

IV.

Ancient, not Ptolemaic atlases.

HERODOTUS begins the 49th chapter of his fifth book *Terpsychore* with the following words: «When Cleomenes was king in Sparta, Aristagoras, the ruler of Miletus, arrived there. And when the latter went to speak with Cleomenes, he brought with him — so the Lacedemonians say — a copper-plate, on which the circle of the whole earth was engraved, and the ocean, and all the rivers.» It is expressly said that ARISTAGORAS referred to this drawing in his attempts to make the king of Sparta assist the Ionians against the Persians. This happened in about the year 500 B. C. We have no further information about this map, and the conjectures that it was constructed by HECATEUS, a countryman and contemporary of Aristagoras, or by the Miletian ANAXIMANDER, who was living one generation earlier, and who, according to a quotation by Strabo (lib. I. cap. 1) from Eratosthenes, made the first map of the world, are without any foundation. But it is in this passage of Herodotus that a map is mentioned in literature for the first time, and that not merely as a valuable curiosity, but as the means of explaining the relative position and extension of the dominions of the king of Persia as regards the Ionians and Greeks, at a negotiation of extreme importance to the independence of the whole Grecian nationality.

There are a few other instances of maps being mentioned in Greek and Roman literature, and then only incidentally, and in a way which denoted that they were scarcely so generally used and so important in antiquity as in our time. CLAUDIUS AELIANUS, for instance, relates in *Variæ Historiæ*, III: 28, that Socrates, in order to check the vanity of Alcibiades regarding his large estates, brought him to a place, where a map of the world was exhibited, and asked him to point out on the same where his estates were situated. DIOGENES LAERTIUS mentions (lib. V cap. II) that THEOPHRASTUS had bequeathed a portico in the vicinity of the Lyceum at Athens, for the suspension of a map of the world. Pliny speaks in lib. III cap. II of a map, whose construction and mounting in a portico at Rome «*ex commentariis M. Agrippæ*» was commenced by his sister and finished by AUGUSTUS. In the geography of STRABO (f. i. lib. II cap. IV) some very insufficient rules are given as to the drawing of maps, while in the work of the great geographer references to maps in order to facilitate the understanding of the text, are exceedingly rare and scanty. Other similar, but still more meagre notices of maps having existed in antiquity may be found in the writings of the philosophers and poets. But, with the exception of Ptolemy's atlas (and Ptolemy's description of the charts of Marinus of Tyre) and the Itinerarium of CASTORIUS (?) (*Tabula Peutingeriana*), there is no ancient atlas extant, nor the description of any sufficiently intelligible to make it possible that a reconstruction could be effected, at least of its main features. With regard, for instance, to one of the maps of antiquity, the above mentioned map of Agrippa, most often referred to and long ago commented upon more than enough, we have not arrived farther than that it was declared by MOMMSEN to be round, by MÜLLENHOPF to be an oval, by DETLEFSEN to be square, by MANNERT and others to be oblong (compare KONRAD MILLER, *Die Weltkarte des Castorius*, Ravensburg 1888, p. 69). This is not to be wondered at, as all we ac-

tually know of it is contained in the words, «*orbis terrarum urbi spectandum expositus.*»

The cause of this deficiency in classical literature evidently depends on the fact, that the geographers and philosophers of antiquity were principally occupied with theoretical schemes of the «*Orbis terrarum*,» considering it beneath their dignity to work out really practical, detailed maps. In the middle ages the same predilection for generalization still prevailed. At least I suspect that allusion to the existence of the excellent Italian or Catalan portolanos of the 14th and 15th centuries will seldom be found in the writings of the learned men of that time.

At all events, the above quoted passages show, that practically serviceable maps existed in Greece and Rome several centuries before the days of Marinus of Tyre and Ptolemy. But not one of these maps is still extant, and owing to the scanty descriptions given of them, it is impossible to form any idea of the manner in which they were drawn. It is, however, possible that the maps of which fac-similes are given on Tab. XXXI from old editions of MACROBIUS and SACROBOSCO, were ultimately founded on præ-Ptolemaic originals. They give us at least a faithful, although roughly sketched representation of the notion prevailing in antiquity respecting the relative positions of continents, islands, seas, and oceans of the earth. It is also possible that the remarkable medieval charts, known under the name of portolanos, compass or loxodromic maps, were originally founded on the maps of Marinus of Tyre, described in Ptolemy's geography. At least the portolanos have played the same part with regard to the first *tabula novæ* in Ptolemy's geography, as the maps of Marinus did with reference to Ptolemy's own original maps.

The following Catalogue of the few and insignificant maps printed before 1520, without any direct connection with the different editions of Ptolemy's geography, will give an idea of the predominance of the old Alexandrian geographer even during the greater part of the first century of geographical discoveries.

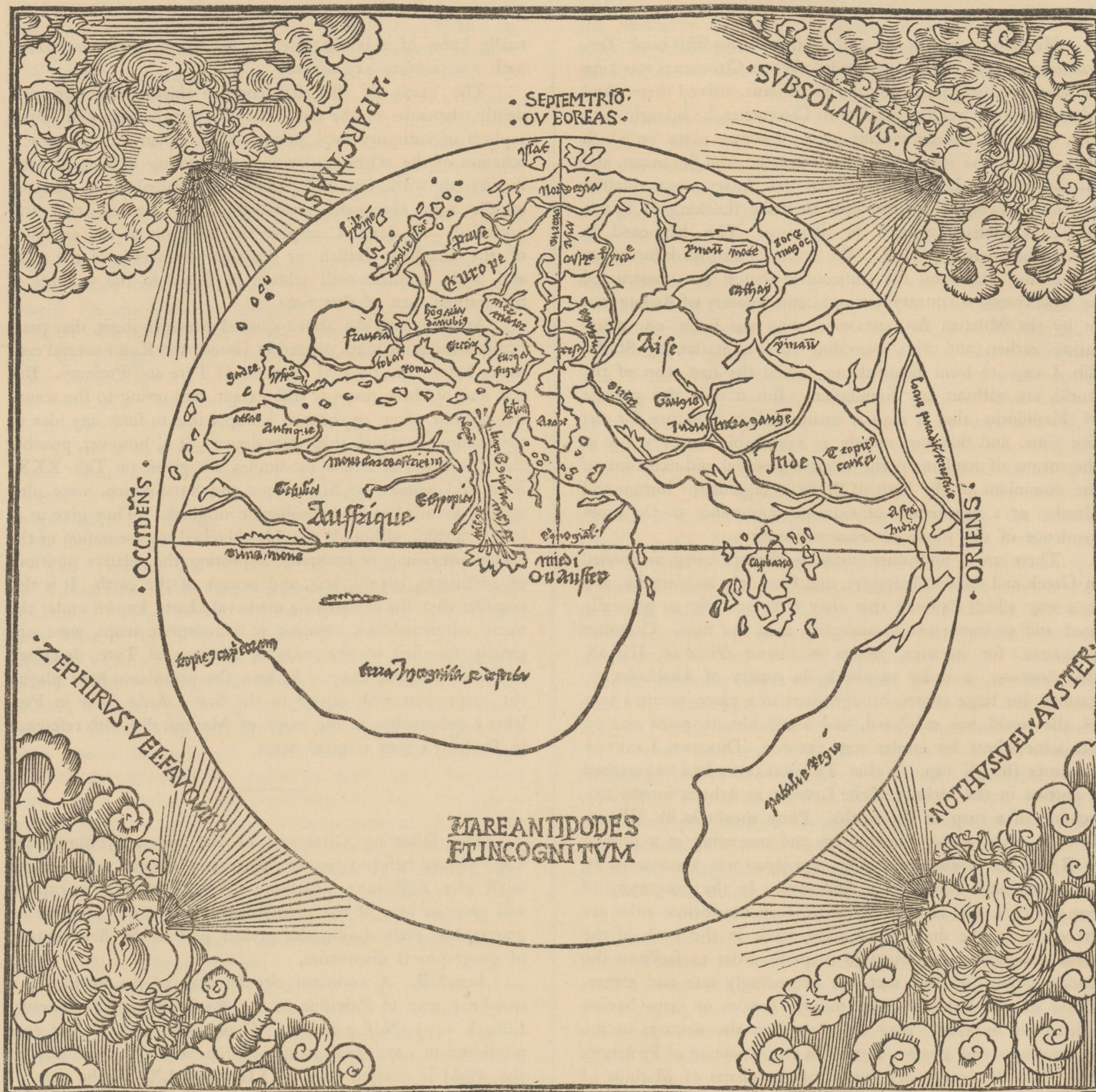
1 and 2. A wood-cut circular map of the world, and a wood-cut map of Palestine in the *Rudimentum Novitiorum*, Lübeck 1475 (N. f. 2 and 3). These maps are the first ever published in print with an unquestionable date. The map of the world is inserted fols LXXVIII and LXXV, the map of Palestine fols CLXII and CLXIII of this bulky folio volume, printed on vellum, or on uncommonly thick paper. In the postscriptum or long colophon it is stated, that the book «with the aid of the art of printing newly invented by the special grace of God to the redemption of the faithful,» was published to serve as a manual to students, and to dispense the poorer of them with the necessity for buying other books. Here it is further mentioned, that the work was finished in Lübeck the day of Oswald MCCCCLXXXV and printed by *Magister* LUCAS BRANDIS DE SCHASS. The work is at present very rare. The Library of the University of Upsala possesses a copy printed on vellum, which is not quite com-

plete, and a perfect copy printed on thick paper is preserved to the town library at Lübeck. The fac-similes here are from that copy, to which I had access through the courtesy of the Librarian, Dr. C. CURTIUS.

3. A map of the world in *Pomponii Mellae Cosmographi Geographia: Prisciani quoque ex Dionysio Thessalicensi de situ orbis interpretatio*. (Colophon): Erhardun

Votum ponitur bene merenti humano viro aspiranti flores novellae aetatis necessarios ad vermiculatos calles geographiae.

4. *Isolario di Bartolomeo da li sonetti*, s. l. e. a. 8:0. In about 1477 a description of the islands of the Greek Archipelago, written in sonnets and accompanied by a number of small maps, resembling the small maps in the *Isolario* of BORDONE was printed in Venice under this title. No



18. Map of the world from *La Salade nouvellement imprimée*, Paris 1522. (Orig. size 254 × 257 m. m.).

raddolt Augustensis impressit Venetiis 1482. Laus Deo. 4:0. (N. T. XXXI). The map which occupies the first leaf of the book, is generally wanting, but that it really belongs to the work is shown by the water-mark corresponding to the water-mark of the text.

