrees. It appears, therefore, that the error in part is one handed down from an early day. The existence of the error will be readily seen on a critical examination of the location of any selected point in the eastern Mediterranean.\(^1\) As to the length of the Mediterranean from east to west, the near approach to accuracy is also most striking. The error in very many of the sixteenth-century maps, traceable to Ptolemy, and appearing on his maps, is nearly twenty degrees, whereas

\(^1\) *Vid.* Reproduction No. 22 for an exception.
on the portolan charts the error seldom exceeds one degree.

Into a critical consideration of the problems of scale and distance as represented in portolan charts, we shall not be able to enter in this brief description. It is interesting, however, to note in this place that the same scale does not appear to have been employed for the Atlantic coast that was employed for the Mediterranean. Though this fact is not always strikingly prominent, yet it is clearly indicated in a large number of the charts.\textsuperscript{1} Herein we may find an explanation for the frequent distortion of the coast regions lying beyond the Straits of Gibraltar, and for the fact that the extension of Europe in latitude is greatly reduced. It may further be noted, as a partial explanation of some of the portolan chartmakers' errors, that it is physically impossible to represent on a plain surface correct distances, retaining at the same time correct latitude and longitude.

A scale of miles divided into fifths or tenths is usually drawn on these charts, often in as many as four or five different places, and frequently on charts of later years in a very elaborate cartouche. It is often very evident that the drafting of such a scale was not done with careful attention to accuracy. Uzielli is of the opinion that it was the Roman mile of 1481 m. which was generally taken as the unit of measurement.

Prior to 1500, degrees of latitude and longitude were seldom if ever indicated on portolan charts, and it may be noted that degrees of latitude are first to be met with on the marine chart of Canerio, recently issued by the author of this paper in size of the original.

A feature of these charts, never failing to attract, is

\textsuperscript{1} \textit{Vid.} Reproduction No. 20.
the network of lines with which they are crossed. Though in some instances, a large number of these lines appear to have been drawn as mere fancy directed, it will generally be found that they are arranged according to a carefully devised scheme, and that the lines, usually thirty-two in number, radiate from a number of crossing points, systematically distributed over the chart. The number of crossing points is not always found to be the same, this being frequently determined by the size of the sheet. On portolan charts there will usually be found a central point of radiation about which, in a circle, whose diameter is very nearly the width of the sheet, eight or sixteen other crossing points are represented, each of which is connected with the centre and usually with every other indicated point. On the larger sheets, additional crossing points appear, which points, it will be observed, also fall into a well-arranged system. There was no attempt at a special ornamentation of these crossing points in the earlier charts, but with the passing years, we find now one, now more, especially designed figures for them: wind roses or compass roses these have been called. It is in part due to the peculiar design of these roses that the name compass chart first came into use. While the ornamentation is not always clearly that resembling the compass card, it frequently is such, having that point which is directed to the sidereal or true north extended as if to represent the magnetic needle, but this extension, it will be noted, never indicates the needle’s declination. Not until 1532 do we find a printed chart on which the variation of the compass is represented, this being on Ziegler’s map of Palestine, and not until 1595 is this declination represented on a marine chart. It is not infrequent that these ornaments are a most striking
feature of portolan charts, though adding little to their scientific value.

The suggestion has been made that the crossing lines were originally intended as construction lines, being laid down by the draftsman to guide him in sketching his coasts and in locating his places of special geographical interest, but so few are the instances which might be cited in support of the theory, that one is safe in asserting it to have been the rule with chart-makers to insert the lines after their charts had been drafted.

In the ancient day, it was a common practice with those who had occasion to refer to such matters, to designate each quarter of the heavens by the wind which blew from that quarter. The north was Boreas, the west was Zephyrus, and the number of winds, that is, directions, at first limited to four, was increased in time to eight, then to sixteen. The Italian chart-makers, in general, referred to the winds as eight in number, often representing them on their charts in the wind or compass roses by the first or initial letter of the name. These eight winds were Tramontana, the north, represented by the needle point = O, the northeast Greco = G, the east Levante, represented by the Greek cross = X, the southeast Scirocco = S, the south Ostro = O, the southwest Libeccio = L, the west Ponente = P, the northwest Maestro = M. We find herein a suggestion that the crossing lines were originally intended to represent the direction of the winds, that is, direction. In time, with the more general use of the compass, the older practice yielded to the newer practice with seamen and direction came to be referred to in terms of compass points rather

\[1 \text{Vid. Reproduction No. 12 for an excellent illustration.} \]
than in the names of the winds, as for example, *North*, *N by E, NNE, NE by N*.

