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OF THE AMERICAN CONTINENT
BY MUSLIM SEAFARERS

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THE QUESTION of a possible pre-Columbian discovery of the Americas has been pondered by many scholars throughout the second half of the 20th century. Recently, stimulated by the publication of the book *1421. The Year China Discovered The World*¹ by Gavin Menzies in the year 2002, the interest in this issue has once more increased considerably.

The author, a retired submarine-commander, maintains his book was intended for a broad public rather than for experts. Yet this modest statement is contradicted by the way Menzies assumes, throughout the book, the status of a would-be authority for the history of cartography.

According to Menzies one map in particular from the collection of Sir Thomas Phillips, which is now in the James Ford Library, Minnesota, drew his attention. It bears the name of Zuane Pizzigano, a Venetian cartographer, and is dated 1424. Menzies' interest in this map was mainly aroused by the appearance of four islands in the western Atlantic called *Satanazes*, *Antilia*, *Saya* and

Ymana.² He concludes that *Antilia* and *Satanazes* are Puerto Rico and Guadeloupe "... but that meant that somebody had actually surveyed the islands some seventy years before Columbus reached the Caribbean". In pursuit of this matter Menzies convinced himself he had found solid evidence that someone indeed had reached the Caribbean 70 years before Columbus and even established a colony there. He considered whether those early discoverers could have been Portuguese but found it quite unlikely.³

In addition to the fact that the appearance of this archipelago on maps predating the Columbus voyages has been discussed for about 200 years, I would like to remark that it was in fact Armando Cortesão who discovered the Zuane Pizzigano Map of 1424. In his book *The Nautical Charts of 1424 and the Early Discovery and Cartographical Representation of America. A Study on History of Early Navigation and Cartography* (Coimbra, 1954) he first expressed the opinion that Portuguese navigators brought the knowledge about the Caribbean islands and possibly even the American mainland to Europe prior to 1424.⁴

¹ Bantam Press, London – New York – Toronto – Sidney – Auckland.

² *1421. The Year China Discovered The World*, l.c. pp. 29-31,

³ *Ibid*, p. 31.

⁴ *The Nautical Charts of 1424*, l.c. p. 109.

This view was further expounded by Cortesão in his *History of Portuguese Cartography*⁵ and has caused widespread discussion. Menzies could well have known that, for example from Tony Campbell's article in the *History of Cartography*⁶.

However, by further considerations and research Menzies came to the conclusion that the Portuguese were far from being in the position to discover the Caribbean islands.⁷

"They [the explorers] must have been skilled in astro-navigation and must have found a method of determining longitude to draw maps with negligible longitude errors."⁸

"There was only one nation at that time with the material resources, the scientific knowledge, the ships and the seafaring experience to mount such an epic voyage of discovery. That nation was China, but the thought of searching for incontestable proof that a Chinese fleet had explored the world long before the

Europeans filled me with dread."⁹ So far Menzies' assumptions.

In the course of some unaccounted further investigations Menzies claims to have "discovered" that "...several Chinese fleets had indeed made voyages of exploration in the early years of the fifteenth century. The last and greatest of them all—four fleets combining in one vast armada—set sail in early 1421. The last surviving ships returned to China in the summer and autumn of 1423. There was no extant record of where they had voyaged in the intervening years, but the maps showed that they had not merely rounded the Cape of Good Hope and traversed the Atlantic to chart the islands I had seen on the Pizzigano map of 1424, they had then gone on to explore Antarctica and the Arctic, North and South America, and had crossed the Pacific to Australia. They had solved the problems of calculating latitude and longitude and mapped the earth and the heavens with equal accuracy."¹⁰

Passing over the question whether Menzies is justified in attributing these achievements to the Chinese (more on this later) I would like to explain that we are talking about seven military missions that were dispatched by the Chinese Emperor Chéng Zǐ (title of reign: Yǒng Lè) in the first quarter of the fifteenth century to the "western barbarians" in order to establish or re-

⁵ Vol. II, Coimbra 1971, pp. 125–139. "The more I study the subject, taking into consideration the various criticisms of my book of 1954, the more convinced I am that the Antilla group of Islands in Zuane Pizzigano's chart of 1424 represents for the first time some undetermined American land sighted during an unknown Portuguese voyage to the western Atlantic" (p. 139).

⁶ Vol. I, 1987, pp. 371–458, esp. 410–411; Campbell's contribution is entitled: *Portolan Charts from the Late Thirteenth Century to 1500*.

⁷ 1421. *The Year China Discovered The World*, l.c. p. 31.

⁸ *Ibid*, p. 33.

⁹ *Ibid*, p. 34.

¹⁰ *Ibid*, pp. 36–37.

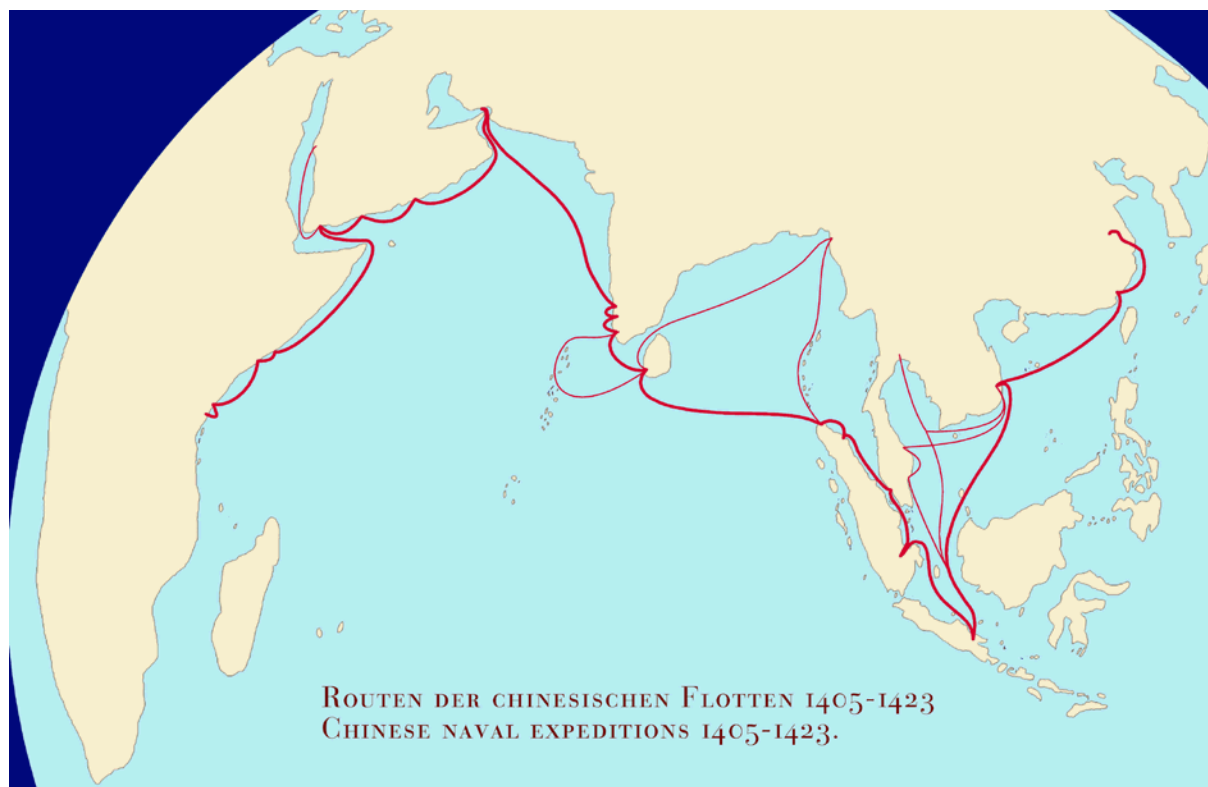


Fig. 1. After Louise Levathes, *When China Ruled the Seas—The Treasure Fleet of the Dragon Throne 1405–1433*. New York, 1994, 252 pp.

new diplomatic relations and claim tribute.

These naval expeditions which took place between 1405 and 1433 are well documented in Chinese records.

The three oldest reports about the expeditions were written by surviving participants. One of them was Mǎ Huān, a Muslim who knew Arabic. His work entitled *Yíng Yái Shèng Lǎn* (“Comprehensive Investigation of the Ocean Shores”) is predominantly of scientific content.¹¹ Sinologists have been working on these sources since the second half of the nineteenth century. They include unambiguous and nearly exhaustive information about the fleets’ itinerary and ports of des-

¹¹ Joseph Needham, *Science and Civilisation in China*, Vol. III, Cambridge – London – New York – Melbourne 1959, p. 558.

tinuation in thirty-six countries bordering the Indian Ocean, covering the south as far as Borneo, Timor and Zanzibar, but not Madagascar and Australia.¹² None of the three surviving contemporary sources includes any maps. Yet the historian Máo Yuán Yí was able to reconstruct a nautical chart based on their data in his book *Wǔ Bèi Zhì* (“Complete Military Chronicle”, 1651).¹³

As early as 1885 the sinologist Georg Phillips had called attention to the fact that “The latitude of places on the map along the Western coast of India, and also along the eastern coast of Africa is shown by

¹² *Ibid.*, vol. IV, 3, 1971, p. 490; Louise Levathes, *When China ruled the Seas. The Treasure Fleet of the Dragon Throne 1405–1433*, New York 1994.

¹³ Cf. J. Needham, *l.c.* vol. III, p. 959, vol. IV, 3, pp. 425, 493.



Fig. 2. World map by Fra Mauro (1459).

the North Star being reckoned at so many digits and so many eights high. These are called in Chinese *chih* (指) and *chio* (角)...”¹⁴

Reading J.-T. Reinaud’s introduction to the *Taqwīm al-buldān* by

¹⁴ *The Seaports of India and Ceylon, described by Chinese Voyagers of the Fifteenth Century, together with an account of Chinese navigation*, in: *Journal of the China Branch of the Royal Asiatic Society* (London) 20/1885/209–226, esp. 218f.; idem, *Seaports... Navigation from Sumatra to China*, *Ibid* 21/1886, 30–42; see also: F. Sezgin, *Geschichte des arabischen Schrifttums*, Vol. XI, p. 333.

the Arab geographer Abu l-Fidā’, it occurred to Phillips that these terms (*zhǐ*, finger or inch and *jüé*, angle) might be equivalents to the words *iṣbaʿ* und *zām*, as used by Arab navigators in the Indian Ocean.¹⁵ The schematic chart from the *Wǔ Bèi Zhì* was edited by Phillips and reprinted by Yousouf Kamal.¹⁶

¹⁵ F. Sezgin, *GAS XI*, 333.

¹⁶ *Monumenta Cartographica Africae et Aegyptii*, Leiden 1926–52, vol. IV, p. 1415 (reprint VI, 170–171).

But how could Menzies come to the conclusion that Chinese fleets had travelled beyond the Cap of Good Hope, traversed the Atlantic all the while surveying and charting the new territories notwithstanding the fact that the sources yield clear information concerning the actual routes and activities (for a survey of these routes v. fig. 1), and leave no room for speculations concerning any further south- or west-bound voyages beyond modern Mozambique. It seems that arbitrary conclusions drawn from the study of several other extant maps¹⁷ which shall be discussed below, have led Menzies into making such claims.

Hoping that the world map drawn by Fra Mauro in 1457 (fig. 2) would yield further clues, Menzies travelled to Venice. There he noticed the following inscription on the map:

“Around A.D. 1420 a ship or so-called Indian junk coming from the Indian Ocean and on its way to ‘the Isles of Men and Women’ was driven beyond Cap de Diab and through the Green Islands in the Dark Ocean towards the Algarve in the west. For forty days they found nothing but sky and water.”¹⁸

Menzies thereupon asked himself “...how did Fra Mauro get this information? How did he know the shape of a junk, and that the Cape

was triangular?”¹⁹ He remembered the name of the Venetian Voyager Nicolò da Conti who returned to Venice probably around 1444 after a sojourn in Syria, where he had learnt Arabic and converted to Islam, and after extensive travels in Iran, India and South-east Asia. Menzies supposes that Conti must have travelled with a Chinese fleet for some time during which he obtained the world map that Mauro later based his version on. Let me just remark that, aside from many other objections, Conti’s own travelogue contradicts the alleged journey with a Chinese fleet around 1420. Historians of geography believe that Conti’s voyage started in 1419 and took until ca. 1444 and that upon his return he travelled in the company of his Arab wife and his children via Socotra, Aden, Jiddah, the Red Sea and Alexandria to Venice.²⁰

In the course of his “research” Menzies found further support for his assumptions on “a copy of a Chinese/Korean chart known colloquially as the Kangnido”²¹. It is kept today at the Ryukoku University in Kyoto (Japan) (fig. 3). Here too he was mainly interested in the representation of Africa: “So accurately

¹⁹ Menzies, l.c. pp. 115ff., 122f.

²⁰ Fr. Kunstmann, *Kenntnis Indiens im 15. Jahrhundert*, München 1863; O. Peschels *Geschichte der Erdkunde bis auf Alexander von Humboldt und Carl Ritter*, München (2nd ed.) 1877, pp. 182–184; R. Hennig, *Terrae incognitae*, 4 vols., Leiden 1944–56, here vol. IV, pp. 33–34.