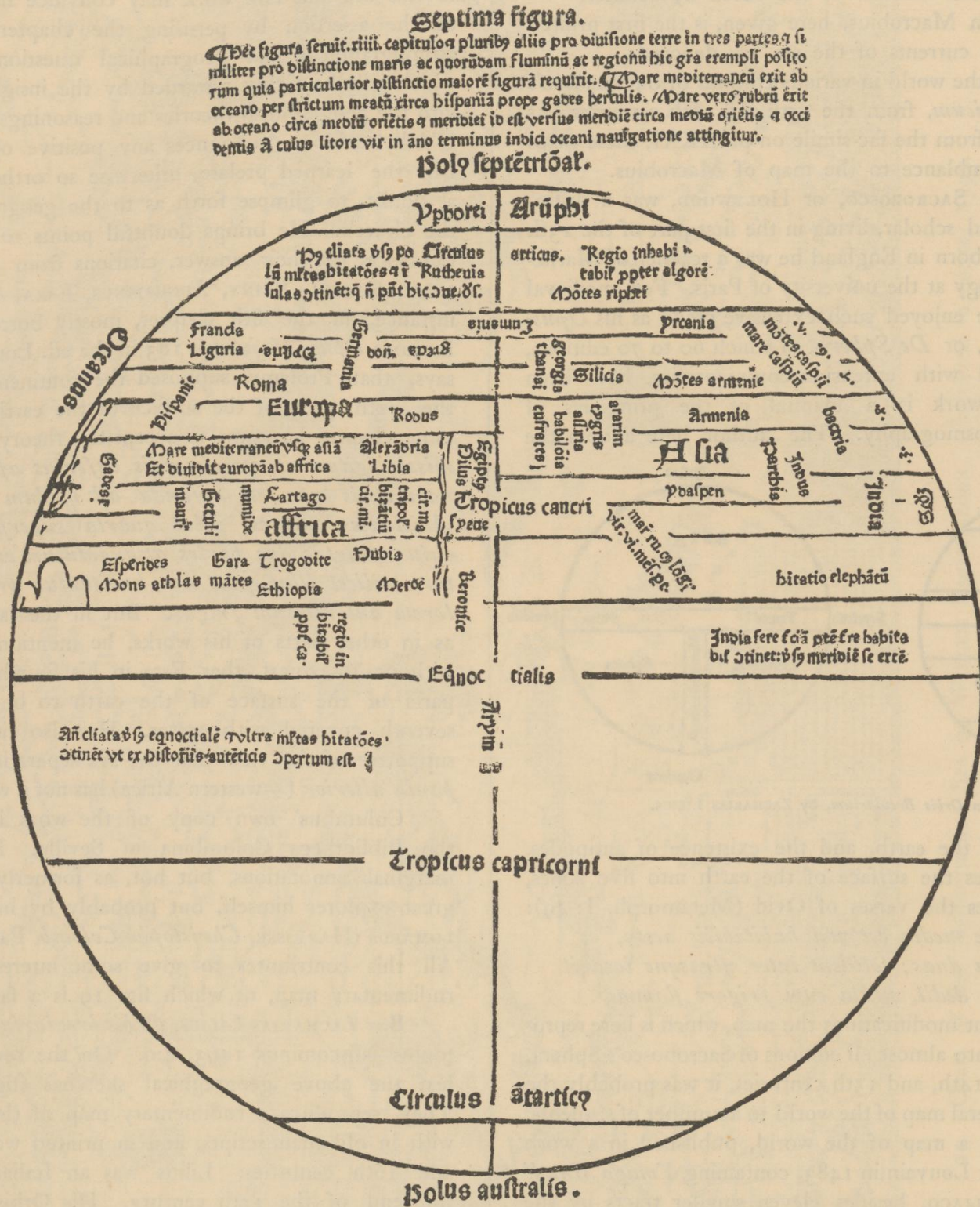
If we except the more correct form given to Scandinavia, it is a reproduction of Ptolemy's map of the world on a reduced scale. The curious inscription may have to be read:

large map is to be found in this edition, but in a later one of 1532 a map of the world, resembling the oval map of BORDONE (N. T. XXXIX), was inserted. As I only had the opportunity of examining this rare work superficially in the Biblioteca Marciana, I must refer to CARLO CASTELLANI, *Catalogo ragionato delle più rare o più importanti opere geografiche a stampa che si conservano nella biblioteca del Collegio Romano*, Roma 1876, p. 66, for a fuller description. In one

of the sonnets the author names himself BARTOLOMEO DA LI SONETTI. He states himself to have been a skilled sailor, who
*»Quindece volte intrireme son statto
 officiale e poi patrone in nave,*
 and who
*»ho piu volte ogninsula chatchatta
 e porti e vale e scogli i sporchi e i netti
 col bosolo per venti ho i capi retti
 col stilo in charte ciaschuna segnatta».*

Although the maps in the work of Sonetti are very insignificant, yet they are of a certain interest as being the

AURELIUS MACROBIUS lived at the end of the 4th and the beginning of the 5th century. His *Interpretatio in Somnium Scipionis* contains, besides essays on different metaphysical and cosmographical topics, some curious geographical speculations in the 2d book, the meaning of which was explained, when the work was printed, by means of a map, probably copied from a sketch in some old manuscript. A map is also referred to in the text, in the following words: *Omnia haec ante oculos locare potest descriptio substituta, ex qua et nostri maris originem, qua totius una est, et*



19. Map of the world from *Ymago Mundi*, by PETRUS DE ALIACO, c. 1483. (Orig. diameter 202 m. m.).

first printed maps of which it is expressly stated that they are founded on actual measurements.

5. The edition of MACROBIUS, published at Brescia (Brixia) in 1483, under the title *»In Somnium Scipionis Expositio,* contains a map of the world of which a fac-simile is given on T. XXXI. The same map is reproduced almost unaltered in several later editions f. i. Brixia 1501, Venetiis 1521, Venetiis 1574, and others. In the edition Basilea 1535 this sketch of the earth is replaced by a map of the old hemisphere, on which Africa is drawn in accordance with the later discoveries, but even here the inscriptions *Aethiopia perusta* at the equator, and *Frigida* at Africa's southern extremity, still remind us of the old prototype.

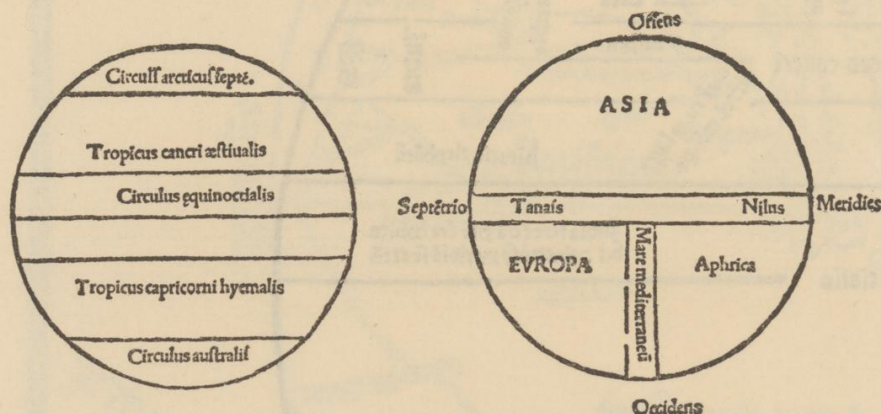
Rubri atque Indici ortum videbis. Caspiumque mare unde oriatur invenies, licet non ignores esse nullos qui ei de oceano ingressum negent. On this map the Caspian Sea is drawn, not as an inland sea, but as a large gulf of the eastern ocean. The passage in which Macrobius treats of the shape and extension of the inhabited world, is quoted by HUMBOLDT (*Kritische Untersuchungen* etc., I p. 166). It is scarcely quite intelligible, but it may be conjectured, that Macrobius considered the earth to be divided by the ocean-currents into four large islands, of which two were in the northern and two in the southern hemisphere. The equatorial zone, which separates the northern and southern islands, was supposed to be a sea impassable from heat, but Macrobius speaks of no

obstacle to navigation between the two islands in the northern hemisphere. Humboldt remarks that this remarkable passage was not referred to by Columbus in his letters, although several editions of Macrobius had been published before 1492, and Columbus, through his own studies and the assistance of his friends, seems to have been familiar with the *dicta geographica* of the classical authors and to have placed great reliance on them. According to LETRONNE (HUMBOLDT, *Krit. Untersuchungen*, II p. 82—91) the geographical theories of Macrobius have probably been borrowed from some old commentaries on the description of the currents of the ocean by Homer.

The map from Macrobius, here given, is the first printed map on which the currents of the sea are denoted.

6. Maps of the world in various editions of SACROBOSCO'S *Opusculum Sphericum*, from the 15th and 16th centuries. As may be perceived from the fac-simile on pl. XXXI, these maps bear a strong resemblance to the map of Macrobius.

JOHANNES DE SACROBOSCO, or HOLYWOOD, was a distinguished and learned scholar, living in the first part of the 13th century. Though born in England he was a teacher of Mathematics and Astrology at the university of Paris. Few medieval literary works have enjoyed such extensive credit as his *Opusculum Sphericum*, or *De Sphera*, of which 60 to 70 editions, generally provided with extensive commentaries, have been published. The work is a manual of the principles of astronomy and cosmography. The author here adopts the



20. From *Orbis Breviarium*, by ZACHARIAS LILIUS.

spherical form of the earth, and the existence of antipodes. At least he divides the surface of the earth into five zones, to which he applies the verses of Ovid (*Metamorph.* I: 49):
*Quarum quæ media est non habitabilis æstu,
 Nix tegit alta duas; totidem inter utrasque locavit
 Temperiemque dedit, mixta cum frigore flamma.*

With but slight modifications the map, which is here reproduced, is inserted into almost all editions of Sacrobosco's *Sphera*. During the 13th, 14th, and 15th centuries, it was probably the only accessible general map of the world to a number of students.

7. Frame to a map of the world, published in a work probably printed at Louvain in 1483, containing *Ymago Mundi* by PETRUS DE ALIACO, besides eleven smaller tracts by the same author and four by JOHANNES GERSON. PETRUS DE ALIACO, or PIERRE D'AILLY, was a French prelate and cardinal, celebrated for his learning. He had great influence on the theological controversies of the age, especially during the council at Constance, where he, amongst others, took part in the sentence of death on Huss. He died in about 1422, and the *Imago Mundi* was, according to a statement at the end of the work, finished in 1410.

As this work has a certain importance in the history of the discovery of the new world, it may here be remarked that the place of printing and the date (Paris c. 1490) generally given to it are not exact. It should be *Louvain before 1487*, as may be deduced by comparing the types with which it was printed, with those employed for a work of Petrus de Crecentiis, printed by Johannes de Westfalia at Louvain, and

by the following annotation, in the handwriting of the 15th century, on the 1st sheet of a copy taken at Olmütz during the Thirty Years' War, and at present belonging to the Royal Library at Stockholm: *Petrus Auliacus. Liber Philippi de Penczicz, emptus Parisiis die Octobris undecima Anno Domini etc. octuagesimo septimo, manu propria ligatus in Wyssaw et signatus in Budesin, die Aprilis 28. Anno etc. 89.* HUMBOLDT (*Cosmos*, II. p. 286) ascribes to this work an influence on the mind of COLUMBUS even greater than his correspondence with TOSCANELLI. Every one having access to this old and rare work may convince himself of the truth of the assertion by perusing the chapters in it treating of cosmographical and geographical questions, the trouble of which will be richly rewarded by the insight he obtains here into the geographical theories and reasonings of the middle ages. D'Ailly seldom pronounces any positive opinion of his own. But the learned prelate, otherwise so orthodox, often allows a doubt to glimpe forth as to the geographical dogmas of the church. He brings doubtful points to view, and gives as guidance to their answer, citations from ARISTOTELES, PTOLEMY, SENECA, PLINY, AUGUSTINUS, ESRA, AVERROES etc. For instance, in the 8th chapter, mostly borrowed from ROGER BACON'S *Opus Majus* (p. 183 in the ed. London 1733), d'Ailly says, that Ptolemy supposed the continents to occupy only the sixth part of the surface of the earth, and later in the same chapter he seems to accept this theory himself: *Ex præmissis igitur et ex dicendis inferius apparet, quod terra habitabilis non est rotunda ad modum circuli sicut dicit Aristoteles, sed est velut quarta superficiæ unius speræ, cuius quartæ due partes aliquantulum extremæ rescinduntur, scilicet illæ quæ non habitantur propter nimium calorem aut nimium frigus.* But in the same chapter, as well as in other parts of his works, he mentions on the contrary, without disavowal, that Esra in his fourth book assumes six parts of the surface of the earth to be inhabited and the seventh covered with water. He also cites Aristoteles as a supporter of the view that the sea separating India from *Hispania ulterior* (=western Africa) has not a very great extension.

Columbus' own copy of the work is still preserved at the Bibliotheca Colombina in Seville. It is supplied with marginal annotations, but not, as formerly supposed, by the great explorer himself, but probably by his brother BARTHOLOMÆUS (HARRISSE, *Christophe Colomb*, Paris 1884, II p. 190). All this contributes to give some interest to d'Ailly's very rudimentary map, of which fig. 19 is a fac-simile.