The information as to geographical details which is contained in portolan charts, though not extensive, is of much historical interest. It will be observed that the coast lines, in general, have been sketched with care, and usually are continuous, broken only where rivers are represented as emptying into the sea. Bays and headlands, if not accurately inscribed, show that the chartmaker must have had before him information which had been intelligently collected. In some instances, the coast appears as a succession of short curved lines, the result of which is to add a feature of ruggedness. Legends are not inscribed directing attention to rocks and shoals, but these are indicated by small dots or crosses along the coast lines.

Care seems to have been exercised to have all islands represented, and while generally located with a near approach to accuracy, they are often found to be much out of proportion as to size.

The technique of portolan charts is by no means complex, as the geographical information, especially in the earlier charts, is limited to the coast of the mainland, or of the islands. Place names are numerous—for the coast of the Mediterranean alone, the number sometimes exceeds one thousand—and these names, running directly inland from the coast, with rare exceptions were written in small letters, though for the regional names, which were inscribed in the later charts, capitals were employed. Since the names run landward from the coast lines, it will therefore be noticed, as one examines the chart, having the north above, that many of the names are inverted. A large majority of the place names are in black, but it is a striking feature that many are in
red, and it is usually the same names so written in the several charts. This fact appears to have no other significance than that a certain special importance then attached, or at least once attached, to the place entered in red.

As these charts were intended primarily for the use of seamen, there was naturally little occasion for attention to the geographical features of the interior regions. These regions, wanting all reference to physical features particularly in the earlier charts, have, therefore, a certain prominence by way of contrast, being blank save for the crossing lines. With the passing years, more and yet more of geographical detail came to have representation on inland regions. River courses in time were represented, though at first with striking inaccuracy: mountain ranges were made to cross certain sections, but clearly attesting the want of exact information: important cities were often made more conspicuous by means of pictures,¹ but cities represented in the interior show a want of knowledge of their exact location. Territorial boundaries do not appear, but many of the separate states bear their respective names, and often in addition are distinguished by an appropriate and highly ornamented coat-of-arms. Castile, for example, has the quartered field with the castle on a red, and a red lion on silver, ground; Aragon, a red standard in a gold field; Portuguese territory, a banner having five dots in a blue field; the Knights of St. John, a silver cross on a red ground; Venice, the gold lion of St. Mark on blue ground; Turkish territory, a banner displaying the half moon; regions remote and unknown, as Tartaria, by a ruler on his throne or an elaborately drawn tent.

¹ Vid. For reproduction of picture of Genoa, p. 28, from Bartolomeo Olivo.
In addition to the features just described, legends were often inserted, where space permitted, referring to the products of the region bearing the legend, or to the character of the inhabitants of the same. Much of this information appears to have been derived from Pliny, Solinus, Isidor, or from travellers such as Marco Polo, or Nicolò di Conti. Such legends or descriptive records are, however, generally confined to the world charts of the portolan type which occasionally are to be found in portolan atlases, as for example, in the atlas of Bianco of 1436 or in such as the Catalan world chart of about 1450, belonging to the Royal Estense Library of Modena, Italy. Now and then one finds the earthly paradise represented, as in mediæval cloister maps. Gog and Magog were often located by the chart-makers, as was Prester John, properly adorned as a Christian ruler, and in the Atlantic we frequently find the so-called fabulous islands such as Antillia, Satanaza, Isla de Man, Brasil, St. Brandan.

Many of the portolan charts are both signed and dated, while many are wanting such inscriptions. Where author and date legend is given it is usually found inserted on the left of the sheet and is very brief, as, "Petrus Roselli compositum hanc cartam in civitate Maioricarum anno domini M cccc lx iij." ¹ It is seldom easy to determine the exact age of an undated chart, remembering that such as are dated frequently contain records which clearly indicate carelessness on the part of the chart-maker or the influence of tradition, as may be seen in the representation of a banner, after the authority so indicated in a locality has been overthrown. A noted instance of such false record is the representa-

¹ *Vid.* Reproduction No. 2. 25
tion of the cross of the Knights of St. John over the island of Rhodes long after that island had fallen into the hands of the Turks. It may further be stated that one is not always justified in giving to a chart a date prior to a known great geographical discovery seeing that such event is not recorded. Portolan chart-makers were generally inclined to make full use in their own records of that which they found at hand. The majority of them were loth to break with tradition or to correct an error, yet we cannot deny to some of them a place of leadership in trans-marine discovery as we find in their charts islands laid down far to the west in the Atlantic, the insertion of which, though not always resting on authentic discovery, unquestionably served to embolden such navigators as were eager for the finding of new lands.