²¹ G. Menzies, l.c., p. 127.

¹⁷ G. Menzies, l.c. p. 38.

¹⁸ Menzies (l.c. p. 122) quotes the translation by Needham (vol. IV, 3, p. 572); I follow the German translation in *Terrae incognitae* by Richard Hennig, vol. IV, Leiden 1944–1956, p. 44.

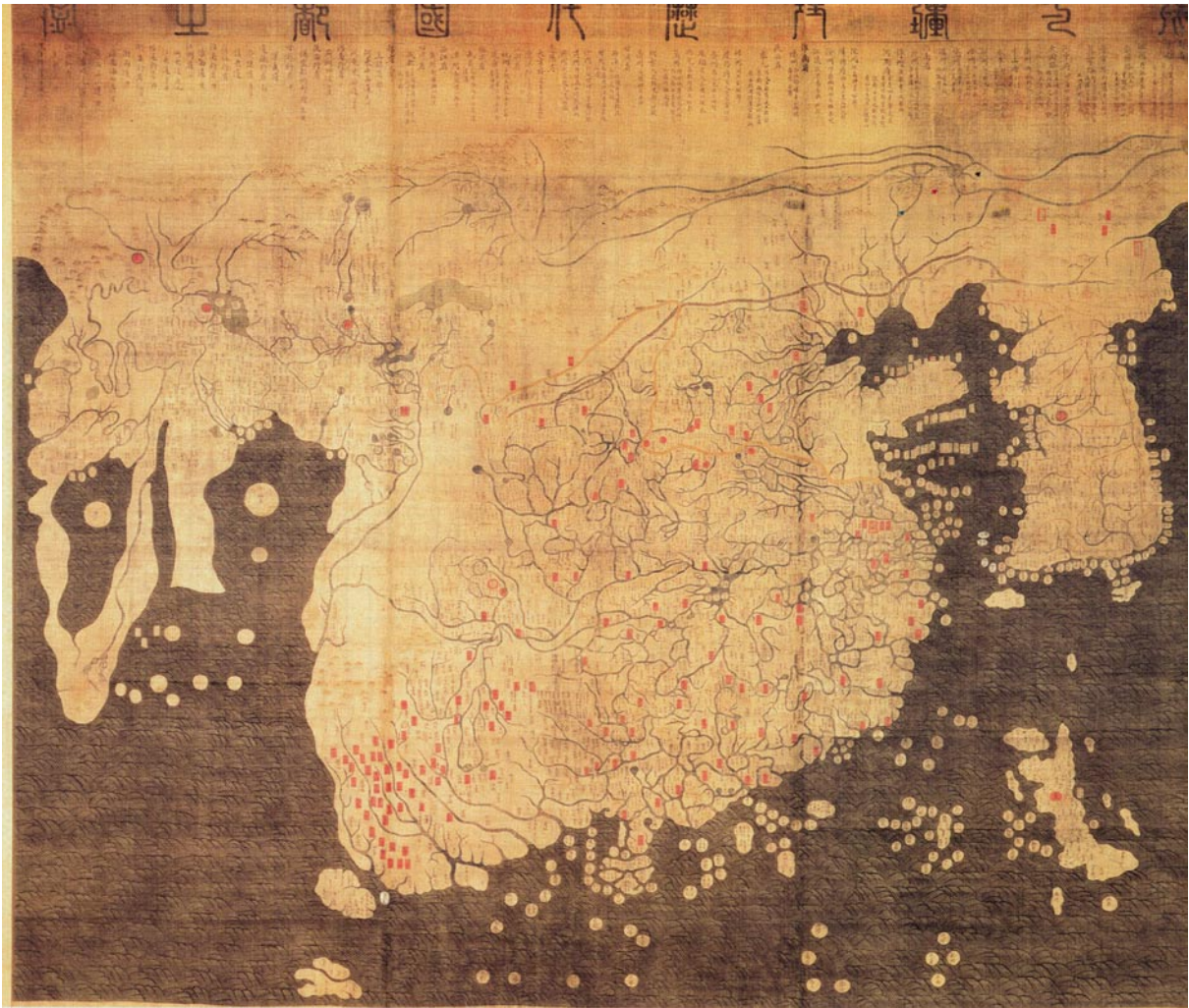


Fig. 3. *Kangnido*-world map (1402).

does the *Kangnido* depict the coasts of East, South and West Africa that there cannot be a shred of doubt that it was charted by someone who had sailed round the Cape. Europeans did not reach South Africa for another sixty years; Arab navigators on the west coast never sailed south of Agadir in modern Morocco, eight thousand kilometres away, and the Mongols never reached Africa at all. The accuracy of the *Kangnido* told me that Mauro/da Conti's description made absolute sense. A Chinese navigator could indeed have reached 'Garbin' and then drawn the *Kangnido*."²²

²² *Ibid* p. 128.

To this I would like to remark that the *Kangnido* map which is adduced by Menzies as evidence for his argumentation is in fact one of several surviving copies or adaptations of a world map compiled by Zhū Sī-Běn, the chief cartographer of the Sino-Mongolian Yuán Empire. Unfortunately the original seems to be lost. A revised version published 1524–1564 complements the Sino-Korean Version of 1402 mentioned above. Both maps have been published in several editions since 1938 and they have been scrutinised and evaluated by a number of scholars. The studies devoted to the subject

by the renowned sinologist Walter Fuchs since 1946 seem to have been decisive for the formation of a clear assessment.²³ Fuchs was followed by Joseph Needham²⁴ in tracing the origins of these charts back to the period around 1300. At such an early date the triangular shape of South Africa and the very precise delineation of the Mediterranean must surprise the historian of cartography.

For Fuchs and Needham it was evident that such modern features could only be explained by knowledge borrowed from the Islamic world. The Arabic names of about one hundred places and countries in Europe and thirty-five in Africa that have already been identified support this view. Only the actual channels through which the process of transmission had occurred were yet to be rediscovered. Fuchs assumed that the knowledge of the Arabic-Islamic world map came to China with the globe that was sent in 1267 (together with six other astronomical instruments) from Marāgha, capital of the western Mongol (Ilkhanid) empire to the court of Qubilai Khān. There is an interesting chapter in the *Records of the Yuán-Dynastie (Yuán Shǐ)*, edited by Sóng Lián (1310–1381) that deals at length with the instruments and models imported from the west

²³ *Drei neue Versionen der chinesischo-koreanischen Weltkarte von 1402*, in: *Studia Sino-Altaica*, Festschrift für Erich Haenisch zum 80. Geburtstag, ed. by H. Franke, Wiesbaden 1961, pp. 75–77.

²⁴ *Science and Civilisation in China*, vol. III, l.c., p. 555f.; F. Sezgin, GAS, vol. X, p. 323.

(i.e. Middle Asia). They were delivered by a man called Jamāl al-Dīn. He also composed a geography of the entire Mongol realms, apparently in the service of Qubilai Khān. The description of the earth globe *Kurat al-ard* (Persian: *kura-i arz*), transcribed in Chinese as *Kū-lai-yì à-ér-zǐ* tells us that it was made of wood, the “seven waters” painted blue-green and the three continents with their rivers and inland waters bright (white). A grid was drawn on its surface in such a way that the proportions of the various regions and the distances along travelling routes could be quantified from it.²⁵ Without taking the liberty to expand any further on the subject of the Sino-Korean map I have to express my astonishment by the fact that Menzies ignores all studies written on the subject since 1938.

The next thing Menzies hit upon during his “research” was “a description by the Portuguese historian António Galvão (died 1557) of a world map the Portuguese dauphin, Dom Pedro, Henry the Navigator’s brother, had brought back with him from Venice in 1428.”²⁶ This report²⁷

²⁵ cf. Sezgin, GAS, vol. X, p. 312; cf. Kuei-Sheng Chang, *Africa and the Indian Ocean. Chinese maps of the fourteenth and fifteenth centuries*, in: *Imago Mundi* 23/1970/21–30.

²⁶ 1421. *The Year China Discovered The World*, l.c. p. 137.

²⁷ *Tratado dos descobrimentos*, Terceira edição, Porto 1944, pp. 122–123; *The Discoveries of the World, from their first original unto the year of our Lord 1555 by Antonio Galvano, Governor of Ternate*, London 1601, new edition with Portuguese text. Ibid 1862, pp. 66–67. cf. GAS, vol. XI, p. 358.

reads thus: "In the yeere 1428, it is written that Dom Peter, the King of Portugal's eldest sonne, was a great traveller. He went into England, France, Almaine [Germany] and from thence into the Holy Land, and to other places; and came home by Italie, taking Rome and Venice in his way: from whence he brought a map of the world, which had all the parts of the world and earth described. The Streight of Magelan was called in it the dragon's taile [*cola do dragam*]: the Cape of Boa Esperança, the forefront of Afrike [*fronteira de Africa*] and so forth of other places: by which Map Dom Henry [the Navigator] the King's third sonne was much helped and furthered in his Discoveries."

"It was tolde me by Francis de Sousa Tavares that in the yeere 1528, Dom Fernando, the King's sonne and heire did show him a map which was found in the studie of the Alcobaza which had beene made 120 yeeres before which map did set forth all the navigation of the East Indies with the Cape of Boa Esperança according as our later maps have described it; whereby it appeareth that in ancient time (*em tempo passado*) there was as much or more discovered than now there is."

Menzies comments upon the first part of the above quote: "Here was an unequivocal assertion that by 1428 both the Cape of Good Hope (Boa Esperança) and 'the Streight of Magelan' (separating Argentina from Tierra del Fuego) had been charted on a map. It was an extraordinary claim. How could the Strait of

Magellan have appeared on a map—for simplicity, I shall call it the 1428 World Map—nearly a century before Ferdinand Magellan discovered it? To emphasize that this was no mistake, Galvão continued:"²⁸ (here follows the second part of the above quotation).

This reference which Menzies claims to have discovered in pursuit of his "research" in Venice has also been known for a long time. As early as mid-19th century the geography-historian Joachim Lelewel called attention to Galvão's²⁹ account and drew the correct conclusion, that the semi-insular shape of Africa must have been known to the Portuguese through foreign, acquired maps rather early on. The reference to the Strait of Magellan on a map in circulation by 1428 however he considered unbelievable and called it a hallucinatory presumption. As I intend to show below (p. 28), current research leads to a different conclusion.

Without even noticing that Galvão alludes to a second map in the passage quoted above—one that back-dates the cartographic representation of the Cape of Good Hope to the year 1408 and thus contradicts the purported discovery by the Chinese expedition fleet in 1421—Menzies makes a connection with yet "another chart that would prove one of the most valuable keys to

²⁸ G. Menzies, 1421. *The Year China Discovered The World*, l.c. p. 137f.

²⁹ *Géographie du moyen age*, vol. II, Brüssel 1852–1857, p. 83, note 172.

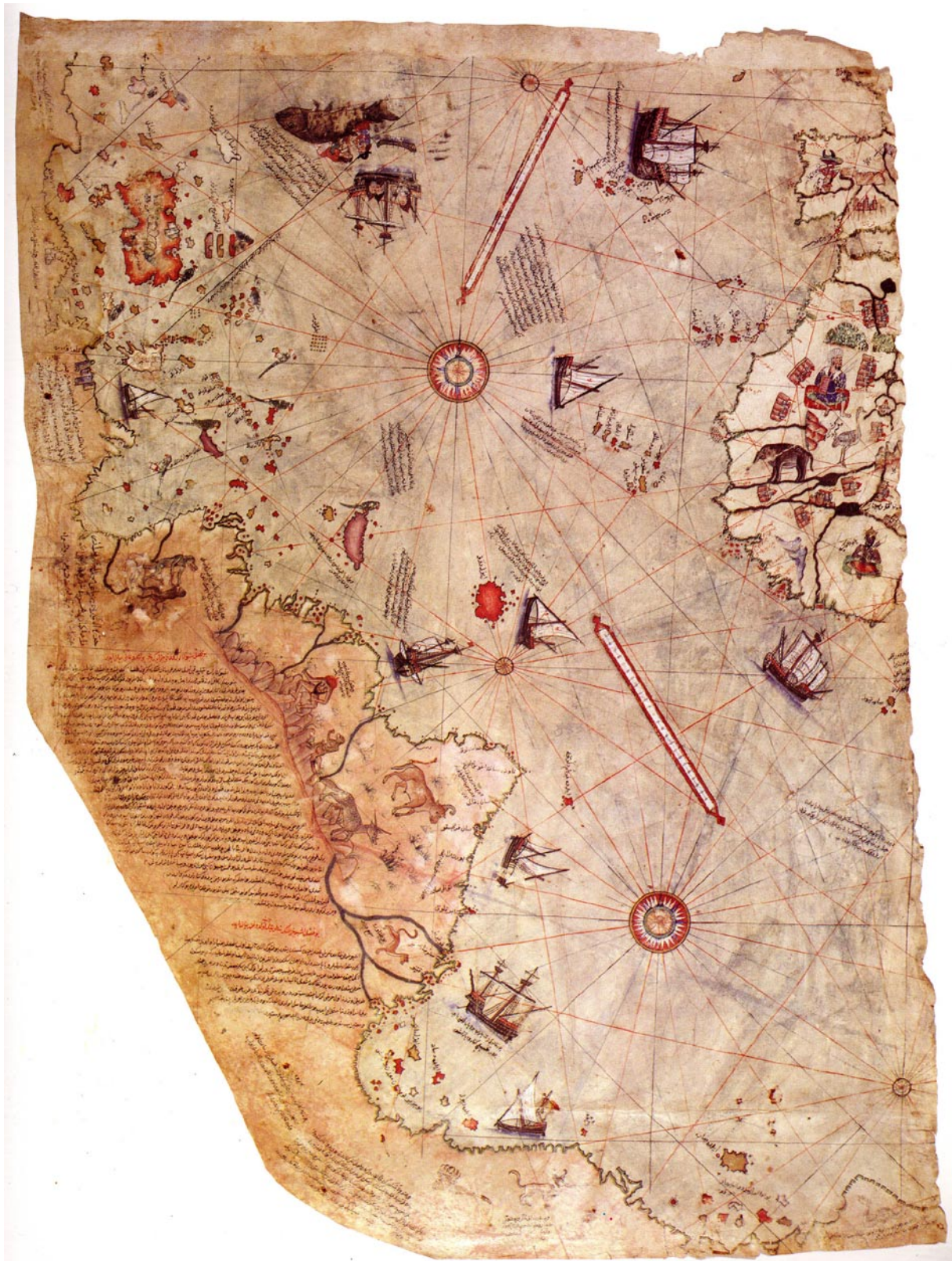


Fig. 4. Map of the Atlantic by Pīrī Re'īs (927/1521–930/1524).