8. ZACHARIAS LILIUS, *Orbis breviarium*, Florentinæ, Antonius Miscominus 1493. 4.0. On the reverse of the fourth leaf the above geographical sketches (fig. 20) are inserted. They reproduce a rudimentary map of the world often met with in old manuscripts, and in printed works from the 15th and 16th centuries. Lilius was an Italian geographer from the end of the 15th century. His *Orbis Breviarium* seems not to contain one line founded on original investigations, or a single expression alluding to the great geographical discoveries during the century in which he lived. It begins with these characteristic words: *Terrarum orbis universus in quinque distinguitur partes, quas vocant zonas. Media solis torretur flammis. Vltimas æternum infestat gelu. Duæ habitabiles inter exustam et rigentes. Altera a quibus incolitur, teste Macrobio, non licuit unquam nobis nec licebit agnoscere.* When he wrote this sentence, the Portuguese mariners had long ago sailed across the sunburnt zone, and before the first edition was printed, Columbus had already discovered the New World. The work of Lilius, however, for a long time remained a popular manual of geography and cosmography.

9. and 10. Two maps in HARTMANN SCHEDEL'S *Liber chronicarum*, of which two large folio editions, the one in Latin



21. Chart of the Mediterranean Sea by WILLEM BARENTSZOON. Engraved in copper 1595.
Almost unaltered copy of a Portolano from the 14th century.

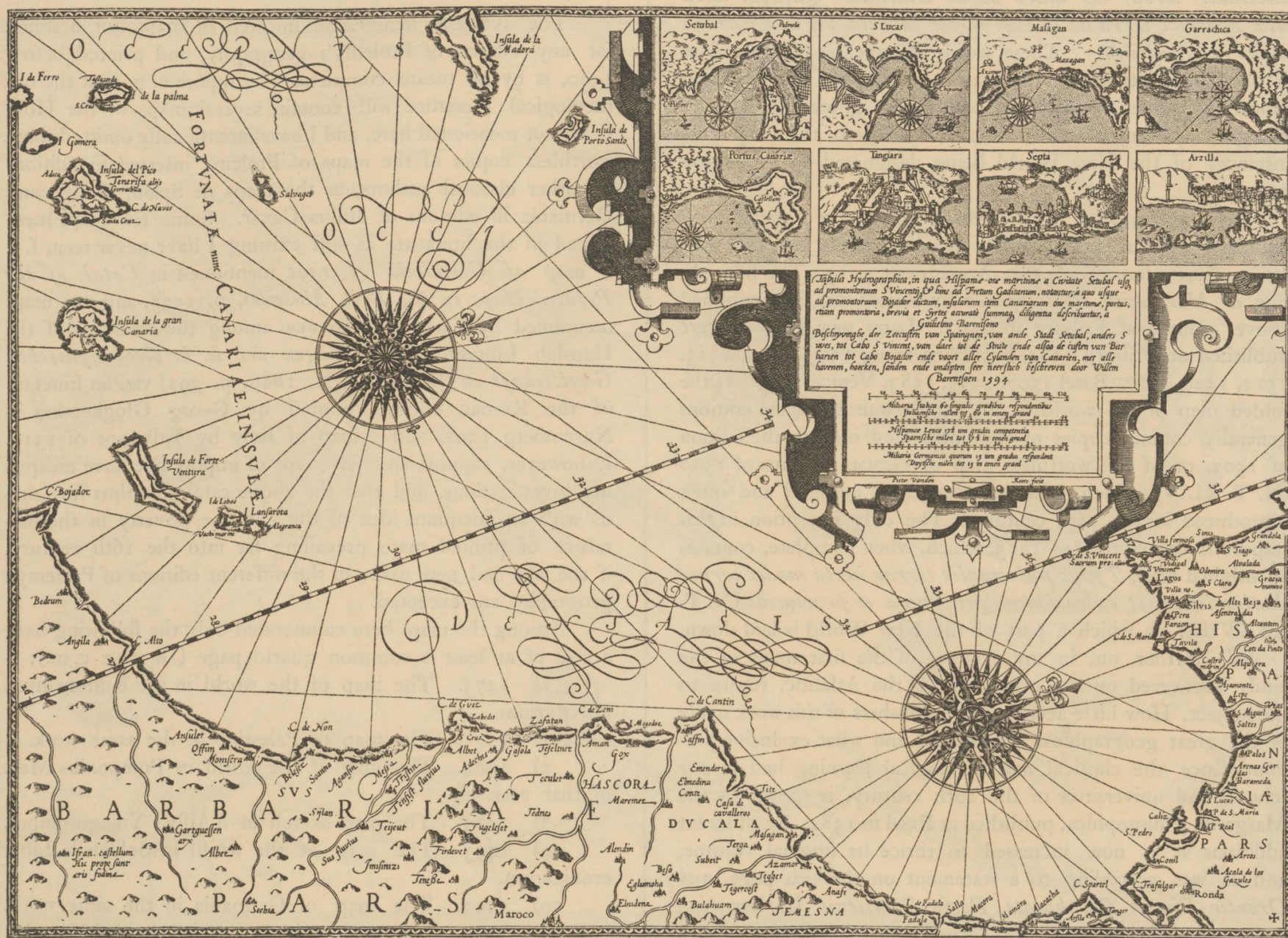
(Orig. size 418 x 855 m. m.)

(Mediolani 1508). The greater part of the title-page is occupied by a map of Africa (N. fig. 37). I shall in a subsequent chapter return to this map, which is the first or second published in print, on which the outlines of Africa are laid down with tolerable exactness.

15. *Cosmographia Pii Papae in Asiae et Europae eleganti descriptione* (Per Henricum Stephanum. Parrhisius . . . MDIX). Under this title the Pope Pius II, or AENAEAS SYLVIVS PICCOLOMINI (born 1405, dead 1464), published a work containing geographical, historical, and ethnographical descriptions of a part of Asia and Europe. That of Asia is introduced by a few chapters on the form of the earth, the division of the mainland into four islands separated by the currents of the ocean, the possibility of circumnavigating the

book. It is an almost unmodified, but badly executed copy of the map in the Margarita of Reisch of 1503 (N. T. XXXI). The legends near the southern border of the map are copied from Reisch. The map is only of interest as being the first (?) map printed in France, and a new instance how slowly the knowledge of the voyages of the Portuguese and Spaniards was spread over the rest of Europe.

16. *Argentorati 1509*. Fig. 22 is a fac-simile of the title-page of a small print, published at Strasburg in 1509. It is illustrated by a globe, on which a small corner of South America, designated as the *Nieuw Welt*, is laid down. Insignificant as this map or drawing may be, yet it is of interest, as being the second printed map on which a part of the New World is represented. I have not seen the original, and



23. Chart of the sea westward of the Straits of Gibraltar by WILLEM BARENTSOON 1594. (Orig. size. 548 X 394 m. m.).

large island formed by Europe, Asia, and Africa, and the suitability of the tropics and the arctic regions for the abode of man. These preliminary chapters are written in the same style of uncertainty and searching for truth, as the chapters in the *Ymago Mundi* of Pierre d'Ailly. Considering the wide circulation and authority enjoyed by the works of the learned Pope, these chapters ought to have exercised an immense influence on the general disposition for exploring voyages, which characterized the century of the great geographical discoveries. I have not seen the first edition printed in Venice 1477 in folio. It seems not to have contained any map. Nor is there any map to be found in the edition Venetiis 1503, described by CASTELLANI in his *Catalogo delle . . . opere geografiche del Collegio Romano*, Roma 1876, p. 68. But the edition printed in Paris in 1509 contains a wood-cut map of the world printed on a folio-leaf, bearing the same water-mark as the other paper in the

copy of its title-page, which is given here, is borrowed from WINSOR, *Critical History of America*, II p. 172. Judging from the analysis given by D'AVEZAC (*Martin Hy-lacomylus Waltzemüller*, Paris 1867, p. 114), the text contains, on its 14 leaves in small quarto, very little of interest and, in spite of the promise on the title-page, scarcely anything of the *quarta orbis terrarum pars nuper ab Americo reperta*. A copy of this map, but without any legends, is inserted into the work mentioned below under No. 21.

17. *Hispani 1511*. The map of the West Indies by PETRUS MARTYR (N. fig. 38); and

18. *Cracovia 1512*. Map of the world by STOBNICZA (N. T. XXXIV). In a subsequent chapter, analysing the first maps of the New World, I shall have occasion to return to these two important maps.

19. A map in *Meteorologia Aristotelis, eleganti Jacobi Fabri Stapulensis Paraphrasi explanata, commentarioque Ioannis Coclaei Norici declarata* etc., Norimbergæ 1512 (N. T. XXXI). On fol. lx verso there is a map of the world showing that the circumnavigation of Africa was known to the author.

In the commentaries of the German theologian Coclaeus there is on fol. lxii written: »*Nam et Germanie imensa esse insulas non pridem compertas cognitum habeo... Et revera longe maior est habitatae nunc terrae mensura, quam veteres isti Geographi descripsere. Nam ultra Gangem India immensa protenditur terra, cum maxima orientis insula Zipangri. Africa quoque ultra tropicum Capricorni longe fertur extensa. Ultra Tanais item ostia plurima habitatur terra, ad mare usque Glaciale. Quidque nova illa Americi terra admodum nuper inventa, vel tota Europa maior esse dicitur.*» These words deserve to be quoted as forming a contrast to the way in which the great geographical discoveries were almost completely ignored in Reisch's Margarita. They are also of interest as one of the very first instances of the New World being designated by Amerigo's name.

20. *Margarita Philosophica Nova, cui annexa sunt sequentia... charta universalis terrae marisque formam neoterica descriptione indicans*, Argentorati 1515. The first edition of *Margarita Philosophica* by Reisch was, as mentioned above, printed at Friburg in 1503. Later new editions were published at Friburg 1504, Strasburg 1504, 1509, 1512, 1513, 1515, 1520, 1565, Basel 1508, 1535, 1583, Venice 1599. If the folded map of the world is not totally wanting, these editions generally contain copies of the antiquated map in the edition of 1503, or of the worthless map of GEMMA FRISIUS of 1540 (N. T. XLIV), which, however, was much admired and often reproduced in the 16th century. The only exception in this respect is the edition of 1515, which, when complete, contains an original map, *Typus universalis terrae iuxta modernorum distinctionem et extensionem per regna et provincias* (N. T. XXXVIII), on which a part of the New World is laid down. I shall further on, in my account of the first maps of the lands discovered on the other side of the Atlantic, return to the subject. How little account the publishers of this work made of the great geographical discoveries, and what exclusive preponderance the classical and theological learning had in the schools and universities of the 16th century, is shown by the *Margarita Philosophica*, published at Basel in 1583. By different additions it is now increased to thrice its original volume, and it was, according to a statement on the title-page, »*ab Orontio Finaeo Delphinatæ, Regio Parisiensi Mathematico, necessariis aliquot auctariis locupletata.*» However, it still contains (page 346) an old Ptolemaic map of the world, and the geographical discoveries of the previous century are only touched upon in a few words, in this encyclopedia of 1403 quarto pages. Pages 1347—1349 a chapter, »*Nova terræ descriptio secundum neotericorum observantiam,*» is inserted. It is borrowed from the text on the reverse of the map of the edition of 1515. But it neither contains any allusion to the new geographical discoveries, nor any explanation to the cordiform map of Gemma Frisius inserted in this edition from the cosmography of Apianus, the publisher very likely disposing of the old block of 1540. In one of the last addenda (HONTER's *Rudimentorum Cosmographiæ Liber unus*) there are for the first time enumerated among the Oceanic islands: »*In Australi (Oceano): Iona, Taprobana, Scoyra, Madagascar, Zanzibar. In occiduo: Dorcades, Hesperides, Fortunatae, America, Paris, Isabella, Spagnolla & Gades.*» The words here cited are already found in the first edition, Cracoviae 1530, of Honter's small and often reprinted Cosmography. Five or six

bare names from a fifty years' old work, are all that Reisch's Margarita, revised by Orontius Finaeus, A. D. 1583, contains regarding the New World or the parts of the Old newly discovered.