It remains to refer to one of the most attractive features of portolan charts, that is to the colors employed. In some of them the work of the miniaturist of the period is seen at its best. In the earliest examples color was but sparingly used, but with the advancing years it became more and more a feature. The compass or wind rose, at first simple in character, seemed in time to offer to the chart-maker an opportunity to display his sense of the artistic, and not infrequently we find roses which are very elaborate. Banners to be truthful presentations needed color, and they often appear in great numbers and in brilliant tones. Much care was frequently given to drafting designs in which to inscribe the scale of miles, or to the addition of a suitable border for the chart. The effort to emphasize the importance of certain cities led to the addition of fine bits of miniature work to the chart’s decorations.
As the crossing lines appear at first to want system or order in arrangement, but on close examination are found to have been laid down in accord with a well-devised scheme, so the color as represented in these lines and in the compass or wind roses seems at first to have been added regardless of rule or of special plan, whereas chart-makers were here most careful in the observance of rule.

It may have been, primarily, for practical reasons that any color scheme was employed at all for the crossing lines. From the multitude of these lines confusion would have prevailed in the attempt to use the chart were the lines of one color. With rare exceptions, it will be found that the lines indicating the eight principal winds or directions are in black, the half winds in green, and the quarter winds in red. For the colors in the several roses or cards, a certain freedom prevailed, especially in the case of those of complicated design. Continental coast lines were generally colored but lightly, though occasionally there was a liberal application of green or blue which was often edged with a line of gold. The coast lines of the larger islands were usually treated as the continental coasts, but smaller islands were entirely covered with red, blue, silver, or gold, and in the case of the smallest of these islands, where numerous, the color was applied so as to produce the most artistic effect regardless of rule. Of the five or six colors employed, red, green, blue, black, gold, yellow, the red seems to be the best preserved.

Seldom was color employed for the larger bodies of water, except in the case of the Red Sea, which invariably exhibits the influence of tradition, being colored red, while on certain world charts of the portolan type,
the larger seas and oceans were covered with waving blue or green lines, as may be seen in the Catalan chart of 1450.

Such then in origin, character, and importance are portolan charts with which modern scientific chart or map-making had its beginning. Apparently first constructed in the thirteenth century they multiply rapidly throughout the fourteenth, fifteenth, and sixteenth centuries as before stated, retaining most of the characteristics exhibited in earliest examples. Though remarkable for their near approach to accuracy, it appears not a little surprising that the learned chart-makers of the sixteenth century did not in general accept them at their value until Ptolemy's maps, by actual astronomical measurements, had been shown to be inaccurate. With seamen, however, these manuscript parchment charts remained in favor long after the invention of printing and its use in the multiplication of maps and charts.
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Raccolta di Mappamondi e carte nautiche del XIII al XVI secolo [Ongania], Venezia. Seventeen charts are reproduced in photograph.


More than five hundred portolan charts and atlases are referred to by Uzielli e Amat which are to be found in fifty-four public and private libraries. Referring only to the larger collections, it may be mentioned that ninety-five of these charts and atlases are to be found in Venice, the majority of them belonging to the Biblioteca Marciana, and the Museo Civico; sixty-six are to be found in Florence, chiefly in the Archivo di Stato and the Biblioteca Nazionale; fifty-two are listed as belonging to the British Museum; twenty-six belonging to the Biblioteca Nazionale of Naples; seventeen to the Bibliothèque Nationale of Paris; seventeen to the Archivo del Collegio di Propaganda in Rome; sixteen to the Biblioteca Ambrosiana of Milan. In the other collections designated the number varies from one to fifteen. Comparatively few portolan charts and atlases are to be found in the libraries of the United States. The largest collection is that belonging to The Hispanic Society of America, in which there are thirty-two, the great majority of which are here described for the first time. In the Edward E. Ayer collection of the Newberry Library of Chicago, there are twenty-one; in the Library of Congress three, and in the John Carter Brown Library of Providence there are two remarkably fine atlases.