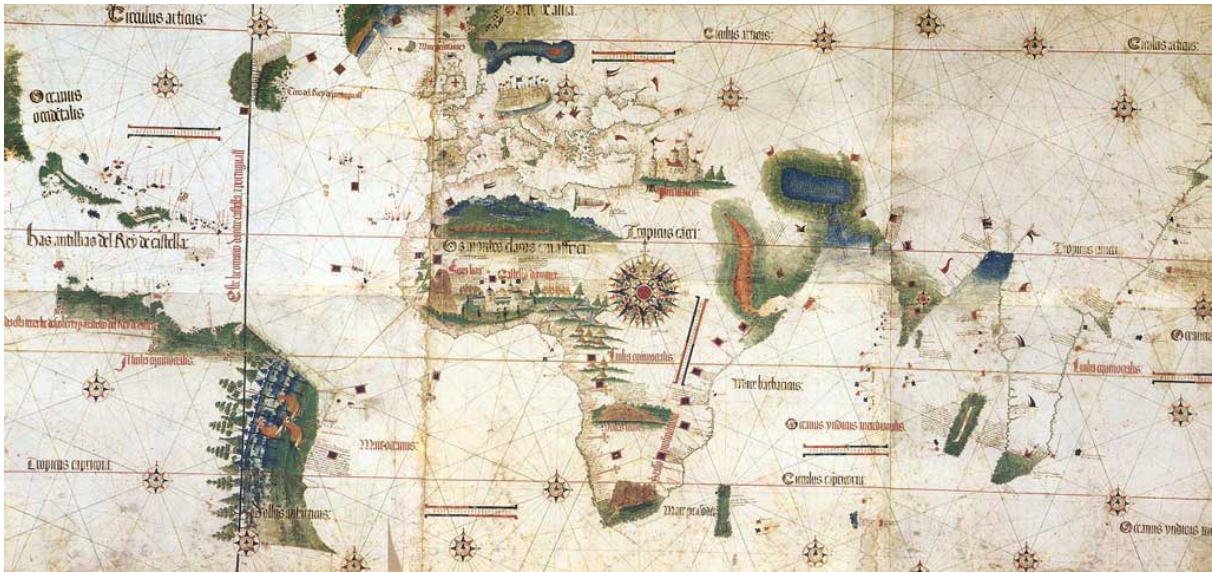


Fig. 5. World map by Alberto Cantino (1502).

unlocking the secrets of the Chinese voyages.”³⁰

He refers to the well-known partial map by the Ottoman admiral Pīrī Re’īs (fig. 4). He supposedly incorporated cartographic materials which were seized by the Ottomans during a naval battle with the Spaniards in 1501. Menzies is particularly interested in the south-western section of the chart, as he presumes this information would be ultimately derived from the Chinese map which allegedly was also the source of the Portuguese world map of 1428.

On his quest for support of his theories Menzies became aware of the surprisingly modern delineation of Africa, especially of its east coast, on the map charted assumedly in 1502 by Cantino (fig. 5). For Menzies this map “where the coast of East Africa is depicted with such accuracy that it appears to have been drawn

with the aid of satellite navigation”³¹ too bears witness to “Chinese expertise”, for “who else but the Chinese could have drawn this astounding chart?”³² After explaining why the Portuguese can be ruled out as possible originators of the map, he goes on wondering “if Arab navigators could have been the original cartographers.”³³ Menzies’ unconsidered answer is no, because he “found not one detailed Arabic chart of the east coast of Africa in Youssuf Kamal’s *Monumenta Cartographica*. Although the Arabs understood how to calculate longitude by lunar eclipse, they never mastered how to measure time with the necessary accuracy, something that the Chinese achieved”.³⁴ It is impossible to deal at length with

³⁰ G. Menzies, 1421. *The Year China Discovered The World*, l.c. p. 140.

³¹ G. Menzies, 1421. *The Year China Discovered The World*, l.c. p. 375f..

³² Ibid.

³³ Ibid.

³⁴ Ibid. Interestingly, this passage has been omitted in the second English edition (l.c., p. 377).

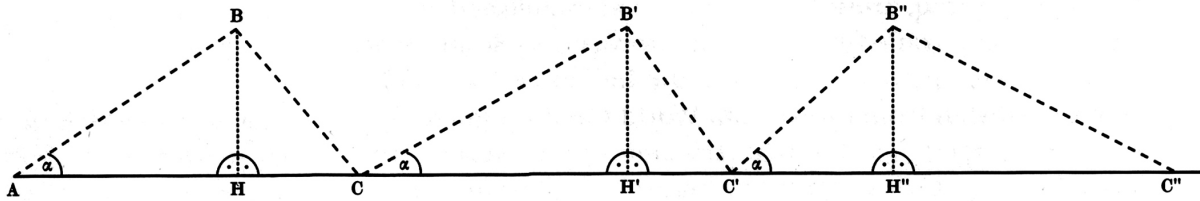


Fig. 6. Method for the determination of distances on the open sea by triangulation. After taking the latitude at the point of departure A one sailed in a known angle α to the equator to point B, took its latitude and thus the distance BH. Thereupon one changed the course towards C (back at the same latitude as A). The distance $AC=AH+HC$ was calculated trigonometrically. This triangulation was repeated until the destination was reached. Latitudes were determined by measuring polar altitudes.

all the statements, claims and assumptions Menzies abounds with, yet I would like to concede one point to him, viz. that the Portuguese cannot possibly have been the originators of the Cantino map. Not only did they lack proper methods for the determination of longitudes as well as accurate chronometry, but especially because the charting of such a stunningly realistic map of Africa must have been a far more time-consuming project than Menzies seems to realise, a mistake that, incidentally, pervades his whole line of argumentation. For centuries the Indian Ocean has effectively been like a huge lake enclosed by the Arabic-Islamic culture area.

In addition to the familiar methods for the determination of longitudes on land, the navigators in the Indian Ocean developed a highly sophisticated method of measuring distances on the open sea parallel or oblique to the meridian as well as parallel to the equator. The last case is equivalent to a determination of longitude. It was a true triangulation, suited for reliable and accurate measurements of trans-oceanic distances on the open sea (fig. 6).

Data found in extant Arabic and Turkish navigation manuals from the 9th/15th and 10th/16th centuries confirm that ample and adequate measurements of the Indian Ocean were taken to the extent that a comprehensive cartographic representation was rendered feasible. Hence Wilhelm Tomaschek was able to reconstruct very fine partial maps according to those data available to him in the year 1897, i.e. at a time when the most important Arabic nautical books had not even been rediscovered.³⁵

One of the most eccentric of Menzies's theories postulates that a Chinese fleet had passed the Cape of Good Hope and continued its westward voyage, discovered America, surveyed and charted its coast line finally to return home via the Arctic Ocean, along the shores of Europe and Asia.³⁶ In the second half of the 16th century the possibility of such a route was fervently discussed in Europe. Some cartographers of renown such as Gerhard Mercator and

³⁵ Cf. F. Sezgin, GAS, vol. XI, pp. 419-426, vol. XII, pp. 318-333.

³⁶ G. Menzies, *1421. The Year China Discovered The World*, l.c. pp. 238, 356.



Fig. 7. World map by Martin Waldseemüller (1507).

Abraham Ortelius would disavow its assumption while John Dee promoted it based on statements in the *Geography of Abu l-Fiḍā'*.³⁷ Menzies became also aware of the first world map (fig. 7) by Martin Waldseemüller (1507)³⁸ and found himself flabbergasted, as expressed in the following passage: "The Waldseemüller map, published in 1507, shows the north coast of Siberia from the White Sea in the west to the Chukchi Peninsula and the Bering Strait in the east. The whole coast, with its rivers and islands, is clearly identifiable. If not the Chinese, who could have surveyed that enormous coastline? How was this chart drawn, showing lands that were not 'officially' discovered by Europeans for another three centuries, unless the Chinese had also travelled there? The first Russian

surveys of Siberia did not take place for another two centuries, and the first Russian map did not appear until the nineteenth century."³⁹

After all, we should be grateful that Menzies raised this issue, it being a weak point in the history of cartography. As far as I am aware, the question where the fairly realistic cartographic representation of northern Asia in Waldseemüller's map—that breaks fundamentally with the Ptolemaean tradition—came from has never been earnestly posed in the entire history of cartography. On what sources are the delineations of rivers flowing into the Arctic Ocean which are found on early, non-Ptolemaic maps, based? Are the graticules drawn in many early maps of Asia connected with reality at all and if so, in which culture area were the underlying empiric data collected?

³⁷ Cf. F. Sezgin, GAS, vol. XI, p. 80f.

³⁸ Ibid, vol. X, p. 357, 477, 570; vol. XI, pp. 87, 94, 346; vol. XII, p. 155.

³⁹ G. Menzies, 1421. *The Year China Discovered The World*, l.c. p. 312 in 1st ed.



Fig. 8. Map of Asia in the time of the Mongols (presumably 7th/13th cent.), from the French edition of the book by Abu l-Gāzī Bahādūr Ḥān (Leiden 1726).

As even modern historians of cartography know hardly anything about the creative period of the Arabic-Islamic culture which lasted about eight hundred years, Menzies considers himself authorised to ascribe the quite detailed cartographic survey of North Asia to Chinese naval officers. In spite of the fact that the collection of data in question must have taken a very long time, Menzies assumes that this incredibly vast area could have been charted in the course of the Chinese naval expedition of 1421 to 1423.

In vol. X of the *Geschichte des arabischen Schrifttums* (pp. 334–545) I have addressed the issue of where the type of Asia-map which turned up in Europe early in the 16th century could have originated. I came to the conclusion that the cartographic

survey of North and Central Asia dates back to the 5th/11th century. An extant copy of a map⁴⁰ from the 7th/13th or 8th/14th century (fig. 8) bears witness to the amazing development in the cartographic survey of that area in the tradition of Arabic-Islamic geography.

It would lead too far to pursue all questionable claims in Menzies' book and neither is it my purpose. Yet one more, particularly dubious theory of his I would like to discuss briefly. It concerns the attempt to trace even the notorious 'Vinland'-map of Greenland back to the Chinese expedition of 1421–23.⁴¹ As this would imply a substantially reduced glaciation of Greenland, Menzies resorts to

⁴⁰ Cf. F. Sezgin, *GAS*, vol. XII, map no. 107, p. 173.

⁴¹ G. Menzies, *1421...*, l.c. pp. 345–356;.

the utterly preposterous statement that the equator had shifted to 03°40' N at the time. This he claims to have calculated using the sailing instructions and stellar guide in the *Wǔ Bèi Zhì* supposedly composed in 1422.⁴² Besides the fact that this book by Máo Yuán Yí, as mentioned above, was written in 1628 not 1422, and passing over the question what particular data from this source Menzies might have exploited for his purpose and how exactly he arrived at his results, not to mention the consequences of such an increase of the earth's axial tilt by almost 4°—above all it should be born in mind that astronomers and geographers in the Arabic-Islamic culture area have observed the sky continuously over long periods of time and in diverse regions of the world. They measured latitudes and longitudes using impressive observatories, equipped with precision instruments and drew or corrected maps of the earth according to the collected data. They would have noticed and documented such a change of the ecliptic with great astonishment. Moreover, the suggested displacement of the equator would have had to reverse itself later, which incident again would have left its mark in the astronomical records.