21. *Opusculum de Sphæra clarissimi philosophi Ioannis de Sacro busto* etc., Viennæ 1518. In this edition of Sacrobosco a copy of the map in the *Opusculum Geographicum*, Argentorati 1509, is inserted, but without any legends. As in the original, the outlines of Africa are here laid down tolerably well, and in the south-western corner of the map a small part of South America is shown. A similar insignificant map, omitting, however, the corner of South America, is also inserted into IOANNES SCHÖNER's *Opusculum Geographicum*, s. a. et l. (sed Norimbergæ 1533).

The synopsis here communicated of maps not destined for any edition of Ptolemy's geography, and printed before 1520, is by no means complete. I suppose e. g. that the old theological literature will contain several maps of the Holy Land not mentioned here, and I have intentionally omitted some worthless copies of the maps of Ptolemy inserted in editions of other classical authors, as the maps of Spain, Gallia, and Germania in editions of Julius Cæsar. Some few maps mentioned in the literature as still existing I have never seen, f. i. a map of Germania of 1491 mentioned in *Catal. of the Printed Maps in the Brit. Museum*, p. 1535, and two maps mentioned by CARL HARADAUER among the treasures of the Hauslab Library (*Mittheilungen der k. k. Geographischen Gesellschaft in Wien*, XXIX, 1886, p. 392) viz. an itinerary of the Roman empire, printed by Georg Glogkendon in Nuremberg 1501, and a map of Italy by Valvassor of 1516. I, however, suppose that few maps of importance have escaped my investigations, and that the above catalogue thus furnishes us with an adequate idea of the extreme poverty in the literature of printed maps prevailing far into the 16th century, if the old and new maps in the different editions of Ptolemy's geography are excepted.

Among the maps here enumerated only the following have a size of at least a common quarto page (18 × 12 c. m.):

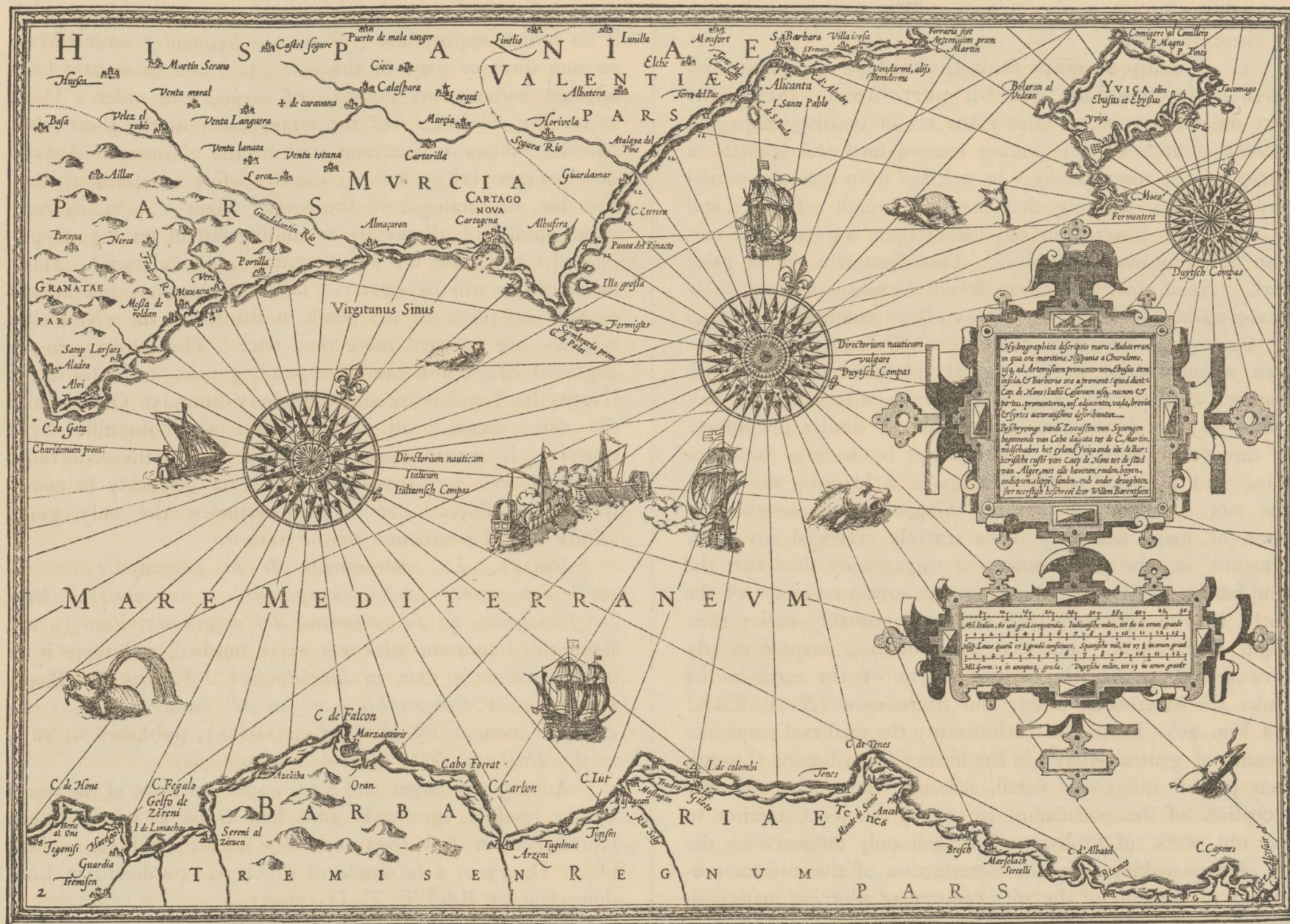
- 1) 1475. The map of the world in the *Rudimentum Novitorium*.
- 2) 1475. The map of Palestine in the same work.
- 3) 1482. The map of the world in Pomponius Mela of that year.
- 7) 1483. The map sketch in d'Ailly's *Ymago mundi*.
- 9) 1493. The map of the world in Schedel's *Liber cronicarum*.
- 10) 1493. The map of Germania in the same work.
- 12) 1503. The map of the world in Reisch's Margarita.
- 14) 1508. The map of Africa in the *Itinerarium Portugallensium*.
- 15) 1509. The map in the Paris edition of the cosmography of Aeneas Sylvius.
- 17) 1511. The map of the West-Indies by Petrus Martyr.
- 18) 1512. The map of the world by Stobnicza.
- 20) 1515. The map of the world in the *Margarita Philosophica* of that year.

Nos. 1, 2, and 7 among these are scarcely to be considered as maps in a modern sense. The Nos. 3, 9, 12, and 15 are bad copies of Ptolemy's map of the world. Consequently only the following five maps, printed before 1520 »*extra Ptolemæum*» and based on real independent geographical investigations, remain, viz.: No. 10, the first new map of central Europe; No. 14, one of the first printed modern maps of Africa; No. 17, the first map of the West-Indies; No. 18, the first map in which the earth's surface was divided

into two hemispheres, and the first, on which the *Novus Orbis* is placed on a par with Europe, Asia, and Africa, or constitutes a part of the world, and No. 20, the map in the *Margarita* of 1515, which has become remarkable through the legend »*Zoana Mela.*»

It is possible that this number may hereafter be somewhat increased by new bibliographical discoveries, but there is very little probability that these discoveries will change the general results of the exposition here given, showing that I have by no means over-estimated the importance of the different, more or less modernized editions of Ptolemy's geography during the 15th and the first part of the 16th century.

all the countries to the south of the Black and Mediterranean Seas, from the Indus to the coasts of the Atlantic ocean. Already, during the course of the invasion, this people not only appropriated but also further developed certain branches of the Græco-Roman civilization. They especially devoted themselves with success to the mathematical, astronomical, and geographical sciences. The circumstance that countries so distant as Spain, the shores of the Indus, and the oases of the African deserts were, for a short time at least, united under the same banner, tended to facilitate the spread of geographical and ethnographical knowledge. This was further promoted by the yearly meetings at Mecca of pilgrims from the most remote parts of the world, and by the inclination for wandering inherited by the Arabs from their ancient nomadic life, which,



24. Chart of a part of the Mediterranean by WILLEM BARENTSZOON c. 1595. (Orig. size 532 X 375 m.m.).

As before mentioned, the main object of this work is to enumerate and briefly to describe the maps printed during the period of cartographical incunabula, and it is accordingly such maps that have almost exclusively come under discussion in the foregoing chapters. But, before proceeding further, I am induced by the close connexion between the maps published in print and the hand-drawn delineations on which these are based, to devote a few pages to a review of the manuscript maps of the middle ages, especially with regard to the influence they have exercised on the printed literature.

The number of medieval manuscript maps, scattered through the libraries of Europe, is very great. They may be classified into four different groups, viz.:

I. Arabian maps. History teaches us that a people from the deserts of Arabia, formerly little known and not very numerous, during the 7th century, invaded and conquered

in connection with a desire to propagate the doctrines of the Prophet all over the earth, induced them to undertake extensive journeys far beyond the dominions of their own Caliphs. All this produced a flourishing period for the geographical sciences in several Arabian countries. Various admirable descriptions of distant lands and of extensive voyages, written by Arabian scholars and far surpassing the geographical productions of the same period among the Christians, are also still extant. But similar perfection was never attained by the Arabian maps, which, if they were original drawings and not, as the planisphere of *EDRISI*, mere copies or reproductions from Ptolemy, are not only far inferior to the maps of the Alexandrian geographer, but not even comparable to the Esquimau-sketches brought home by English and Danish polar travellers from the icy deserts of the polar regions. Il est impossible de rien imaginer de plus informe. Pas de pro-

jection, pas de graduation, rien qui ressemble à une image régulière où l'on a eu égard à la vérité des formes, des positions et des distances. On ne comprend pas comment les Arabes ont pu descendre à de pareilles productions, ayant sous les yeux les cartes graduées de Ptolémée» (VIVIEN DE ST. MARTIN, *Histoire de la Géographie*, Paris 1873, p. 263). They have not exercised any influence upon the development of cartography, and none on the map-printing of the 15th and 16th century. For further details about the Arabian geographical works I may refer to LELEWEL, *Géographie du Moyen-Age*, Bruxelles 1852; A. F. MEHREN, *De Islamitische Folks geografische Kundskaber* (*Annal. for Nordisk Oldkyndighed*, Kjöbenhavn 1857); VIVIEN DE ST. MARTIN, *Histoire de la Géographie*, Paris 1873; PESCHEL, *Geschichte der Erdkunde*, München 1865, and to the numerous monographies (by REINAUD, JAUBERT, WÜSTENFELD etc.) cited by these authors.

II. European maps from the middle ages, founded neither on Ptolemy nor on portolanos. During the next millennium after Ptolemy the art of drawing maps had become almost extinct among learned men and scholars in Europe. Yet some passages in writings from this long period may be cited, showing that maps, of which a few are still to be found inserted in old manuscripts, were then in use, even for educational purposes. Thus Santarem, in his great work, *Essai sur l'histoire de la cosmographie et de la cartographie pendant le Moyen-Age*,¹ enumerates a map by COSMAS of the 6th century; a ⊕-formed planisphere from a manuscript in the Library at Strasburg of the 9th century; a ⊕-formed planisphere from a manuscript by Salustius in the Biblioteca Laurentiana; a similar planisphere of the 10th century in a manuscript by Isidorus from Seville. But a glance at the first leaves in his atlas will show, that not a single one of these »Mappemondes» deserves the name of map, and they have scarcely exercised any other influence on the development of cartography than that the wind-heads, so often employed as ornaments on maps of the world in the 15th and 16th centuries, probably derive their origin from them,² and that some of these maps evidently have served as models to the figure of the earth in the works of Macrobius, Lilius, and Sacrobosco (N. T. XXXI and Fig. 20). From the 12th century the medieval maps first became of general interest in the history of civilisation through their greater fullness of detail, although they were, with the exception of the portolanos, in every respect inferior to the old work of Ptolemy. Yet their only influence on the art of map-making was the introduction of the custom prevailing to the end of the 16th century, of adorning maps with drawings of towers and temples, of kings sitting on their thrones in full attire, of monsters and ethnographic details, and with inscriptions of a doubtful geographical character, borrowed from the heathen mythology or Christian martyrology.