Menzies omitted this passage in the second English edition or rather was forced to drop it and replaced it by the sentence: “and this at a time when the climate was much colder than in 1422”.⁴³ Yet this merely

converts an unsustainable line of thought into an unaccounted claim. On the page before he had stated: “To justify that belief, I had to answer the question of whether Greenland really could have been circumnavigated. It is completely impossible today, even in a nuclear-powered icebreaker, for the seas surrounding the far north are frozen solid all year round. However, there is direct evidence that conditions in the early 15th century were markedly different from those ruling today.”⁴⁴ As this evidence turns out spurious that should be the end of all speculations about a northern journey of the Chinese fleet.

With this I shall conclude my remarks on some of Gavin Menzies' countless outrageous theories. As a science-historian I am, needless to say, not exactly delighted that convoluted and ill informed opinions of this ilk receive such an undue level of publicity through the enormous number of copies printed and a lecture which Menzies gave, of all places, at the Royal Geographic Society. According to his own account, “it was broadcast around the world to thirty-six countries populated by two billion people”.⁴⁵ On the other hand it could be useful to demonstrate with such a manifest example the piteous state of the history of cartography. Above all it is the ignorance regarding the eight centuries of flourishing in the

⁴² Ibid p. 350.

⁴³ Ibid, p. 352;

⁴⁴ Ibid, p. 349.

⁴⁵ First Engl. edit. p. 407f. Omitted in the second Engl. edition.

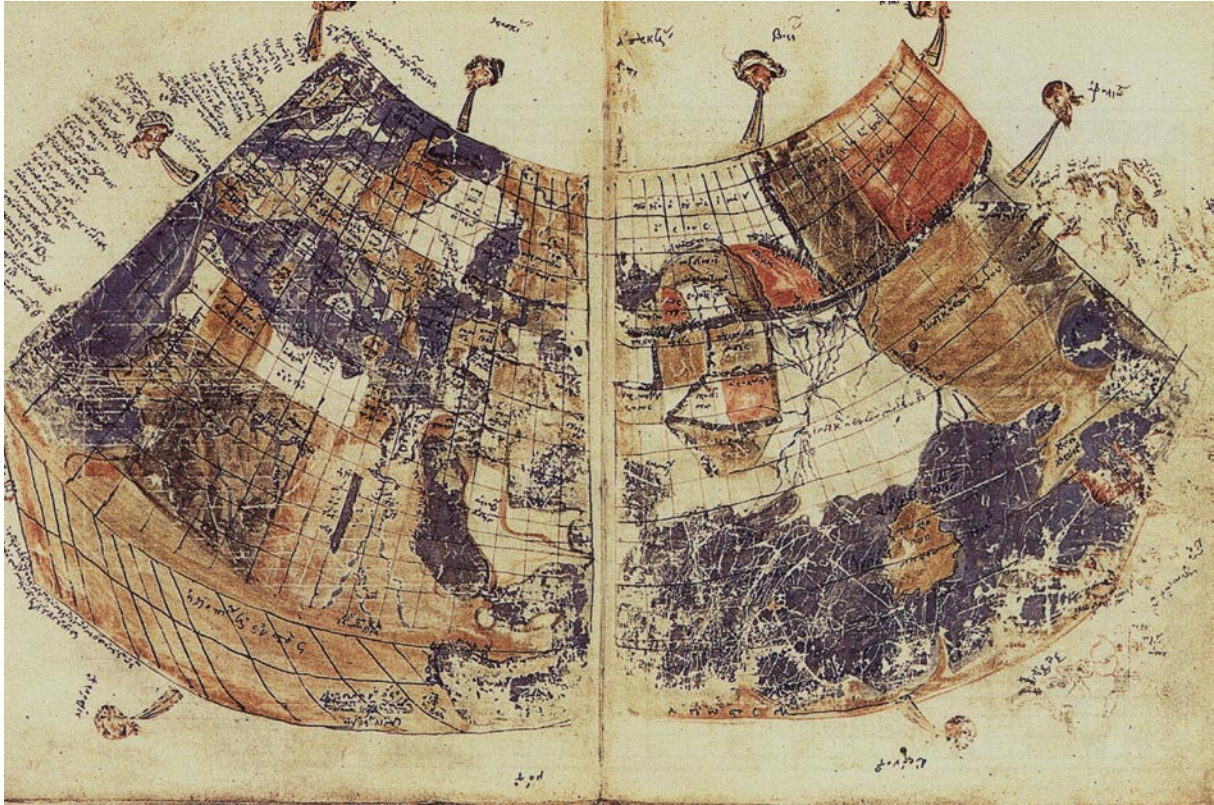


Fig. 9. World map from Ptolemy's *Geography* in a manuscript from the late 13th century.

sciences and culture in the Arabic-Islamic area that causes such a phenomenon.

* * *

The question of a possible pre-Columbian encounter of people coming from the Old World with the fourth continent has engaged scientists already in the last century frequently and seriously. Leo Wiener presented a large scale study on the subject from an anthropological point of view, entitled *Africa and the Discovery of America*⁴⁶. The most consummate treatment however, incorporating the progress achieved in the half century since Wiener, was supplied by Ivan van Sertima and is entitled *They Came Before Columbus*⁴⁷. It goes without saying

that the content of this book, which was reprinted about twenty times, vexed many people, exposing it to criticism and square refusal. Yet the basic proposition that inhabitants of the Old World reached the landmass beyond the Atlantic Ocean time and again since antiquity appears to be generally corroborated. In all likelihood these encounters between inhabitants of Old and New World came about—up to a certain point in history—by chance rather than on purpose. In order to venture a deliberate discovery journey, a clear cut notion of the globe and its circumference—not to mention seaworthy vessels and adequate navigation skills—were required.

⁴⁶ Vol. I–III, Philadelphia 1920–1922.

⁴⁷ New York 1976.

It was crucial for the rapid and far reaching cartographic survey of the earth in the Arabic-Islamic culture area that the notion of the various oceanic basins being enclosed by land, as inherited from the predecessors Marinus and Ptolemy (fig. 9), was abandoned in favour of the concept of an insular configuration of the oikoumene.

The first world map (fig. 10), created by Arabic-Islamic geographers upon commission of the Calif al-Ma'mūn early in the 3rd/9th century, already represents the oikoumene in an insular configuration. The oceans are laid-out in a peculiar manner: the entire landmass of the oikoumene is surrounded by an ocean of restricted navigability (*al-baḥr al-muḥīt*) which in turn is enclosed by a second 'obscure' ocean that was considered un-navigable due to its darkness. This concept alone would have discouraged potential adventurers from any attempt to reach Asia via the western route across the Atlantic as long as it held sway. It took in fact quite a long time until the theory of an un-navigable, dark ocean was dismissed for good. Abū 'Abdallāh al-Zuhrī, who revised the Ma'mūn *Geography* in the 6th/12th century, raised objections against the 'dark zone'. At any rate, according to his account the offshore distance known to be navigable had by this time been expanded to 800 parasangs (ca. 2400 Arabic miles or 4800 km).⁴⁸ In this context an important yet still little known concept by al-Bīrūnī (died 440/1048) should be

remembered. It states that the oikoumene was enclosed by an all-embracing ocean that separates its western and eastern (outermost) shores and possibly isolates also another continent or inhabited island in between.⁴⁹

The polyhistor al-Mas'ūdī (died 345/956) relates⁵⁰ that he had written in his lost book *Mir'āt az-zamān* about mariners from Arabic Spain who risked their lives attempting to sail westwards across the Atlantic at various times. "Amongst them was a man called Ḥaikhas hailing from Cordova who hired a couple of young men on ships he provided and travelled out to the ocean. After a fairly long time they came back with rich booty." Yet others would not return; this was a well known fact in the region. This somewhat obscure account of al-Mas'ūdī is cleared up in the light of al-Idrīsī's more detailed report (548/1154). According to the latter these voyages were actually ventured in search of remote shores beyond the ocean or hitherto unknown landmasses in it. Al-Idrīsī relates at length about a failed attempt—at the time apparently quite notorious—by

⁴⁹ Ibid, p. 128; al-Bīrūnī, *Taḥqīq mā li-l-Hind*, Ed. E. Sachau, London 1887; reprint: *Islamic Geography* vol. 105; engl. transl. von E. Sachau, London 1910; reprint: *Islamic Geography* vol. 106–107.

⁵⁰ *Murūğ aḍ-ḍahab wa-ma'ādin al-ğawāhir*, vol. I, Paris 1861, pp. 257–259; Abū 'Abdallāh al-Ḥimyarī, *K. ar-Raud al-mi'tār fī ḥabar al-aqtār*, Ed. Iḥsān 'Abbās, Beirut 1975, p. 509; H. J. Olbrich, *Die Entdeckung der Kanaren vom 9. bis zum 14. Jh.: Araber, Genuesen, Portugiesen, Spanier*, in: *Almogaren* (Graz) 20/1989/60–138, esp. 64.

⁴⁸ Cf. F. Sezgin, *GAS*, Vol. X, p. 127.

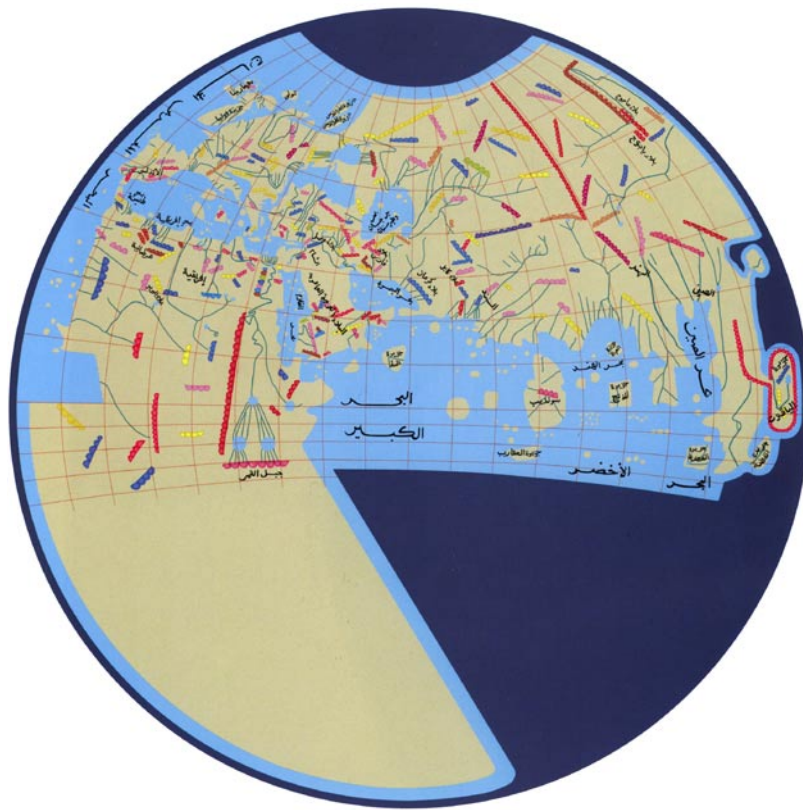


Fig. 10. World map by the geographers of al-Ma'mūn (first third of the 3th/9th cent.).
 Above: from *Masālik al-abṣār* by Ibn Faḍlallāh al-'Umarī (ca. 740/1340); below: reconstruction.

eight members of a family to cross the ocean in a vessel constructed specially for that purpose.⁵¹ As such endeavours seem to have been quite frequent a dockside street in Arab Lisbon was named *darb al-maghrūrīn* (“Strayer’s Road”). Reports about those expeditions appear to have enjoyed a certain circulation in the western parts of the Islamic World. Further attempts were launched from Mali in West Africa. Shortly before 712/1312 Sulṭān Muḥammad Abū Bakr is reported to have dispatched a fleet with the aim to reach “the other side of the ocean”. According to Ibn Faḍlallāh al-ʿUmarī’s narrative, after the necessary preparations the fleet sailed out heading for the open sea. There it was seized by a perilous current and sank with the exception of but one vessel. Thereupon the Sulṭān equipped a second fleet and personally embarked with it in pursuit of the same quest but never returned.⁵²

⁵¹ Al-Idrīsī, *Nuzhat al muštāq fi ḥtirāq al-aflāq*, Vol. I, pp. 220–548; Julius Klaproth, *Ueber die Schiffahrten der Araber in das Atlantische Meer*, in: *Asiatisches Magazin* (Weimar) 1/1802/138–148 (reprint in: *Islamic Geography*, Frankfurt 1994, Vol. 237, pp. 47–51); R. Hennig, *Terrae incognitae*, Vol. II, pp. 424–432; F. Sezgin, *Wissenschaft und Technik im Islam*, Vol. I, *Einführung*, Frankfurt 2003, p. 173.

⁵² Ibn Faḍlallāh al-ʿUmarī, *Masālik al-abṣār* facsimile edition, vol. IV, Frankfurt 1988, p. 43; French transl. in: M. Gauderoy-Demombynes, *Masālik el abṣār*, vol. I: *L’Afrique, moins l’Égypte...*, Paris, 1927 (Reprint in: *Islamic Geography*, vol. 142), p. 74f; cf. al-Qalqašandī, *Ṣubḥ al-ašā*, vol. V, Kairo 1915, p. 294f.; A. Zéki Pacha, *Une seconde tentative des Musulmans pour décou-*

It seems that expeditions like that even reverberate in Chinese sources: the two Song Dynasty geographers Zhōu Qù-Fēi (1178) and Zhào Rǔ-Gùā (1225) both quote reports from Muslim merchants according to which Arab ships coming from West Africa reached a fertile country in the west after approximately one hundred days of travel across the Atlantic. Thus reads the Chinese scholar Li Hui-Lin’s⁵³ interpretation of the passage. I am however not entirely convinced, because it does not appear to state unambiguously that the expedition in question was indeed west-bound across the Atlantic.

vrir l’Amérique, in: *Bulletin de l’Institut d’Égypte* (Kairo) 2/1919–1920/57–59, reprint in: *Islamic Geography* Band 239, pp. 44–46; Egmont Zechlin, *Das Problem der vorkolumbischen Entdeckung Amerikas...*, in: *Historische Zeitschrift* (München) 152/1935/1–47, esp. 46; R. Hennig, *Terrae incognitae*, vol. III, pp. 161–165; Basil Davidson, *The Lost Cities of Africa*, Boston, Toronto, 1970, pp. 74–76 (not seen), v.a. Ivan van Sertima, *They Came Before Columbus*, l.c., p. 67, 70.

⁵³ *Mu-lan-p’i. A case for pre-Columbian transatlantic travel by Arab ships*, in: *Harvard Journal of Asiatic Studies* 23/1960–1961/114–126. The two Chinese books were translated into English by Friedrich Hirth and W.W. Rockhill, *Chau Ju-Kua: His Work on the Chinese and Arab Trade in the 12th and 13th Centuries, entitled (Chu-Fan-Chi)*, translated from the Chinese and annotated, St. Petersburg 1911 (reprint in: *The Islamic World in Foreign Travel Accounts*, Vol. 73), v. a. F. Hirth, *Chao Ju-Kua, a new source of mediaeval geography*, in: *Journal of the Royal Asiatic Society* (London) 1896, pp. 57–82 (reprint: *The Islamic World in Foreign Travel Accounts*, Vol. 74, pp. 299–324).

Hence I would like to shed light on the question of a possible pre-Columbian discovery of the fourth continent from the study of historic maps. Unfortunately no Arabic originals are extant that could be useful in that respect but there are some Portuguese-Spanish ones and the copy of a Javanese map that offer important clues.

First, I would like to put two maps under closer examination: "the lost Columbus-map of America dated 1498" in a version of the Ottoman admiral Pīrī Re'īs and the Portuguese copy of a Javanese map showing the east coast of South America. The Pīrī Re'īs-map (fig. 4) was discovered in the library of the Topkapı Sarayı in 1929 and published by Paul Kahle in 1931⁵⁴. It was examined some years later by Kahle and by several other historians of cartography who followed him. Interest in this map has once more increased during the past two decades and even expanded beyond circles of experts. I had previously studied this map but my focus then was confined to aspects that had been dealt with by Kahle, whose treatise⁵⁵ I believe is still the most thorough one dedicated to the subject. Hence I assumed that this map, drawn by Pīrī Re'īs at Gallipoli and

presented in 923/1517 to Sultan Selīm, consisted of two parts: one part comprising the eastern regions of Middle America and the Caribbean, the second part with the eastern shores of South America. The northern part would supposedly correspond to the lost Columbus-map. Kahle suggested that Pīrī Re'īs had obtained this source from a Spanish mariner whom Kemāl Re'īs had captured on a seized Spanish vessel in 1501. According to his own account this captive had accompanied Columbus on his first three journeys across the Atlantic. The importance of this map—which mainly shows several archipelagos in the Caribbean mistaken as part of the coastline of East Asia—would then primarily be imputed to it being a copy of the Columbus-map that had long been considered lost. As far as the southern part was concerned one had to presume it was based on a Portuguese map. In the course of preparations for a lecture on the topic of pre-Columbian discovery of America I dealt with the Pīrī Re'īs-map once more at some length whereupon I came to revise my opinion.

When I first read the detailed and excellent description of the South American part of the Pīrī Re'īs-map in Paul Kahle's commendable article⁵⁶, I received the impression that Pīrī Re'īs was the first cartographer who undertook to compile a map of the new continent using all the results from encounters of Portuguese navigators with the shores of South America (between the southern part

⁵⁴ P. Kahle, *Un mapa de América hecho por el turco Piri Re'is, en el año 1513, bésandose en un mapa de Colón y en mapas portuguesas*. In: *Investigacion y Progreso*, Anno V (1931)/12/169–172.

⁵⁵ P. Kahle, *Die verschollene Columbus-Karte von 1498 in einer türkischen Weltkarte von 1513*. Berlin and Leipzig 1933 (repr. in: *Islamic Geography*, vol. 22, pp. 165–225).

⁵⁶ *Ibid* p. 180 ff.



Fig. 11. Projection of the Piri Re'is-map on the modern atlas.

of the Caribbean to about 50° south of the equator) that we know today and even some that have meanwhile fallen into oblivion, with astounding exactitude—actually quite incredible by the standards of European navigators and cartographers of that time. This however would lead to new questions: would these mariners who reached South America mostly by coincidence and stayed only briefly, be at all in the position to determine longitudes? Did Piri Re'is use a graduated map of South America from which he extracted his data? According to Kahle, Piri Re'is supposedly based his map on a model of Portuguese provenance. Let us therefore compare the Piri Re'is

map with the earliest surviving Portuguese maps up to 1502. Although the representation of a part of South America found there betrays a certain affinity with Piri Re'is', it is still substantially less developed both in terms of content and the area covered. An example that Kahle had already noticed is the estuary of the river *La Plata* in the vicinity of modern Buenos Aires which is clearly delineated by Piri Re'is even though it was supposedly not discovered until 1515.⁵⁷ Particularly perplexing too is the result of superimposing the Piri Re'is-map on the modern atlas (fig. 11) with a

computer. The coordinates of the *La Plata* estuary (Parana, ca. Long. 58° ; Lat. 35° south) for example turn out almost congruent. As seen on the map fig. 11, the match is very close in the northern part of the coastline between about Long. 75° in the north-west to about Long. 45° . In other words, the coastline of the Piri Re'is map deviates in longitudes and latitudes in some points hardly at all, in some points only 0.5° to 2° from the modern atlas. This is a degree

⁵⁷ *Die verschollene Columbus-Karte von Amerika vom Jahr 1498 in einer türkischen Weltkarte von 1513*, in: *Forschung und Fortschritte* (Berlin) 8/1932/248–249, esp. p. 248f (reprint in: *Islamic Geography*, vol. 22, pp. 162–163, esp. 162).

of exactitude which was unknown in the history of European cartography prior to the 18th century.

Kahle had already made a passing remark on the amazing accuracy of the delineation of South America on that map.⁵⁸ The Turkish historian Afet [İnan] also dealt with this phenomenon in a lecture given for the Société de Géographie de Genève in 1937.⁵⁹ She demonstrated the latitudinal and longitudinal fidelity in the representation of the South American east coast by means of a chart which is quite close to our computer-aided projection. The question how, when and by whom such precise coordinates could have been measured, she unfortunately answered with the bizarre and rather nationalistic assumption that the Turkish cartographer had compiled his map—using the Columbus materials but based on the Ptolemean *Geography* that was still prevalent by the 10th/16th century—in what had to be described as a stroke of genius.⁶⁰

Another, inferior representation of Brazil appears already on the ungraduated world map by Alberto Cantino (fig. 5) of 1502.⁶¹ Armando Cortesão and Avelino Teixeira da Mota, two assiduous scholars of

Portuguese cartography, concluded that there must have been some knowledge about Brazil prior to the first recorded Portuguese expedition (1501) and that consequently “the attribution of such a discovery to anyone else is no more than a mere legend.”⁶² It must have escaped the two scholars that the coastline as shown on the Cantino map shortly after the first, allegedly accidental contact of Pedro Álvares Cabral with Brazil on his journey to India (March 9 1500 – May 15 1501) already approaches a fairly realistic shape and that the Caribbean islands Cuba, Haiti, Jamaica, Puerto Rico and Antillas, still absent in the map drawn by Bartholoméo Colombo (1503), are also clearly delineated in this 1502 map. Christopher Colombo (Columbus) had visited these archipelagos on his four journeys to America and mentioned them in his reports, yet in order to survey them cartographically with any degree of accuracy it would have taken far more time and improved acquaintance with measuring latitudes and especially longitudes.

Another important map should be consulted in the discussion about a possible pre-Columbian discovery of America. It was composed by the Spanish navigator Juan de la Cosa (fig. 12) who had served Columbus as a navigator on the first three journeys. The map bearing his name was drawn in the year 1500 and is kept

⁵⁸ Ibid, p. 10f.

⁵⁹ *Un amiral, géographe turc du xvi^e siècle. Piri Reis, auteur de la plus ancienne carte de l'Amérique*, in: *Belleten (Ankara)* 1/1937/333–349 (reprint in: *Islamic Geography*, vol. 22, pp. 288–308).

⁶⁰ Ibid p. 347 (reprint, p. 302).

⁶¹ *Portugaliae Monumenta Cartographica*, vol. I, 1960, p. 13ff; F. Sezgin, GAS, Vol. XII, p. 270.

⁶² *Portugaliae Monumenta Cartographica*, vol. I, p. 10f.



Fig. 12

at the Museo Naval of Madrid.⁶³ Superimposing the de la Cosa map in the computer on the modern atlas (fig. 13) reveals that the distances between West Africa and the north-eastern shores of Brazil are quite realistic. The only feasible explanation is that this map was based on an original featuring a grid of parallels and meridians relying on accurate determinations of longitudes. The islands Cuba, Haiti, Ja-

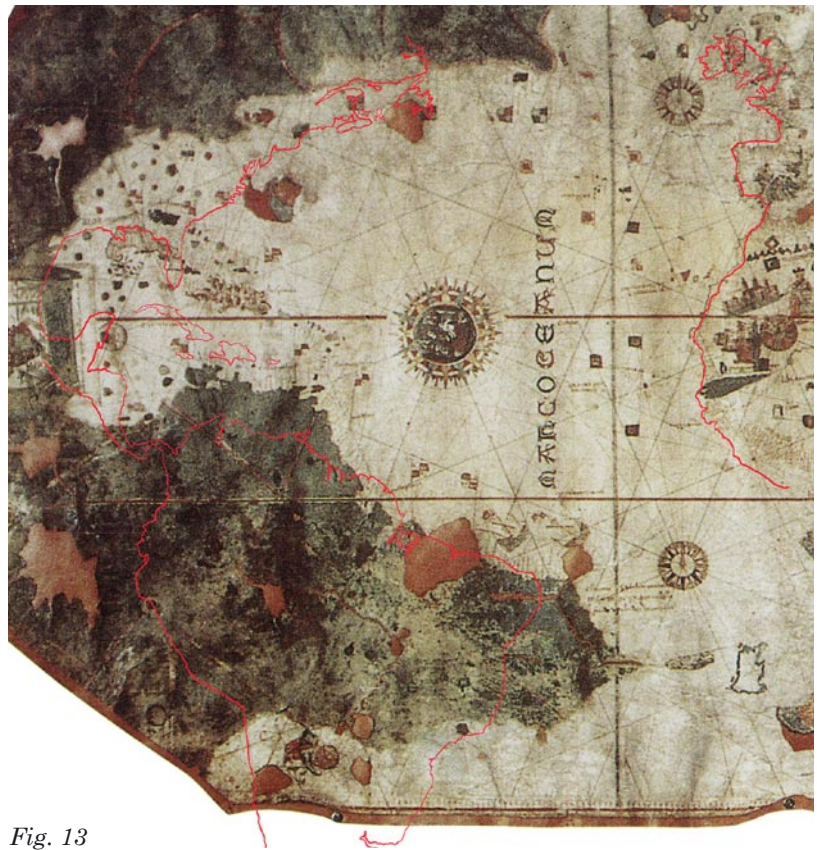


Fig. 13

⁶³ See F. Sezgin, GAS, vol. XII, Karte 190, p. 269. In its colophon the map is dated: "Juan de la Cosa la fizo en Puerto de S.M^a en año de 1500", cf. George E. Nunn, *The Mappemonde of Juan de la Cosa. A critical investigation of its date*. Jenkintown 1934, p. 1.

maica, Puerto Rico and the Bahamas are also well drawn; their maximum latitudinal and longitudinal error is only about 5°. Even the Gulf of Mexico and the south-eastern shores of North-America are rendered in a way