To show that the above estimate of maps of this group has not been unjust, I have here given fac-similes on a reduced scale of a couple of them (fig. 17 and 18). The reader will find numerous fac-similes and further information respecting these maps in:

Vicomte DE SANTAREM, *Essai sur l'histoire de la cosmographie et de la cartographie pendant le Moyen-Age, et sur les progrès de la géographie après les grandes découvertes du XV:e siècle*, 3 vols. 8:o. Paris 1849—52, and the *Atlas composé de mappemondes et de cartes hydrographiques et historiques du XI:e au XVII:e siècle pour la plupart inédites* etc. by the same author. Complete copies of this

work are scarce, and the work has besides been so irregularly published, that the well-known bookseller Mr. Quaritch in London was compelled to print a special title-page and an *Index of Maps* to some copies at his disposal. This index is almost indispensable to the collation of the work. It is introduced by the following bibliographical data.

»The Vicomte de Santarem published originally, in 1842, a work entitled »Recherches sur la priorité de la Découverte de la Côte Occidentale de l'Afrique,» with an Atlas consisting of 30 plates. He afterwards made this Atlas (which was in fact unfinished at the time) the foundation of the present great work, which contains 78 plates, and was published at the expense of the Portuguese Government. It was not, however, completed, in consequence of his death in the year 1855. The Maps in this last Atlas are not numbered, except those belonging to the original work, the numeration of which is no longer appropriate. There are frequently several Maps on one sheet or page of the new series, and these have been selected without any principle of sequence or order. There is no list or index for the arrangement of the sheets; but M. de Santarem communicated to the »Nouvelles Annales des Voyages» (1855, vol. 2) shortly before his death, a classified list or catalogue of the several Maps . . . M. de Santarem speaks of all the Maps enumerated in his list as »published;» but there are a few which cannot be traced. Many inexactitudes will be observed in his descriptions and notices — two or three of the Maps in the list in the »Nouvelles Annales» are repeated more than once. The headings to the engraved Maps, and the corresponding titles in the list in the »Nouvelles Annales» are sometimes very dissimilar. Occasionally the dates assigned on the maps and in the list differ by a century. It would appear that the list in the »Nouvelles Annales» was very carelessly drawn up (probably in consequence of illness), but it is nevertheless the only guide afforded to the intention of the author.»

JOMARD, *Les monuments de la géographie ou recueil d'anciennes cartes européennes et orientales publiés en fac-simile de la grandeur des originaux*, Paris (s. a.). Even this important atlas was never finished, and there is no other text to it than an *Introduction à l'Atlas des Monuments de la Géographie par feu M. Jomard*, a short but excellent memoir by M. E. CORTAMBERT, published in 1879 in the *Bulletin de la Société de Géographie*.

Among the larger and more important maps of the world of the middle ages only one has, as far as I know, been reproduced in full size: that of RICHARD OF HALDINGHAM, of A. D. 1300, a fac-simile of which was published in London 1869 by Rev. T. T. HAVERGAL.

III. Sea-charts of the middle ages. Portolanos, compass or loxodromic charts.

Besides the contributions to what may be called the mythic cartography mentioned above, there are also preserved from the middle ages two other kinds of maps, namely charts of the Black and Mediterranean Seas, most nearly corresponding to the mariners' maps of our time, and maps of the world, for which these old charts have served as a basis. The former have never had for object to illustrate the cosmographical speculations of some classical author, or some learned prelate, or the legends and dreams of feats and chivalric deeds within the court-circle of some more or less lettered feudal lord. They have only been intended to serve as guides to mariners and merchants in the Mediterranean sea-ports. They have also seldom had learned men for authors, and slight was

¹ The first known map of that kind is a map of Cosmas from the 6th century. The division of the horizon has played no small part in the cartographical and geographical literature of old, and often, especially on maps of the world, the different wind-directions were marked by blowing heads, placed on the border of the map (e. g. the maps here given on pl. XXIX, XXXI, XXXIII, XXXVIII, XLIV and XLIX). For further particulars, the reader is referred to a very interesting letter from D'AVEZAC to M. HENRI NARDUCCI inserted in: *Bolletino della Società Geografica Italiana*, XII, Roma 1875, p. 379.

gable rivers. Only exceptionally the interior of the continents is provided with territorial details, extensive legends etc. But when this is the case, it will generally be found that the neat and correct manner of drawing, so characteristic of what may be called the portolano-style, is no longer adhered to in that part of the map, which seems to indicate that the maps of the interior were introduced on the portolanos at a later period of decadence.

The work, *Studi biografici e bibliografici sulla storia della geografia in Italia*, Vol. II. *Mappamondi, Carte Nautiche, Portolani ed altri Monumenti cartografici specialmente Italiani dei Secoli XIII—XVII per G. UZIELLI e P. AMAT DI S. FILIPPO*, Roma 1882, edited by the Italian Geographical Society, contains a review of earlier manuscript maps, preserved in Italian libraries. The catalogue embraces 524 numbers, of which about 400 are portolanos, or sea-charts, drawn before the beginning of the 16th century. Another important work on the same subject was lately published by Professor THEOBALD FISCHER of Marburg under the title: *Sammlung mittelalterlicher Welt- und Seekarten italienischen Ursprungs und aus italienischen Bibliotheken und Archiven*, Venice 1886. Besides a general historical and critical description of the maps, a detailed analysis and (in a separate atlas) photographic fac-similes are here given of eleven of the most important of them. The learned Professor thus sums up the result at which he arrives:

A) It is not proved that maps expressly drawn for the use of mariners (sea-charts), were employed by the Greeks and Romans. Probably their navigators were only directed by sailing-directions (Peripli), indicating the directions of coastlines, the harbours, the distances between halting-places, prominent capes etc., with great exactness not only in the Black Sea and the Mediterranean, but also in the north-western part of the Indian Ocean. Nor did the Arabs delineate any sea-charts; the only sea-chart known with Arabic legends being a copy of an Italian original.

B) Map-sketches of the western Mediterranean for the use of mariners were already drawn in Italy during the beginning of the 12th century. The compass having been generally adopted in the middle of the 13th century, at least in some of the Mediterranean countries, the first loxodromic charts (portolanos) were from that time constructed by its aid. Already in the latter part of the 13th century these charts probably attained the finish met with in the maps still extant from the beginning of the 14th century. Such maps were also made in Catalonia from Italian models (thence the name *Cartes Catalanes*).

C) In 1883 498 loxodromic charts, of which 419 are of Italian origin, were known in the Italian libraries. The one of earliest date among them is the chart of PIETRO VISCONTE of 1311, and maps of the same model were still drawn by hand long after the discovery of the art of printing. Numbers of copies of the same original were fabricated for sale by professional artisans, adhering for generations to the model once accepted. We accordingly find portolanos of the 15th and 16th centuries copied from charts from the beginning of the 14th century with astonishing exactness not only as to the cartographical details, but also as to the manner of drawing, legends, colouring etc.

D) The original charts are founded on a careful utilization of the observations of mariners. They were drawn for practical purpose and never much cared for by scientific geographers. With regard to the Black and Mediterranean Seas, northern Africa, and the western coast of Europe, as far as to the mouth of the Scheldt, the charts are founded on the

experiences of thousands of mariners, collected during a long succession of commercial voyages. Here the charts have attained a wonderful perfection in comparison with other cartographical works from that remote age. But the mapping of the lands and seas beyond the extreme limits of the voyages of the Italian mariners is, on the other hand, generally very incomplete and defective, as only depending on tales and rehearsals.

The name 'Portolano' is rejected by FISCHER and BREUSING as being improper and equivocal, having originally signified not a chart, but a sailing-directory or book of courses. The name 'compass-chart' is also disapproved by these eminent authorities, who propose the name 'loxodromic charts' for the maps formerly styled portolanos. It, however, seems to me highly inconvenient and objectionable to denote old practical maps by this newly invented Greek name. These maps are characteristic not of the learning, but of the great personal experience of their authors or draughtsmen, and of the care and want of learned prejudices, with which the necessary material was collected.¹ The name 'Compasskarten' is also improper and deceptive, it being by no means proved that these charts were originally constructed by compass-bearings. Many of them are evidently older than the use of the compass on board ships. I shall therefore here retain the old name of *Portolanos* or *Portolan-charts*, referring to the manner in which these charts have originated (observations while sailing from port to port). The double meaning of the word will scarcely cause any misunderstanding. The word 'chart' has a similar double meaning in many languages. Two course-directories without charts were, for instance, printed at Amsterdam in 1540 and 1541 by JAN JACOBSZON under the title: *Dit is die kaerte van dye Suyd zee tot dat Ranserdyeep toe etc.* and *Dit is die caerte van der zee om Oost en West te zeylen*, and the same word *Caerte* is used by LUCAS JANSZ WAGHENAER to denote some of the *sea-charts* in his celebrated *Spieghel der Zeevaerdt*, Leyden 1584.

After having carefully compared the fac-similes of the most important portolanos, which BUCHON and TASTU, SANTAREM, JOMARD, FISCHER, LESOUJEFF, and others have given, with Ptolemy's maps, with the *Tabula Novæ*, printed in the oldest edition of Ptolemy's geography, and with other maps of the 15th and 16th centuries, I am also obliged to differ in some other respects from the opinions pronounced by my predecessors.

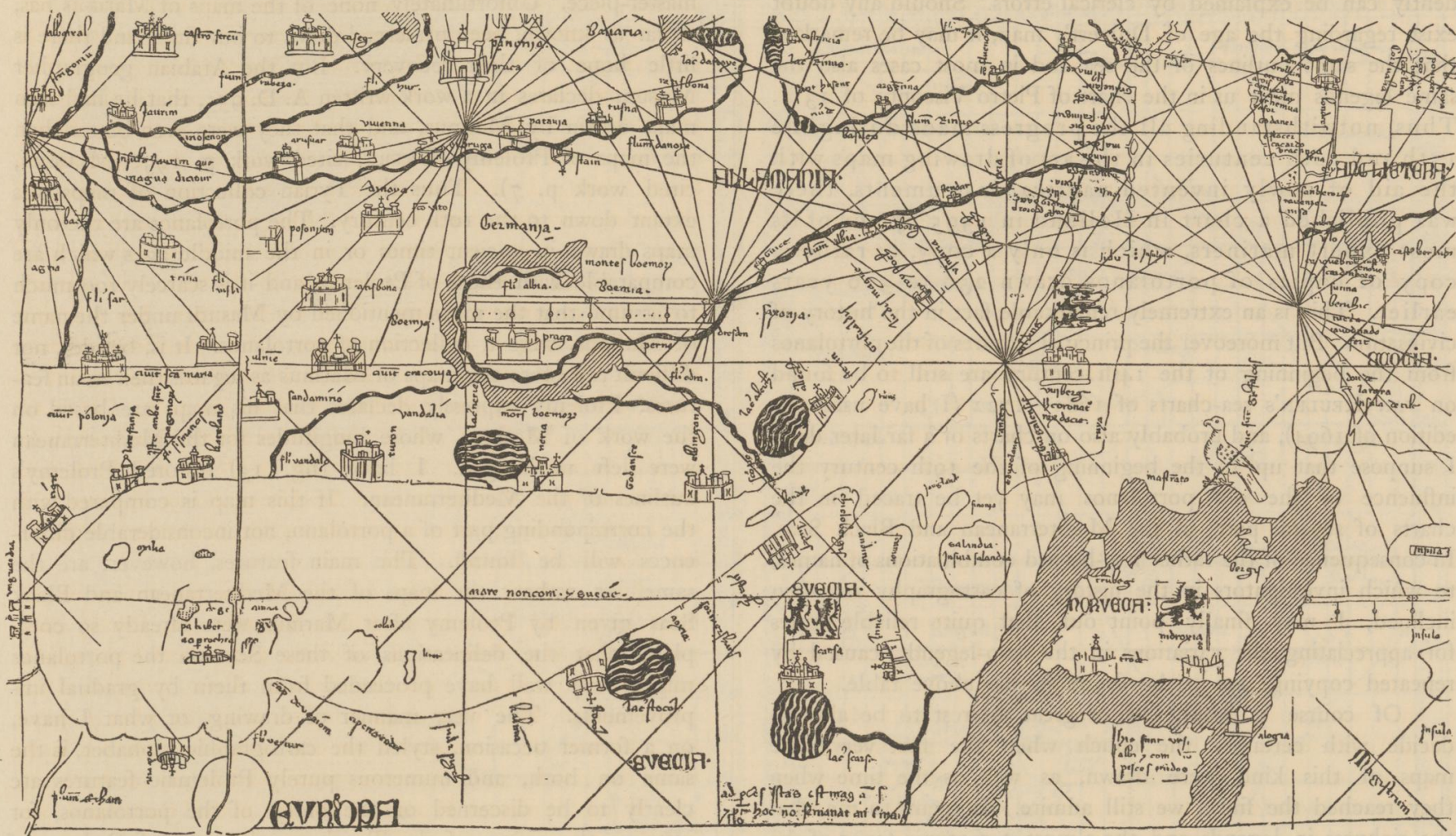
When Professor Fischer wrote his above mentioned elaborate memoir, he did not know that any portolanos of the Mediterranean and Black Seas had been published in print; he expressly says (p. 85): *Es kann auffallen, dass man niemals dazu schritt dieselben durch Holzschnitt oder Kupferstick zu vervielfältigen,* and he nowhere in his paper cites an instance of their having been used to any great extent as material for printed maps. This is correct so far as they are never or scarcely ever mentioned by learned geographers during the century of the great geographical discoveries. But it is from these very portolanos that they have gathered their materials for several of the *Tabula Novæ* which were added to Ptolemy's geography; and in 1595 a true portolano of the Black Sea, the Mediterranean, and the coasts from the Canaries to Antwerp was faithfully and in a masterly way engraved in copper and published in: *Nieuwe beschryvinghe ende Caert Boeck vande Midlandtsche Zee etc. door Willem Barentsoen. Tot Amstelredam Ghedruct by Cornelis Claesz. op't Water in't Schrijffboeck, by d'oude Brugghe 1595.*² On the title-

¹ It is to be remembered that the loxodromes only form straight lines on maps with parallel meridians, and that only on maps on Mercator's projection they both form straight lines and indicate the proper course to be steered in sailing from one place to another. The name 'loxodromic chart' for a portolano is thus mathematically exact only under the supposition that it is constructed on Mercator's projection.

² With regard to the long title, and the different editions of this rare atlas, the reader is directed to: P. A. TIELE, *Nederlandsche Bibliographie van Land- en Volkenkunde*, Amsterdam 1884.

page is a view of the roadstead of Genoa, in which a naval combat is progressing. This *Caert Boeck* forms a thin folio volume with 10 charts, engraved in copper, with innumerable wood-cut coast-views. The maps are signed WILLEM BARENTS-ZOEN and dated 1593—95. On 15 folio leaves at the end of the work there is a *Haven-wyser vanden Middellandsche Zee*, said to be translated by MARTIN EVERART from an Italian book called *Portolano*. But in several places in the book the celebrated arctic explorer Willem Barentszoon is expressly given as the author of the whole. Notwithstanding this, the first double folio map is a copy of a Mediterranean portolano from the beginning of the 14th century. With regard to the general outlines of the Mediterranean and Black Seas and to the main character of the charts, any one may convince himself of the exactness of this assertion, by a comparison between the fac-simile on a reduced scale of Barents' map (fig. 21) with the portolano of Dulcert of 1339 (fig. 16), or with any other similar medieval work. As for

Dulcert 1339.	Carte Catalane (from Buchon et Tastu) 1375.	W. Barentszoon 1595.	van Keulen 1694.
Beroardo.	Beroardo.	Castel Verando.	Castro Verando.
Jaffa.	Jaffa.	Jaffa.	Jaffa.
Arzuffo.	Arzuffo.	Arsuffo.	Alzulo.
Cesaria.	Cesaria.	Spezaira.	Caesaria.
Castro Pelegri.	Castel Pelegri.	Castel Peregrino.	Castro Pelgrine.
Carmen.	Carmeni.	Carmini.	
Acri.	Acre.	Acri.	I. Juan d'Acari.
Cauo Jancho.	Cavo Iancho.	C. Blanco.	C. Blanco.
Sur.	Sur.	Sur.	Sur.
Sarafent.	Sarafent.	Sara feret.	Saraferet.
Saytos.	Saytos.	Saites.	Saita.
Damor.	Damor.	Damor.	Dantor.
Baruti.	Barut.	Barut.	Baruti.
Flavius canis.	Flum Canis.	F. Canis.	P. Canis.
Gibeleto.	Gibillet.	Gibileto.	Gibiletto.
Bodroan.	Bodron.	Vadro.	Vadro.
Conestar.	Conestabilli.		
Nerfin.	Nofin.		
Tripoli de Suria.	Tripolli de Suria.	Tripoli.	Tripoli.
Larcha.	Larcha.	Larcha.	Laraca.



26. The Baltic with surrounding countries from the portolano of DULCERT 1339. (The part of the original here reproduced 409 X 230 m. m.).

the legends, the tables below will show the extreme care with which Barents and, one century later, VAN KEULEN, followed the old models or originals.

Comparison between the legends on portolanos and W. Barentszoon's and van Keulen's sea-charts.

Dulcert 1339.	Carte Catalane (from Buchon et Tastu) 1375.	W. Barentszoon 1595.	van Keulen ¹ 1694.
<i>1. The coast of Syria.</i>			
Damiata.	Damiat.	Damiata.	Damiata.
..nese.	Enes.	Tenes.	Tenere.
Faramia.	Faramia.	Faramia.	Faramida.
Rasalcasero.	Rasal Casero.	Raxalgagero.	
Stagnom.	Stagnom.	Stangoni.	Sangoni.
		C. Gall.	C. Gallo.
G. de Larissa.	Golfo de Larissa.	G. Larissa.	G. de Larissa.
Berto.	Berto.	P. Berton.	P. Berton.
Darom.	Darom.	Damar.	Damor.
Gazara.	Gatzara.	Galsara.	Gosara.
Excalona.	Eschalon.	Æscalona.	Escalona.

Prexon.	Prexon.	Pxini.	Proxoni.
Tortossa.	Tortosa.	Tortosa.	Tortosa.
<i>2. The eastern coast of Tunis.</i>			
Nubia.	Golfo di Tunis.	G. de Tunis.	Tunes.
Cobun.	Nubia.	Calibia.	Gallipia.
Maometa.	Cobon.	C. Bona.	C. Bona.
Recholia.	Mameta.	Mahometa.	Mahometa.
Sussa.	Rechilia.	Recolia.	Araclen.
Monisterie.	Sussa.	Susa.	Susa.
Cunie.	Monestir.	Monastir.	Monaster.
Affricha.	Conjeras.	Conieras.	Comigeras.
Capulia.	Affricha.	Africa.	Aphrica.
Casar Pignatar.	Capulia.	Capulla.	C. Capudia.
Capisse.	Casar Pignatar.	Casar Punator.	Casar Mol.
Cæsar Nachar.	Capis.	Caphis.	Zuchis.
Muroto.	Casar Nacar.	Casar Nacur.	Casar Natur.
Insula de zerbis.	Muroto.	Marota.	Maroto.
	Illa de Gerba.	I. de Serbi.	I. Zerby.
<i>3. The French coast of the Mediterranean.</i>			
Porto ventre.	Port Venre.	P. Veneris.	P. Veneri.
Coliuro.	Copliura.	Calibre.	Calibre.
Sasse.	Salses.	Salsas.	

¹ General chart of the Mediterranean, signed on the right corner I, and a special chart, signed VI (*De Groote Nieuwe Vermeerderde Zee-Atlas ofte Water-Werelt*, Amsterdam 1694).

Dulcert 1339.	Carte Catalane (from Buchon et Tastu) 1375.	W. Barentszoon 1595.	van Keulen 1694.
Leocata.	Leocata.	C. Leucata.	C. Leucata.
Nerbona.	Nerbona.	Narbona.	Narbona.
Sanper.	San Per.	S. Pera.	S. Pedro.
Sirignan.	Serigna.	Serignan.	Serigian.
Agde.	Agde.	Agde.	Agde.
C. de Seta.	Cap de Seta.	M. de Seuta.	C. Zeuta.
Magalona.	Magalona.	Maguelone.	Magdalena.
Lates.	Lates.	Latas.	
Mopesler.	Montpesler.	Mompeillier.	Montepelliers.
Aque Morte.	Aygues Mortes.	Aigues Mortes.	Aqua del Morte.

In some other parts of these maps, for instance in Corsica and Sardinia, there are differences, perhaps depending upon an Italian, not a Catalan original having served as original to Barentszoon's chart, or upon the latter having followed portolanos not of the 14th, but copies of copies of them of the 15th or 16th century. Yet the identity of the legends is in most parts of the maps so complete that the insignificant differences evidently can be explained by clerical errors. Should any doubt exist regarding the age of Dulcert's map, it may be remarked that the same outlines of the sea and in most cases also the same legends meet us in the chart of Pietro Visconte of 1311. Thus, notwithstanding all the progress made during the 15th and 16th centuries in the art of drawing maps with the aid of newly invented nautical instruments, there was published a chart in Holland in 1595 by one of its most expert mariners, which is only a copy, or rather a copy of copies of portolanos drawn 250 to 300 years earlier. This is an extremely remarkable fact in the history of civilisation. But moreover the principal features of the portolanos from the beginning of the 14th century are still to be found on VAN KEULEN'S sea-charts of 1681—1722 (I have used the edition of 1694), and probably also on charts of a far later date. I suppose that up to the beginning of the 19th century the influence of the old portolanos may yet be traced on the charts of several parts of the Mediterranean and Black Seas. In consequence of the rather hap-hazard combinations of names, to which investigators in the history of cartography are often inclined, I may finally point out, that quite reliable scales for appreciating the variations in the map-legends, caused by repeated copying, are to be found in the above table.