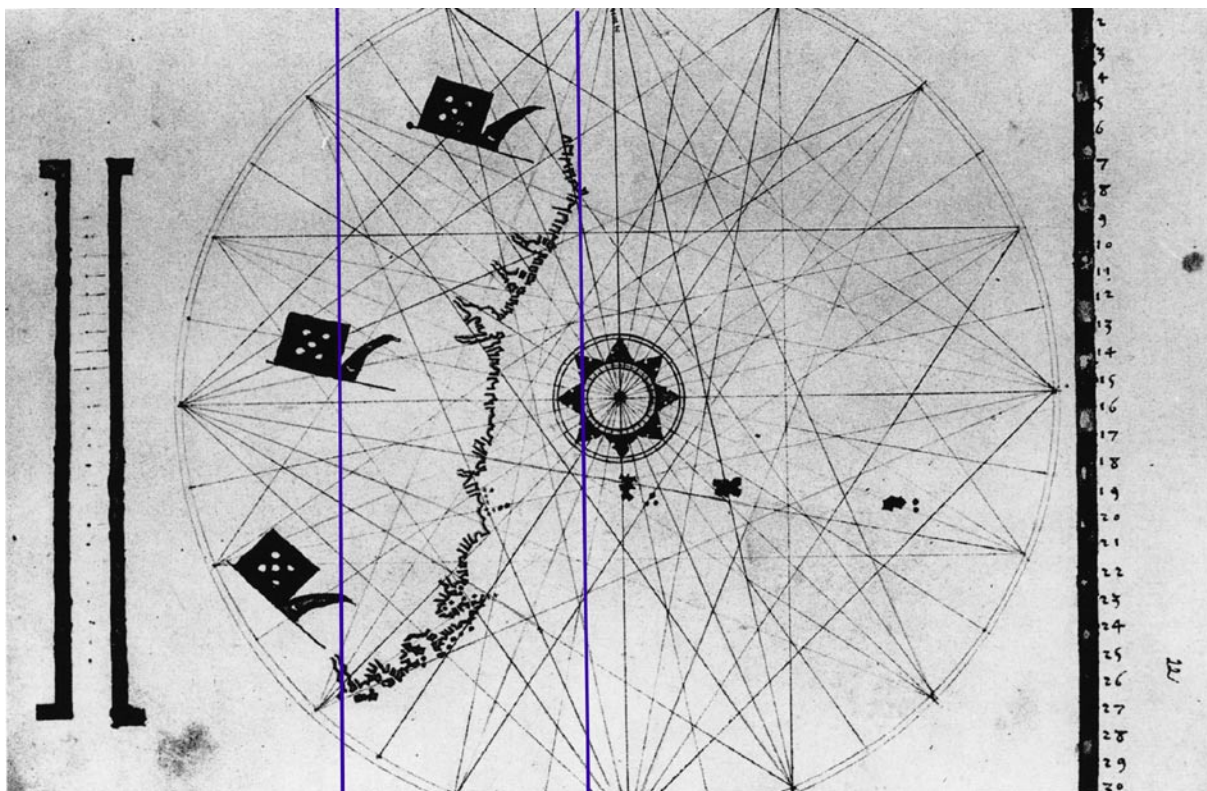


Fig. 14. Part of the coast of Brazil, copied from the "Javanese Atlas".

that gives a certain idea of the actual configuration; the coordinates deviate from modern ones between 5° and 10° .

The inclusion of the South American coastline and the Caribbean archipelagos which were supposedly discovered—not to mention mapped—only between 1503 and 1508, led George N. Nunn to reject the date stated in the colophon of the de la Cosa map and to presume it was a later copy in which more recently gathered information had been incorporated.⁶⁴ This is in fact the only plausible conclusion outside a pre-Columbian discovery of America.

The fourth (fig. 14) map that I would like to discuss is the part of the Javanese atlas mentioned above

which delineates the eastern shores of Brazil between Latitude $6^{\circ}30'$ and 27° South. The original atlas comprising 26 partial maps had been seized by the Portuguese during the conquest of Malakka in 1511. Alfonso Albuquerque (1445–1515), conqueror and new viceroy, refers to it in a letter to King Emanuel I (died 1521), the German translation of which I have already published in Vol. XI of the GAS⁶⁵; because of its momentousness for the history of cartography I would like to quote the relevant passage here once more:

"I also send thee a part of the copy of a large map which was made by a Javanese pilot, representing the Cape of Good Hope, Portugal, the land Brazil, the Red Sea, the Persian

⁶⁴ Ibid, p. 51f.

⁶⁵ L.c., p. 327f.

Sea, the Spice Islands (Moluccas), the sailing routes indicating the direct way to China and Formosa as taken by the ships, together with the inside [the hinterland] of the countries bordering to each other. It seems to me the most beautiful thing I have ever seen. Your Majesty will be delighted to see it. The place names were written in Javanese characters, but I had the aid of a Javanese who could read and write. I send your Majesty the part which was copied by Francisco Rodrigues after the original. In it your Majesty will find laid out where the Chinese and the inhabitants of Formosa come from, which course your Majesty's ships will have to steer in order to get to the Clove Islands where the gold mines are found, to the islands Java and Banda, the island of Muscat and Muscat blossoms, the kingdom of Siam, the Cape of the Chinese which they circumnavigate before returning home and which they will never pass. The original was lost [sank] with the *Frol de la Mar*. I discussed the content of this map with the pilot and with Pedro Dalpoem in order to render it as lucid as possible for your Majesty. This map is very accurate and well known because it is used for navigation. The part with the archipelago called 'Selat' (betwixt Malakka and Java) is missing."

The surviving Portuguese copy of this atlas⁶⁶ bears testimony to the advanced stage which cartography in the Islamic World had reached before

the turn of the 10th/16th century. A good example is the delineation of Madagascar which is amazingly close to the modern configuration. It excels all subsequent representations which were based on it; differences found in them are no improvements but deformations. Corrections of some points were achieved only since the end of the 19th century.⁶⁷ The South American coastline found in the Javanese atlas had drawn the attention of Gabriel Ferrand, the eminent scholar of Arabic-Islamic nautical science in the Indian Ocean, already in 1918. At this early stage in the study of Arabic-Islamic geography he was at a loss to explain it. He asked himself how a Javanese cartographer in 1511 or even earlier could have known anything about the *terra do brazyll* and couldn't think of an answer.⁶⁸ In the course of my own research into Arab cartography of the Indian Ocean and its influence on Portuguese maps, I had come to the conclusion that this must be a case of adoption of a Portuguese contribution by Javanese navigators, probably mediated by mariners from the Ottoman empire.⁶⁹ Now I would like to revise my opinion. Upon repeated examination of the matter and the sources it became evident that the representation of the South American coast on the

⁶⁷ Ibid, vol. XI, p. 410–413.

⁶⁸ *A propos d'une carte javanaise du XV^e siècle* in: *Journal Asiatique* 11^{ème} sér. 12/1918/158–169, esp. 166 (Reprint in: *Islamic Geography*, vol. 21, p. 1–12, esp. p. 9); cf. F. Sezgin, GAS, vol. XI, p. 441.

⁶⁹ GAS, vol. XI, p. 441.

⁶⁶ Cf. GAS, vol. XII, map 198 a–z.



Fig. 15. The coastal line from the "Javanese" Atlas (red) projected on the modern map.

"Javanese" map is totally independent of the three other maps discussed above and that it must be a copy of a chart depicting the region as elaborated by Arabic-Islamic navigators in the 9th/15th century. Unfortunately, we lack any point of reference for judging the longitudinal accuracy in the Javanese delineation of Brazil, such as an island in the Atlantic or the coast of Africa. Yet it runs quite congruent with the modern map of the part of the Brazilian coast (fig. 15) lying between latitude $6^{\circ}30'$ and 27° south, which slants some 15° towards west in this section.

Let me briefly summarise the matter as discussed above: three of the four maps under consideration, those by Pīrī Re'īs, Juan de la Cosa und Alberto Cantino, appear to be related without any indications that one would have been copied from the other. It is possible that they are based on a common source. Certainly,

the crucial aspect is that the representation of the Brazilian coastline on all three maps and the first two in particular is amazingly correct in terms of both latitudes and longitudes. These common grounds are also betrayed by the position of several islands from which it can be concluded that the sources were originally graduated and based upon a significant number of reliable coordinates. At that time the Arabic-Islamic culture area was the only one where the determination of longitudes was practiced with the required degree of exactitude. The method of reckoning differences in longitude from the time elapsing between the occurrence of a particular astronomical event, notably lunar eclipses, as observed from distant longitudes was known in Europe but did not yield acceptable accuracy mostly because precise and portable chronometers were lacking. This is illustrated by the outrageous errors the coordinates ostensibly measured by Columbus himself are afflicted with.⁷⁰ According to his own account he determined the longitudinal difference between the little island Saona (to the south-east of Haiti) and Cape St. Vicente in Portugal as $5\frac{1}{2}$ hours i.e. $82^{\circ}30'$ by observation of the lunar eclipse on September 14, 1494.

⁷⁰ Cf. O. Peschel, *Geschichte der Erdkunde*, p. 401; Hermann Wagner, *Die Entwicklung der wissenschaftlichen Nautik des Zeitalters der Entdeckungen nach neuern Anschauungen*, in: *Annalen der Hydrographie und maritimen Meteorologie* (Berlin) 46/1918/105–118, 153–173, 215–233, 276–283, esp. 277; see also F. Sezgin, *GAS*, vol. XI, p. 296.

The true value is 59°40'. Another measurement taken on the northern shore of Jamaica relative to Cadiz in Spain on February 29 Columbus reports in detail, this time the error amounts to a formidable 38°45'. He writes: "The distance of the centre of the island Janahica (Jamaica) in India and the Isle of Calis (Cadiz) in Spain is seven hours and 15 minutes, that is to say the sun goes down 7¼ hours earlier in the latter than in Janahica."⁷¹ Hence he estimated the difference in longitude as 108°45'; it really is about 71°. Columbus' skills in the determination of latitudes was also not remarkable "for example he states a latitude of 42° (compared to actual 21°) for the coast of Cuba...".⁷² Yet other European 'discoverers' do not qualify as originators of reliable maps either. An exorbitant measurement taken of the longitudinal difference between the bay of Rio de Janeiro and Sevilla is reported by Magellan's navigator Andres de San Martin. Upon observation of the conjunction of the moon with Jupiter on December 17, 1519 he arrived at 17h 55min, viz. 268°45'; in reality the difference is only 37°13'.⁷³ The table of latitudes which Duarte Pacheco compiled around 1507–1508 under the

title *Esmeraldo de situ orbis* gives the latitudes of eighteen places on the Brazilian east coast.⁷⁴ Those amongst them that are found in the modern atlas bear errors between 3° and 5°. Longitudes are not even mentioned at that stage.

The fact that Portuguese navigators and even astronomers failed at the determination of longitudes or longitude differences is not made a secret of by the two pioneering historians of cartography Armando Cortesão und Avelino Teixeira da Mota.⁷⁵

One more testimony which seems rather important to me I would like to add, viz. that of Bartolomé de las Casas (1484–1566), historian and son of a merchant who participated in the second voyage of Columbus. He was acquainted with Diego the son and Bartolomeo the brother of Columbus. In his *Historia de las Indias* he relates: "Columbus carried a map with him on which this land India [i.e. the shores of the newly discovered land he believed to be India] and the islands, especially Española which was called Zipangu [Japan], were depicted."⁷⁶

This source amongst others convinced P. Kahle that Columbus had possessed a map which served as

⁷¹ H. Wagner, *Die Entwicklung der wissenschaftlichen Nautik*, l.c., p. 277.

⁷² Arthur Breusing, *Zur Geschichte der Kartographie. La toleta de Marteloio und die loxodromischen Karten*. In: *Zeitschrift für wissenschaftliche Geographie* (Weimar) 2/ 1881/129-195, esp. p. 193; F. Sezgin, GAS, vol. XI, p. 98.

⁷³ Cf. H. Wagner, *Entwicklung der wissenschaftlichen Nautik*, l.c., p. 282.

⁷⁴ Cf. F. Sezgin, GAS, vol. XI, p. 286.

⁷⁵ *Portugaliae Monumenta Cartographica*, vol. I, p. 24.

⁷⁶ Las Casas, *Historia de las Indias*, in: *Coleccion de Documentos inéditos para la Historia de España*, vol. 62–66, Madrid 1875–76, esp. vol. 2, p. 278; P. Kahle, *Die verschollene Columbus-Karte*, l.c., p. 26 (reprint, l.c., p. 190).

a basis for his first journey.⁷⁷ Several other extremely interesting passages in this connection are found in the letters of Columbus included in the *Raccolta Columbiana*.⁷⁸ For instance, one which mentions that natives of the Caribbean told a story about ships belonging to the “great Khan” which had visited them in the past. It would, however, be quite futile to speculate about which particular historical person could be referred to here as “the great Khan”.

An entry in the Santa Maria’s log on September 25, 1492 is quite enlightening as well. It relates how Columbus had sent a map on which he had marked out certain islands, to the captain of the convoying ship Pinta, Martin Alonso Pinzón, three days before. “Martin Alonso said they should now be in the very position at which those islands were drawn in the map whereupon the admiral [Columbus] answered that he thought so too, but it could be they had missed them due to currents that had driven the flotilla to the north-east with the effect that the distance covered was actually less than what the navigators had calculated by the speed. The admiral requested the map be sent back and it was returned on a twine. Hereupon the admiral with his officers and

navigators began to re-check the position.”⁷⁹

This was in all likelihood the same map that Columbus had obtained from the Florentine astronomer Paolo dal Pazzo Toscanelli.⁸⁰ According to his own account Las Casas kept this map and updated it for Columbus when new islands and coasts were discovered.⁸¹ This and various other passages leave no doubt that Kahle was convinced that Columbus embarked on his travels with a map of the Atlantic on which several meso-American islands were already drawn-in. Kahle even realised that this map must have been graduated (l.c. p. 41f, reprint p. 205) which of course implies at least one successful pre-Columbian expedition from a culture area adept in cartography. Unfortunately Kahle did not pose the question as to which particular culture offered the potential to accomplish such a thing.