Of course it would be of great interest to be able to decide with certainty the epoch when the first very rude maps of this kind were drawn, as well as the time when they reached the finish we still admire. It seems to me, that the richness in legends and the almost stereotypic tenor of the legends during centuries, should make it possible for a scholar, well versed in the history and geography of the middle ages (especially the crusades?), to give a reliable answer to the latter question by a careful analysis of the numerous names on the portolanos. With regard again to the former question, a definite answer will be involved in great difficulties and great uncertainty, until new data for its elucidation have been discovered. I suppose that these data, if yet extant, must be furnished from the lands of the old Byzantine empire. In a short appendix (*»Nachträge und Verbesserungen»*), appearing at the end of the index of the above cited *»Sammlung mittelalterlicher Welt- und See-Karten,»* Fischer seems to accept the opinion pronounced by FIORINI in *Le proiezioni delle carte geografiche*, Bologna 1881, p. 648, that the Italians had learnt the art of drawing portolanos from Byzantium shortly after the year 1000. On the other hand, he says (p. 78): *»Somit ist die Mitte des 13. Jahrhunderts auch gewiss der früheste Zeitpunkt, bis zu welchem wir die Entwerfung der ersten loxodromischen Karten hinaufrücken dürfen, in der zweiten Hälfte des 13. Jahrhunderts erlangten sie die vollendete Form, in welcher wir*

sie schon zu Anfang des 14. auftreten sehen.» Fischer's assertion that the Greeks and Romans probably never employed nautical charts (*Itineraria maritima*) for practical use seems scarcely to be quite correct. The description and criticism of the works of Marinus of Tyre by Ptolemy shows on the contrary that the *Διορθωσις* of Marinus was a real portolano, provided with a text, which seems to have had much in common with the *»Opera chiamata Portolano»* of the middle ages, and of which, as of the portolanos, several editions had been issued. If Ptolemy himself had not always spoken of Marinus as a definite personality, it could even be conjectured that the name *»μαρῖνος ὁ Τύριος»*, or the *Tyrian sea-fish*, had only been a collective name for a certain category of nautical maps, like the name *Waghenaer*, or *Waggoner*, fourteen hundred years later. The numerous editions mentioned by Ptolemy indicate that the Tyrian charts were made for a practical purpose, and the improvements, introduced according to Ptolemy in every new edition, constituted the germ for the future master-piece. Unfortunately none of the maps of Marinus has, as far as known, been preserved down to our time, and there is little hope of their recovery. But the Arabian geographer MASUDI declares in a work written A. D. 955, that he had seen maps drawn by Marinus, and that they were even better than the maps of Ptolemy (UKERT, cited work p. 195; MEHREN, cited work p. 7). Thus the Tyrian collection of maps was extant down to the 10th century. The portolanos are the only maps drawn in ancient times or in the middle ages which are comparable with those of Ptolemy, and it is scarcely too much to assume that the maps mentioned by Masudi under the name of Marinus, were a collection of portolanos. It is, besides, not difficult to restore the maps of Marinus as regards their main features. Ptolemy expressly declares that his maps are based on the work of Marinus, whose longitudes for the Mediterranean were left unchanged. I have (fig. 15) restored Ptolemy's outlines of the Mediterranean. If this map is compared with the corresponding part of a portolano, not inconsiderable differences will be found. The main features, however, are the same, or rather: the maps of the Mediterranean and Black Seas given by Ptolemy after Marinus were already so complete, that the delineations of these Seas on the portolanos might very well have proceeded from them by gradual improvements. The very manner of drawing, or what I have, on a former occasion, styled the cartographic alphabet, is the same on both, and numerous purely Ptolemaic features are clearly to be discerned on the oldest of the portolanos, for instance the course of the Tanais on the map of Dulcert of 1339. If we further consider, that the outlines of these seas on all other independent maps of the middle ages were disfigured so as not to be recognizable, it seems to me highly probable that the first origin of the portolanos is to be derived from the Tyrian charts described by Ptolemy under the name of Marinus.

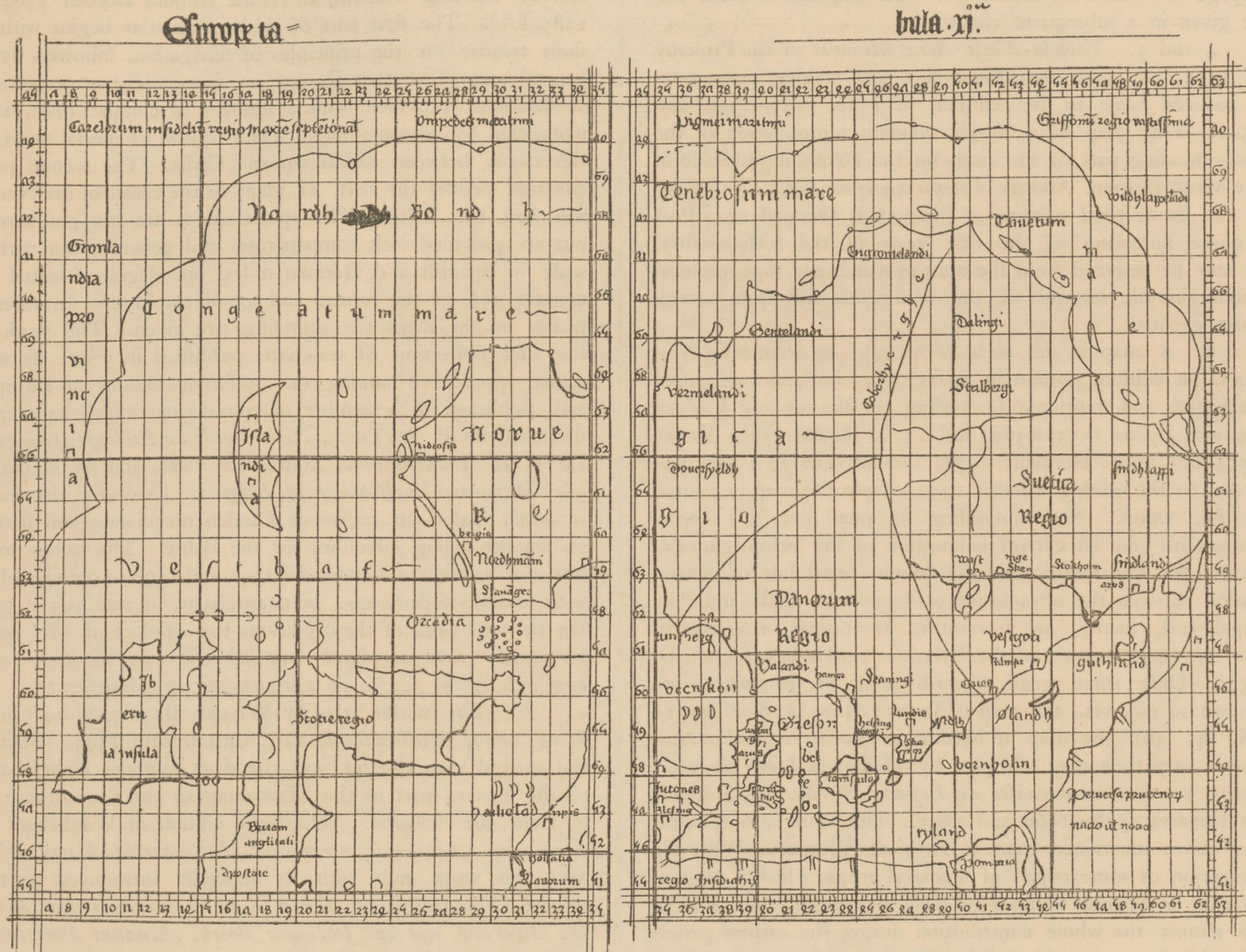
No graduation appears on the original portolanos, but when they were published in print, they were generally provided with meridians and parallels on a projection of equidistant parallelograms, or on the projection on which the maps of Marinus of Tyre, according to Ptolemy, were constructed. This is criticized by BREUSING, who, supposing that these maps were based on deviating loxodromes, means that a conical net of graduation should be preferred for their graduation. I cannot unconditionally accept this opinion. In many cases, especially when the problem is to draw meridians and parallels on portolanos of great extent from north to south, the conical projection, or perhaps rather the *»projection of Donis,»* may be the most suitable or the one coming nearest to accuracy. But this is by no means generally the case. In fact, a highly interesting, but in no

wise easily solved problem here presents itself to the cartographer. It may be stated thus: If the relative position of a number of places on the earth is fixed: a) by measuring the distances between these places, or b) by measuring the azimuths of the courses steered by vessels, or c) by giving the distances as well as the azimuths; what kind of projection on a plane surface will give the relative positions of these places either exactly, or, this not being possible, with the least possible deviation from the direct observations? An exact solution is only possible in the event b), and then we get a map on Mercator's projection.

If, again, as probably has generally been the case, the maps were based on measurement as well of the distances as of the courses of ships, the observations cannot be rendered on a

meridians and parallels, the projection of Marinus was generally preferred. But already, in 1558, on the publication of the voyage of the brothers Zeno by Marcolini, a very remarkable attempt was made to provide an old map with a conical net of graduation. The principles here followed are described in Ruscelli's edition of Ptolemy, Venetiis 1561, 1562, 1564 etc., on the reverse of *Septentrionalium partium nova tabula*. The chart of the North Sea and the Baltic by CAMOCIUS of 1562 (fig. 25), and the above mentioned maps of Barents of 1595, are portolanos graduated on the projection of Marinus.

While Ptolemy's maps, immediately after the discovery of the art of printing, were spread abroad in numerous copper-prints or wood-cuts, a long time elapsed before the first complete portolano or loxodromic map was published in print.



27. The map of Scandinavia by CLAUDIUS CLAVIUS 1427. (Orig. size 220 X 155 m. m.)

plane surface without a considerable adjustment. Even a mathematician of our days would not find it easy here to propose a general rule. It would be necessary by means of the method of the least square to connect observations, the relative values of which it is almost impossible to determine. Of course a mathematical treatment of the problem could not have come under consideration in the middle ages, and the problem was then, no doubt, simply solved by every map-maker trying as well as possible to introduce into the old map-model such corrections as were considered necessary by his customers. If the courses were laid out according to a deviating compass, as perhaps usually was the case after the 14th century, the problem became still more complicated. A general rule for the graduation of a medieval portolano accordingly can scarcely be fixed. When the portolanos in the 16th century were provided with

The reason for this seems partly to have been the little attention paid by the printers to these productions of unlearned mariners, partly the difficulty of reproducing the different colours of these maps by copper-print or book-press, and the cheapness at that time of manual labour, even of artists. But from the great number of portolanos still extant in Italy we may deduce that they had a greater circulation in the 16th century than printed cartographical works. The portolanos saved from destruction seem at least to be more numerous than the total number of copies still extant of the editions of Ptolemy's Atlas printed before 1500.

The following maps based on portolanos or drawn according to the principles adopted by the portolano-makers, although generally without any compass-lines or loxodromes, were published in print during the 16th century, viz.,

1. *Orbis typus universalis iuxta hydrographorum traditionem*, printed in the Ptolemy of 1513 and 1520 (N. T. XXXV) and copied, with exception of the westernmost part of the map, in the editions of Ptolemy of 1522, 1525, 1535, and Vienna 1541.

2 and 3. Two portolanos (without compass-roses) of Africa, printed in Ptolemy of 1513 and 1520 and reproduced on a reduced scale in ed. 1522, 1525, 1535, and 1541 (N. Fig. 8 and 9). Notwithstanding the want of the usual straight lines denoting the compass bearings, these maps¹ are evidently copies of true portolanos and, through the richness and exactness of the map of the coast, quite comparable with the old charts of the Mediterranean Sea so highly admired. The legends prove them to have been drawn after the second voyage of VASCO DA GAMA. A fuller account of them will be given in a subsequent chapter.

4 and 5. *Tabula Nova Asiae Minoris* in the Ptolemy of 1513 and 1520, reproduced in a very careless manner on a reduced scale in the editions of 1522, 1525, 1535, and 1541. This map is a rough woodcut reproduction of the corresponding part of the earth on the common portolano of the Mediterranean. Also the *Tabula moderna Indiae* (N. fig. 10) in the above cited editions of Ptolemy is founded on a Portuguese portolano of the first years of the 16th century, as may be deduced from the want of names and topographical details in the interior of the continents and from several coast-legends.

6. A map in the *Arte de navegar* by PEDRO DE MEDINA, 1st edition, printed in Spain² 1545 and afterwards often translated and reprinted (according to BRUNET and CARTER BROWN: Lyons 1553, 1569, and 1576; Rouen 1573; Venice 1554 and 1555; Germany 1576; London 1581). I have had access to the edition Venetia 1554, where the map is printed in fol. xxxiii. Notwithstanding its small size, this map is remarkable for its correct delineation of the Isthmus of Panama, for the insertion of the famous papal line of demarcation between the ultramarine possessions of Spain and Portugal and, finally, on account of its original being one of the few maps printed in the Pyrenean peninsula before A. D. 1570. Only three small Spanish maps of that period are known to me, viz., the map of PETRUS MARTYR, Seville 1511 (N. fig. 38), the map of Medina in the *Arte de Navegar* and a very rude map of Spain by Medina in *Libro de grandezas y cosas memorables de España*, Sevilla 1549; Alcala de Henares 1548—1566 and 1595. This work also contains the above mentioned chart in *Arte de Navegar*. With the exception of some copies of medieval maps, which I suppose to exist in Spanish editions of classical authors, this seems to be almost the whole contribution during the earliest period of printed cartographical literature from the countries, from which the New World and the south-east passage to India were discovered, and from which hundreds of the most important voyages of discovery started during that period. Fig. 75 I give a fac-simile of Medina's original map. It is far inferior to the copy published in Venice and also, I suppose, to the copies published in France.