António Galvão provides us with an utterly significant clue to this problem in his 1555 *Tratado dos descobrimentos* mentioned above.⁸² According to his report (s. above p. 8) the Straits of Magellan and the Cape of Good Hope inter alia were delineated in an early 9th/15th century map “according as our later maps have described it”. This map was

⁷⁷ *Die verschollene Columbus-Karte*, l.c., p. 21, 40f (reprint, l.c., p. 185, 204f).

⁷⁸ *Raccolta di documenti e studi pubblicati dalla R. Commissione Colombiana...* (Joaquim Bensaude, Ed.), Rom 1892–1894, vol. I/1, p. 31; P. Kahle, l.c., p. 26 (reprint, l.c., p. 150)

⁷⁹ *Raccolta Columbiana*, I, p. 10. p. Kahle, l.c., p. 37 (reprint p. 201).

⁸⁰ Cf. F. Sezgin, GAS, vol. XI, l.c., p. 66ff.

⁸¹ Las Casas, *Historias de las Indias*, vol. I, l.c., p. 279; P. Kahle, *Die verschollene Columbus-Karte*, l.c., p. 40f (reprint, l.c., p. 204f).

brought back to Portugal from a long journey to the Holy Land via Rome and Venice by Dom Pedro (the King's son) in 1428.⁸³

In my treatment of this subject in vol. XI (p. 359) of the GAS, I followed the geography-historian J. Lelewel.⁸⁴ Yet today, with deepened understanding of the matter, I believe my interpretation was incorrect. In fact I have come to the conclusion that Galvão's report undoubtedly implies that the passage, which was later called the Straits of Magellan after its assumed discoverer, was known in the Arabic-Islamic culture area, from whence cartographic representations had reached Europe by the early 9th/15th century.

⁸² Terceira edição, Porto 1944, p. 122f.; cf. GAS, vol. XI, l.c., p. 358;

⁸³ The first author who called attention to this text was probably Placido Zurla, *Il map-pamondo di Fra Mauro*, Venice 1806, p. 86; cf. von Humboldt, *Kritische Untersuchungen*, l.c., p. 255, 286 (refers to p. 7, 86, 87, 143); Humboldt (l.c., p. 287) wondered: "How could the inclusion of an American strait in a Portuguese map predating Magellan's travels be explained?" He answered himself: "I would like to refer to the circumstances which might have pointed to the existence of a strait; and it is well known that in the Middle Ages speculations were religiously incorporated in the maps as was the case with Antilia...". To this I would like to remark that Humboldt appears to presume that the map in question was originally from Portugal. Yet according to my reading this was the very map which Dom Pedro had procured on his travels in the Arabic-Islamic culture area. The fact that the Cape of Good Hope was apparently also delineated in this map should be kept in view.

⁸⁴ *Géographie du moyen Âge*, vol. II, Bruxelles, 1850–1857, p. 83, note. 177.

This is also confirmed by the testimony of Antonio Pigafetta (ca. 1490–1536), chronicler and travel companion of Fernão de Magalhães (Magellan, ca. 1480–1521), who reports to have seen these straits on a map that was kept in the Royal Treasury of Portugal. According to Pigafetta this map was drawn by an excellent man called Martin Behaim.⁸⁵ It is hardly surprising that this report⁸⁶—which ever since 1682 has been highly estimated by many scholars⁸⁷—has perplexed the historians of cartography as it states unambiguously that Magellan used a map made by Behaim (died 1507) which already included the passage on the southern extremity of America.

After lengthy discussion of the issue Alexander von Humboldt came to the conclusion that Magellan had attributed the map erroneously to

⁸⁵ *Anton Pigafetta's Beschreibung der von Magellan unternommenen ersten Reise um die Welt. Aus einer Handschrift der ambrosianischen Bibliothek zu Mailand von Amoretti zum erstenmale herausgegeben*. Translated from the French, Gotha 1801, p. 45f; Gian Battista Ramusio, *Delle Navigazioni et Viaggi*. Venice 1563–1606, Reprint: Amsterdam, 1968–1970, vol. I, p. 354b; *Magellan's Voyage. A narrative account of the first circumnavigation by Antonio Pigafetta*, vol. I, translated and edited by R. A. Skelton..., New Haven, London 1969, p. 51; vol. II, (facsimile) p. 17.

⁸⁶ Joh. Christoph Wagenseil, *Sacra parentalia quae manibus... Frid. Behaimi*, Nürnberg 1682, p. 16 (not seen).

⁸⁷ Cf. R. Hennig, *Terrae incognitae*, vol. IV, p. 394.

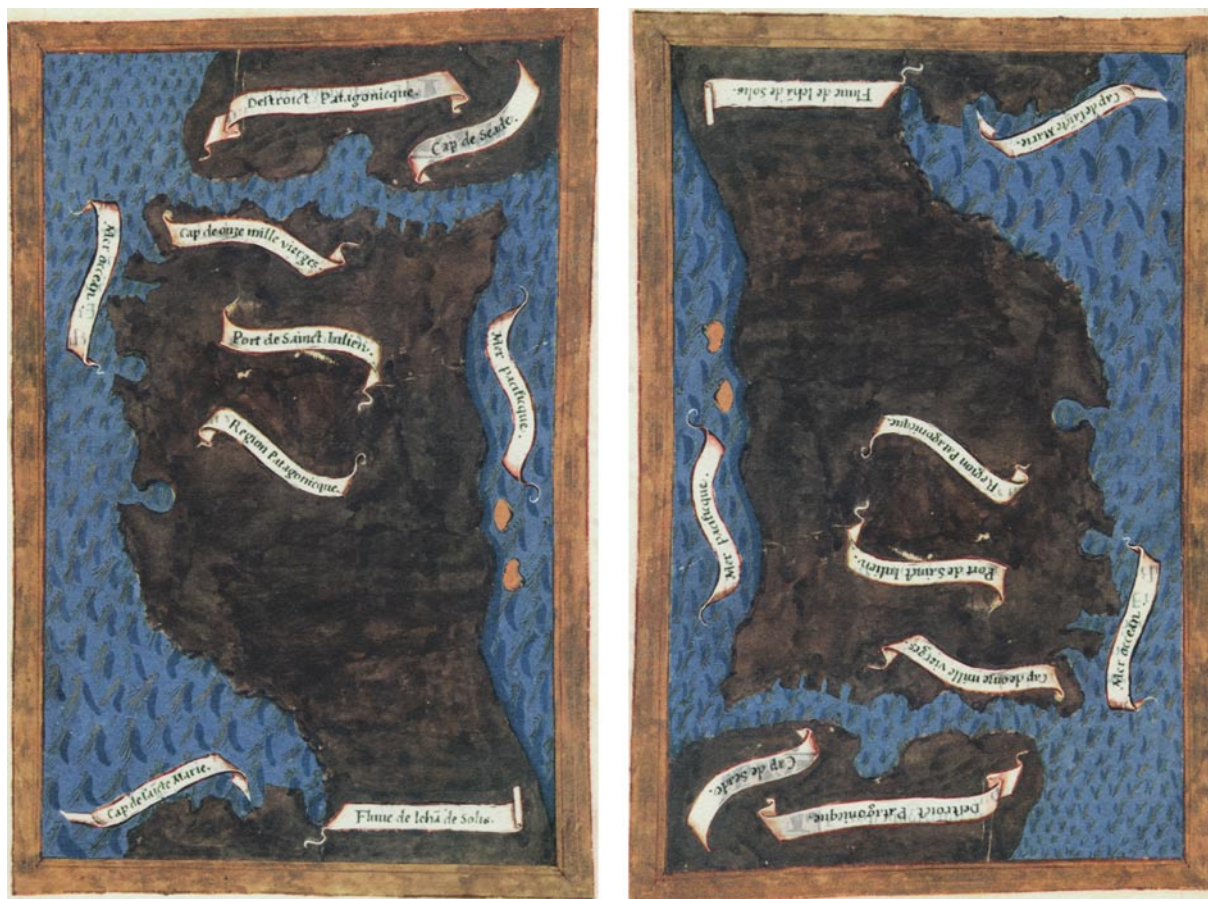


Fig. 16. The southern extremity of America by Antonio Pigafetta (ca. 1521). Original southern-oriented (left).

Behaim who had acquired enormous fame.⁸⁸

R. Hennig expounded the problem in a chapter entitled *Martin Behaim's angebliche Vorentdeckung Amerikas und der Magellanstraße* in his book *Terrae incognitae*.⁸⁹ He tentatively concluded: "By way of a brief summary it can, without reservation, be stated as true that Magelhães by

1517 possessed a map on which the southern parts of America were represented which he ascribed by mistake to Martin Behaim. The true author is impossible to establish." My explanation is that the map might have actually been drawn by Behaim but as a copy made upon Royal commission from a highly valued, old original. It seems that the cartographic representation of the South American strait did gain some circulation through the map introduced to Portugal by Dom Pedro in the year 1428 not only amongst the Portuguese but also in Spain. This assumption is corroborated by a map made by the Spaniard Juan de la Cosa (fig. 12) in 1500 on which the southern extremity of America appears circumnavi-

⁸⁸ A. von Humboldt, *Kritische Untersuchungen...*, Vol. I, Berlin 1836, pp. 255, 277–308.

⁸⁹ Vol. IV, pp. 390–418, esp. 414f; cf. O. Peschel, *Geschichte der Erdkunde*, p. 277f; Siegmund Günther, *Martin Behaim*, Bamberg 1890, p. 43; Johannes Willers, *Leben und Werk des Martin Behaim*, in: *Focus Behaim Globus*, vol. I, Nürnberg 1993, pp. 173–188, esp. 183; Ernest George Ravenstein, *Martin Behaim, His Life and His Globe*, London 1908, pp. 34–38.

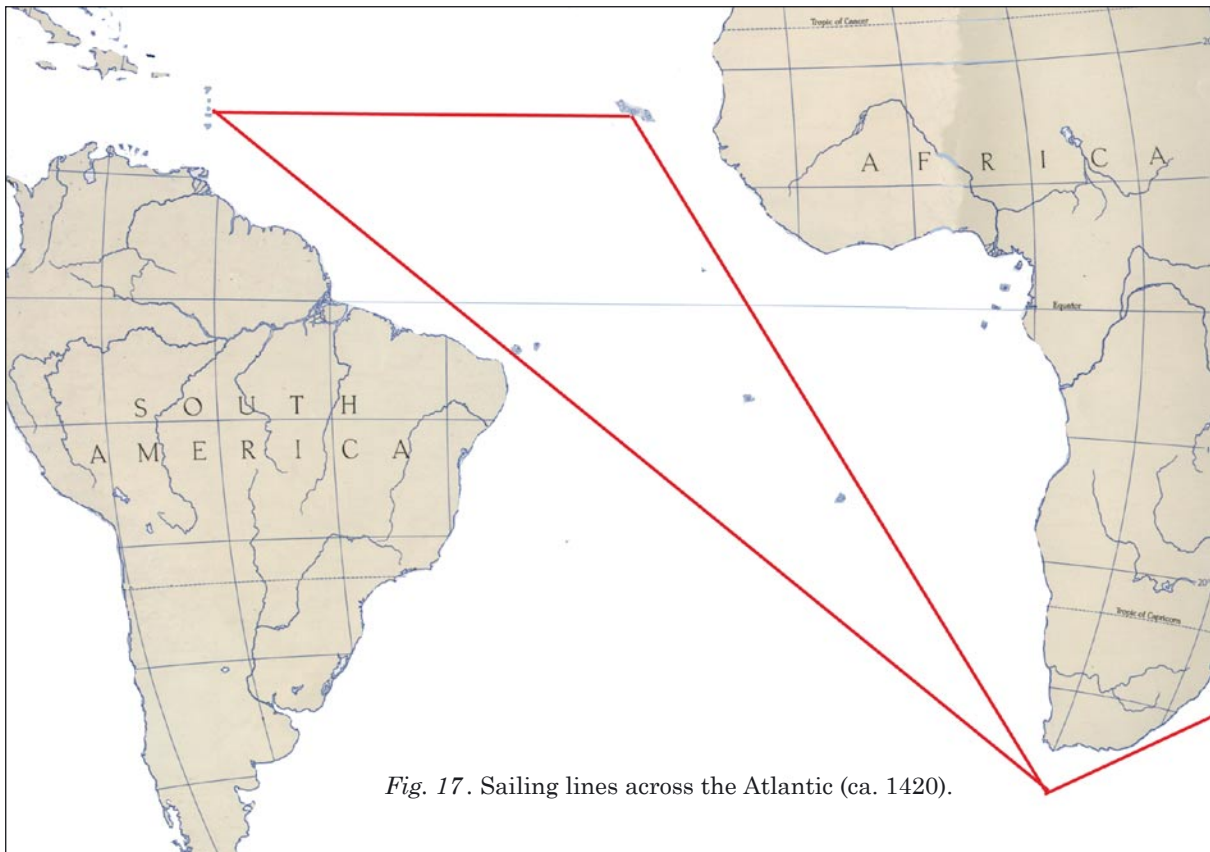


Fig. 17. Sailing lines across the Atlantic (ca. 1420).

gable and there is even an island further in the south.