7. *Carta Marina Nova* (N. T. XLV), at first printed on a small scale, as a general illustration to a note on sea-charts, in Ruscelli-Gastaldi's Ptolemy, Venetiis 1548, and afterwards reprinted on a slightly enlarged scale in the editions of 1561, 1562, 1564, and 1574.

8. Various charts of parts of the Mediterranean, printed in Italy. They are generally direct reproductions from por-

tolanos. Like all old maps not inserted in books but published on separate sheets, these charts are now very rare, and of most of them, no copies are extant. But I suppose that they were, like the portolanos, once largely circulated and used by mariners and merchants. Some of these maps are inserted in the Collegio Romano copy of Atlas Laferri (Nos. 8; 35; 115; 129; and 130, pages 240—250 in the catalogue of CASTELLANI).

9. A chart of the Baltic and the North Sea, engraved in copper in 1562 in Venice *apud Ioannem Franciscum Camocium* (N. fig. 25). When this chart was published, it was beyond all comparison the best map of the Southern Baltic and the North Sea.

10. *Spiegel der zeevaerdt etc. door LUCAS JANSZ WAGHENAER Pilot oft Stuijzman residerende inde vermaerde Zeestadt Enchuijsen* (First edition, Leyden 1584—1585, fol.). The first part of this marine-atlas begins with a short treatise on the principles of navigation, followed by a general map of western Europe on the equidistant projection of Marinus, provided with a number of compass-roses, and intersected by compass-lines. Then follow 22 special maps of the coasts between Enkhuisen and Cadiz. The second part contains, besides the text, 21 maps of the coasts of the North Sea and the Baltic. The special maps are not graduated, but are provided with compass-roses and generally also with a scale in Spanish and German miles; one degree is stated to contain $17\frac{1}{2}$ of the former and 15 of the latter. In several places on the maps the soundings are given. This work is the first collection of sea-charts published in print. It was much appreciated among the seafaring nations of Europe, and published in a number of editions in various languages described by P. A. TIELE, *Nederlandsche Bibliographie van Land- en Volkenkunde*, Amsterdam 1884, and by F. VANDER HAEGHEN in *Bibliotheca Belgica*. Evidently the work is partly based on Italian or Catalan portolanos, and partly on ancient sailing directions for the Baltic. The same work was also printed in Leyden in 1592 and 1598 in oblong folio, with double-folded sea-, or coast-charts, of size 195 x 555. On the title-page of these editions it is spoken of *het oude vermaerde Lees-caertboeck van Wisbuy vermeerdert, ende van ontallijcke fouten en valsche coersen ghesuyvert.*

11. The marine atlas by WILLEM BARENTSZOON, *Caert boeck vande Midlandtsche Zee*, Amstelredam 1595. Besides the general map (N. fig. 22), the work contains eight charts of the western part of the Mediterranean and the entrance to it from the Atlantic. Whilst the edition of Waghenaer of 1592 gives *het oude vermaerde Lees-caertboeck van Wisbuy*, this work ends with an appendix introduced by the words: *Dit navolghende Boeck is ghetranslateert door Marten Everart, uyt een Italiaens Boeck, ghenamt Portolano, twelck te segghen is Havenwyser, ofte een speciale verclaringhe van alle de havenen der Midlandsche Zee*. It is very remarkable that the authors of the sea-charts of the North Sea and the Baltic, as well as of the Mediterranean, referred to written descriptions from the middle ages, when the first marine-atlases were published in print at the end of the 16th century. This further confirms the circumstance, before pointed out, that, as Ptolemy's geography is the model of the modern atlases and was still often referred to at the end of the 16th century, so our sea-charts have been developed from medieval portolanos. On some of the special maps in Barentszoon's atlas there are two kinds of compass-roses, one (*Directorium nauticum italicum, Italiensch compas*) giving the true points, and the other (*Directorium nauticum vulgare*,

¹ Loxodrom or compass-lines are laid down on the large map of Olaus Magnus, although otherwise this map has not at all the character of a portolano.

² In Cordova, according to BRUNET, in Valladolid, according to HARRISSE. The names of three cities, Sevilla, Cordova, and Valladolid, are mentioned on the title-page.

Gemeyn Duytsch compas) the deviating ones. The special charts of the Mediterranean are not graduated, whereas a broad double line, on which the degrees of latitude are marked out, is drawn in the direction of the meridian, across the chart of the sea between Cape St. Vincent and Cape Bojador (N. fig. 23). I assume that this sea-chart is based on Portuguese maps and that we have here a reminiscence of the introduction by the men of Prince Henry the Navigator of the

of Europe and a part of Africa are laid down with tolerable exactness. The portolanos were used as models, and the map was completed in accordance with accessible data and prevailing traditions, and as well as was then possible. Necessarily it was incorrect, but nevertheless it was constructed with better judgment than that which guided the drawer of the map of the world f. i. in the *Rudimentum Novitiorum*. The most complete maps among these are:



28. MARINO SANUDO'S map of the world from the beginning of the 14th century. From Bongars, *Gesta Dei per Francos*. Hanoviae 1611. (Diam. of circle in original 330 m. m.)

method of determining the ship's position by means of observations of latitude.

4. General maps of the world based on portolanos. Besides the general maps before (mom. 2) mentioned in this chapter, we also have, from the middle ages, other maps of the world, for which the portolanos served as starting points, and which, though still rude, far surpass other medieval maps or geographical drawings of the world.

On these maps Europe, Asia, and Africa form a large circular island with Jerusalem almost in the centre. In this circle the Black Sea, the Mediterranean, and the western coasts

MARINO SANUDO'S atlas of the beginning of the 14th century, composed for his great work *Liber Secretorum Fidelium Crucis*. According to UZIELLI and AMAT DI S. FILIPPO (II: p. 50) this atlas, in the most complete codex extant, consists of nine plates, among which one is a planisphere of the world. Four of these maps (Egypt, Jerusalem, Palestine, and the planisphere) were printed *Hanovia* 1611 in J. BONGARS' *Gesta Dei per Francos*, which, among other works, also contains Marino Sanudo's *Liber Secretorum Fidelium Crucis*. Copies of the planisphere have been published by Lelewel and Santarem (two variations, the one from a

manuscript in Paris, the other from a codex in Brussels). For several memoirs on Sanudo's work I may further refer to the work of G. UZIELLI and AMAT DI S. FILIPPO before cited, as well as to H. SIMONSFELD, *Studien zu Marino Sanuto dem Aelteren* (*Neues Arch. der Gesellsch. für ältere deutsche Geschichtskunde*, Vol. 7, 1881—82). Sanudo's atlas appearing to be partly founded on original informations and being very remarkable through the delineation as well of the northern countries as of Africa, I here (fig. 28) give a fac-simile of its map of the world from the copy in Bongars' work.

The map of the world of ANDREA BIANCO of 1436. Of this excellent artist a map of the world or a planisphere

is still extant besides various portolanos resembling that of Marino Sanudo, but not so well executed. It has been reproduced several times, amongst others in the works of Santarem and Theobald Fischer.

FRA MAURO's map of the world of 1457. A well preserved planisphere, in the *Biblioteca Marciana*, having a diameter of 1,96 m. It is rich in details and legends and of great importance to the history of geography. It was for the first time fully described and reproduced in a work: *Il Mappamondo di Fra Mauro Camaldolese*, published in 1806 in Venice by PLACIDO ZURLA; then by SANTAREM, and on a more or less reduced scale by several other geographers.

V.

Extension of Ptolemy's Oikumene towards the north and northwest.

As may be perceived from the general map of Ptolemy, and from his *Tabula 1ma*, 8va Europae, and 2da, 7ma, 8va Asiae (N. T. I, II, IX, XVII, XXII and XXIII), he, following the example of Marinus, made his atlas of the known world, towards the north, terminate everywhere at lat. 63° N. This boundary-line quite arbitrarily adopted crosses, for about two thirds of its length, the Sarmatian and Scythian deserts. Until the middle of the 16th century, when the English and Dutch began their north-east voyages, the geographers took no notice of what was situated beyond lat. 63° N. Although some notices respecting northern Asia may have penetrated to the civilized countries of Europe through Marco Polo or other Asiatic travellers, and although the constructors of globes, and drawers of general maps of the world, were compelled to let the continent of Europe and Asia terminate towards the north in a coast-line, this hardly justifies us in speaking, before that time, of an extension of the maps of this part of the world beyond Ptolemy's boundary-line. The case was different in the west, where the 63d parallel was drawn by Ptolemy across the island of Thule through *Oceannus Hyperboreus* and *Deuceledonius*. Even here the maps of Ptolemy do not correspond very well with reality, but they show that the accounts of the distribution of land in these parts of the world had already reached, before A. D. 150, as far as to Egypt and Syria. Thus the northern coasts of Germany and the Cimbrian peninsula (Jutland) are laid down at least recognizably and near to their proper latitudes. But in the sea farther to the north there are, instead of the Scandinavian peninsula, only two islands, *Scandia* and *Thule*. Between Thule and the northern extremity of Scotland, which extends much too far to the east, the *»Orcades Insulae 30»* are placed, and between Scandia and Jutland, the *»Scandia Insulae 3.»* The main island *Scandia*, as well as *Thule*, had an extension from east to west of only about 150 kilometres. On Scandia we read the names of *Levonii*, *Chedini*, *Dauciones*, *Gutae*, *Phiresi*, *Phanone*, among which only a couple can be referred

to nations whose names are still registered on the pages of history. But the inhabitants of the Roman empire soon learned that this map of the northern part of Europe could not be correct, first through the tribes, which from the north invaded the rich countries of the south, and which mentioned with pride the large territory in the North for their home, and afterwards by the Vikings. It was also for that manifestly incorrect part of Ptolemy's atlas that the geographers of the middle ages first composed new maps completely different from the old type. Of such maps the following are yet extant:

1. Maps of the North on portolanos and general maps of the world based on portolanos of the middle ages. Regarding these works, the reader is referred to a preceding chapter. The usual manner in which the Baltic and surrounding lands were drawn on the portolanos is shown by the fac-simile of a part of one of the oldest of them yet extant, the map of DULCERT of 1339. Analogous drawings of Northern Europe are found on the famous *Carte Catalane* of 1375 (see above p. 46), on ANDREA BIANCO's map of 1436, and, as far as I have been able to ascertain, on almost all other earlier portolanos embracing the countries north-east of the mouth of the Scheldt. The most characteristic features of the northern parts of these maps appear to me to be the following.

When these maps were drawn, the Gulf of Bothnia was not yet 'discovered.' Thus the Baltic got its principal extension in east and west, and a form not in the least corresponding to reality. In the centre of its eastern part there is a large island, Gotland (*ya Codladie in qua sunt nonaginta parochie*; ANDREA BIANCO, 1436), often marked with purple and gold, probably to indicate its power and wealth. There are still about ninety parishes on Gotland, but its power and wealth long ago came to a sudden end with the destruction of Visby, in 1361, by the Danish king Valdemar.² The north-eastern parts of the portolanos also contain in the east the names of Novgorod and of some other cities, with which the Gotlanders had commercial intercourse. Like the Baltic

¹ If this map is compared with which Pliny's account of *Scandinavia*, *Baltia*, *Thule*, *Nerigon*, etc. (Lib. IV Cap. XIII and XVI) it will be perceived, that the Alexandrian geographer was not well acquainted with the informations about the northern countries, collected during the military expeditions of the Romans to Britain, Gallia, and Germany.

² The importance of this event seems, however, to have been exaggerated. The trade and wealth of Gotland commenced already to decline at the end of the 13th century, with Visby ceasing to be the emporium for the commerce of the Baltic.