A rough delineation of the southern parts of America including the Straits, drawn up by Magellan or participants of his expedition, namely his chronicler Antonio Pigafetta, has fortunately survived in a travelogue written by the latter. It is particularly noteworthy that this map is southern-oriented, as was the Arab custom (fig. 16).

Finally, confirming my view that navigators from the Arabic-Islamic culture area knew a substantial amount of the landmasses in the Ocean, and brought home at least some cartographic sketches, is the inscription on the world map of Fra Mauro⁹⁰ (fig. 2) (1459) mentioning

⁹⁰ Cf. GAS, vol. X, pp. 554–558; XII, map 63, p. 122.

an Arab naval expedition of the period around 1420: “Around A.D. 1420 a ship or so-called Indian junk coming from the Indian Ocean and on its way to ‘the Isles of Men and Women’ was driven beyond Cap de Diab and through the Green Islands in the Dark Ocean towards the Algarve [*al-garb* = Arab.: the west] in the west. For forty days they found nothing but sky and water. Making good way they covered 2000 miles according to their own estimation. After seventy days they finally returned to said Cap de Diab.”⁹¹ P. Zurla had already identified *diab* in Cape Diab as the Arabic word *diyāb* (pl. of wolf), hence

⁹¹ R. Hennig, *Terrae incognitae*, vol. IV, p. 44; for the original text cf. *Il mappamondo di Fra Mauro Comaldolese*. Descritto ed illustrato da Placido Zurla, Venice 1806 (cf. note 83 above).

one could read *Cape of the Wolfs* or *Promontory of the Wolfs*.⁹² To this A. von Humboldt remarked⁹³ that a peculiar kind of wolf was indeed strikingly common on the southern extremity of Africa. In the term *Dark Ocean* Hennig⁹⁴ justly recognised the denomination used by Arab geographers for the open sea of the Atlantic.

Being well aware of the extensive debate about possible identifications of 'the Isles of Men and Women' I venture to propose, not without reservation, that the *Virgin Islands* (of the lesser Antillas)—allegedly named after their inhabitants (11000 virgins) and apparently already on the map used by Columbus—could be meant here.⁹⁵ The 'Green Islands' are probably the Cape Verde Islands located 24°W, 16°N off the shores of Africa. Along all of the southern part of the West-African coast they provide the most convenient harbour on a journey across the Atlantic (fig. 17). It is also noteworthy that the westerly course taken to the 'Green Islands' ran roughly parallel to the equator.

All this is included in the short inscription that by coincidence survived on a map made in 1457. The latter was copied from an original that also had reached Venice only by chance. Nevertheless it assumes utmost importance for our subject in connexion with other extant sources.

⁹² Zurlo, l.c., p. 86.

⁹³ *Kritische Untersuchungen*, vol. I, p. 280f.

⁹⁴ *Terrae incognitae*, vol. IV, p. 48f.

⁹⁵ P. Kahle, *Die verschollene Columbus-Karte*, l.c., p. 22f, (reprint, l.c., p. 186f).

Even more than by reports such as these, my notion, that the maps used by European 'discoverers' must have been of Arabic-Islamic provenance, was reinforced by the above mentioned fact that many of the new islands and coastlines are drawn in those maps with a degree of longitudinal precision that was not approached in Europe prior to the 18th century. It has been a well known fact in the history of geography for quite a while that the difficulties with exact determinations of longitudes could not be overcome in the European culture area for such a long time. Yet the fact that the method of determining longitudes through lunar eclipses was greatly improved in the Arabic-Islamic culture area by refined observation techniques, and that new, reliable methods were developed and extensively used since the 5th/11th century, are still ignored by modern historians of geography. Even more important is the method devised by navigators of the Indian Ocean for the determination of longitudes on open sea with such accuracy that coordinates in surviving maps and tables put us in awe even today. In order to account for the exactitude of the geographical configurations of the ungraduated maps discussed above, the astonishing congruence of their coastlines with modern renditions, I do not see an alternative to assuming they were created by navigators from the Arabic-Islamic culture area, well versed in astronomy and geography.

Studying this matter we find ourselves confronted with two major issues: first, that the creative period of sciences in the Arabic-Islamic culture area which lasted for roughly eight centuries has as yet hardly been recognised by the modern historiography of this branch, let alone its importance being appreciated. Hence, the prerequisites for an assessment of the position of the Arabic-Islamic culture area in the universal history of geography are lacking to this day.

The second major issue consists in the fact that Arab geographers and map makers left only sparse and incidental information about the extensive achievements of their culture. Many important discoveries and innovations found their way into contemporary historiography too late or not at all. Apparently the Arabic-Islamic navigators and cartographers were hardly aware of the significance which the progress they achieved had for world history. Historians or chroniclers—and that is true for all culture areas—may have been in the position to judge the importance and authenticity of historic sources and to make reasonable assessments of their position in the history of science. Yet they often failed to grasp the significance of contemporary inventions and discoveries and hence passed over them in their works. What is more, separate maps stood very little chance to survive for a long time—this too applies not only to the Arabic-Islamic culture—unless they were handed down as a part of some book. The sinolo-

gist Walther Fuchs gave a very apt summary pointing out that the cartographic heritage of the Arabs was evidently fragmentary; moreover it would not always reflect the actual state of art in navigation.⁹⁶ A copy of the famous world map of the Ma'mūn geographers survived only due to its integration in an encyclopaedia written in 740/1340. The Idrīsī map (548/1154, fig. 18) survived exclusively through manuscript copies of the book version. Also the twenty-six partial maps of the extremely important Javanese atlas mentioned above (seized on a captured ship by Albuquerque, the Portuguese conqueror of Malakka, who had it translated into Portuguese and sent to his king) owe their survival to the inclusion in a book.⁹⁷ Finally the map of North Asia from the 7th/13th or 8th/14th century (fig. 8)—a document of unique significance—should be mentioned, which the Swedish officer Ph. J. Strahlenberg obtained around 1715 (while in Siberian captivity) as part of a book on the genealogy of the Turks. It became available to us through his translation or participation in it.⁹⁸

By the 9th/15th century cartography in the Arabic-Islamic culture area had developed (besides the progress in the survey of Asia and Europe) a more or less modern

⁹⁶ Walther Fuchs, *Was South Africa already known in the 13th century?* In: *Imago Mundi* 10/1953/Sp. 50 a, b; F. Sezgin, *GAS*, vol. X, p. 324.

⁹⁷ Cf. *ibid.*, vol. XI, p. 327f., 427f.

⁹⁸ *Ibid.*, vol. X, p. 378 ff.

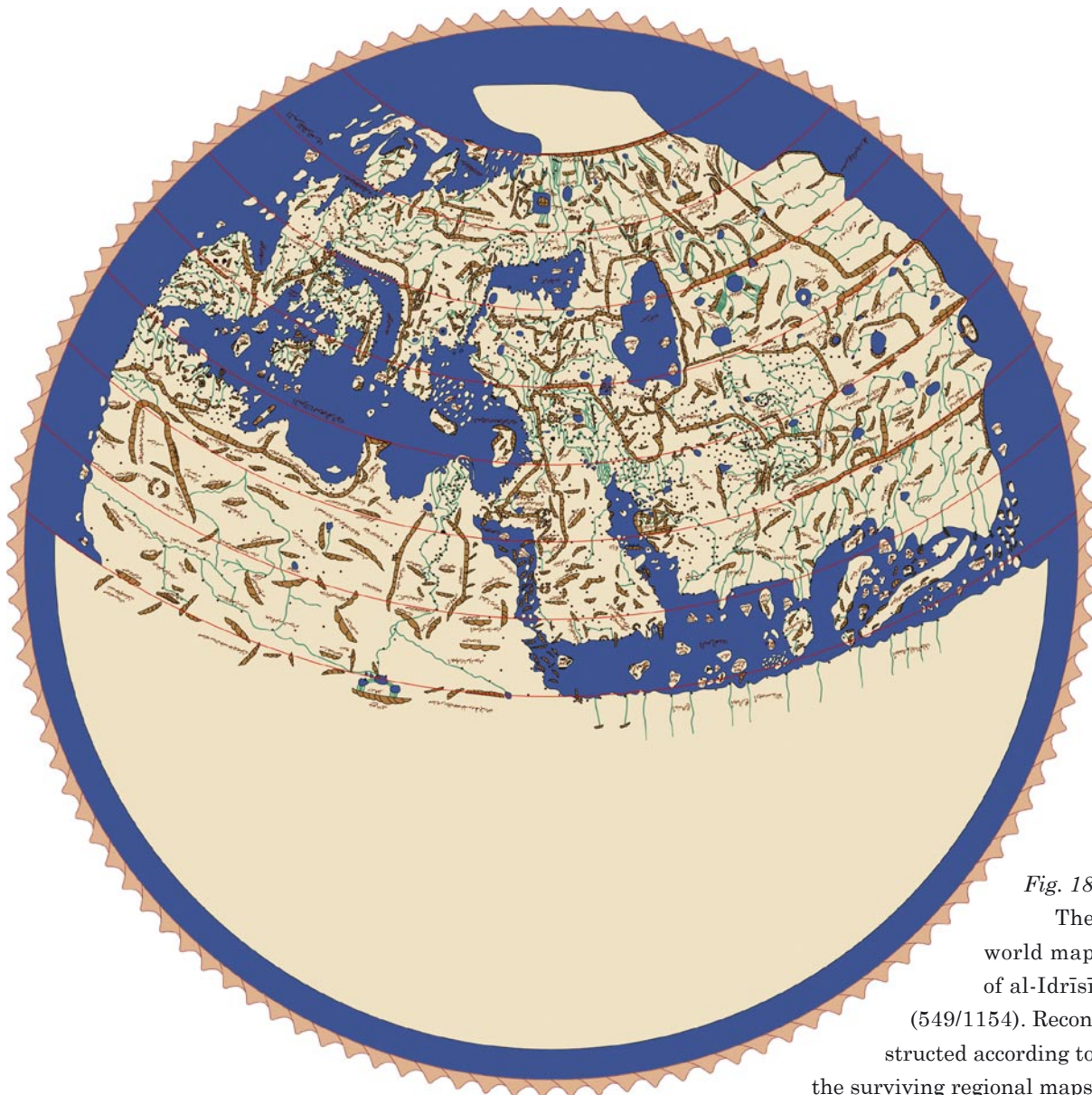


Fig. 18.
The
world map
of al-Idrisi
(549/1154). Recon-
structured according to
the surviving regional maps.

representation of the entire Indian Ocean. The standard reached at that time was the result of continuous and hard work carried out in the Islamic world from the 3rd/9th century until towards the end of the 10th/16th century. Of course it was based on the achievements of Greeks, Iranians and Indians. As early as the 1st/7th century Muslims had reached Madagascar and by the 3rd/9th century Islam had spread through large areas of East Africa to Mozambique. In the 1st/7th century there was al-

ready a large Muslim community in the Chinese seaport Canton. As reported unequivocally by the historian al-Ya`qūbī (died towards 290/903),⁹⁹ a regular traffic between Māssa (in the south of Agadir) and China was established by the 3rd/9th century (cf. fig. 19), relying on 'sewn' ships (as opposed to nailed) built in Ubulla upon Tigris. This and the highly developed navigation in the area in general has

⁹⁹ *K. al-Buldān*, Leiden 1892, p. 360..., F. Sezgin, GAS, vol. X, p. 562, XI, p. 383f.



Fig. 19: Trading route between Māssa, south of Agadir, and China (3rd/9th cent.).

so far been completely ignored by the modern history of cartography. Thus, it is little known that navigators of the Indian Ocean were able to measure distances on the open sea in all directions including parallel to the equator (fig. 6). Portuguese mariners who reached the Indian Ocean guided by existing maps found themselves dependent on the help of Muslim pilots. Vasco da Gama was awestruck by huge, oceangoing vessels, equipped with compasses and maps with grids of parallels and meridians, which he encountered on the east coast of South Africa. Thus furnished with superb maps, excellent pilots, the Jacob's staff (cross staff, *balestilha*, fig. 20) that replaced the astrolabe which had proved unapt on a reeling ship's deck, advanced nautical compasses (fig. 21), only partly digested rules of contemporary Islamic

navigation, and not least the extensive tables which provided information about all kinds of distances filed after latitudes and directions, the Portuguese got to know almost the entire Indian Ocean in a short period of time. The almost perfect map of Africa that fell into the hands of the Portuguese was the fruit of work that was done in the course of several centuries.

Arab navigators who, sure of their navigational skills, crossed the Indian Ocean non-stop between East Africa and Sumatra on a regular basis, would have been generally discouraged from attempts to cross the Atlantic because they knew the true distance between West Africa and China (as deduced from the astronomically determined circumference of the earth). On the other hand considering the currents in the Atlantic

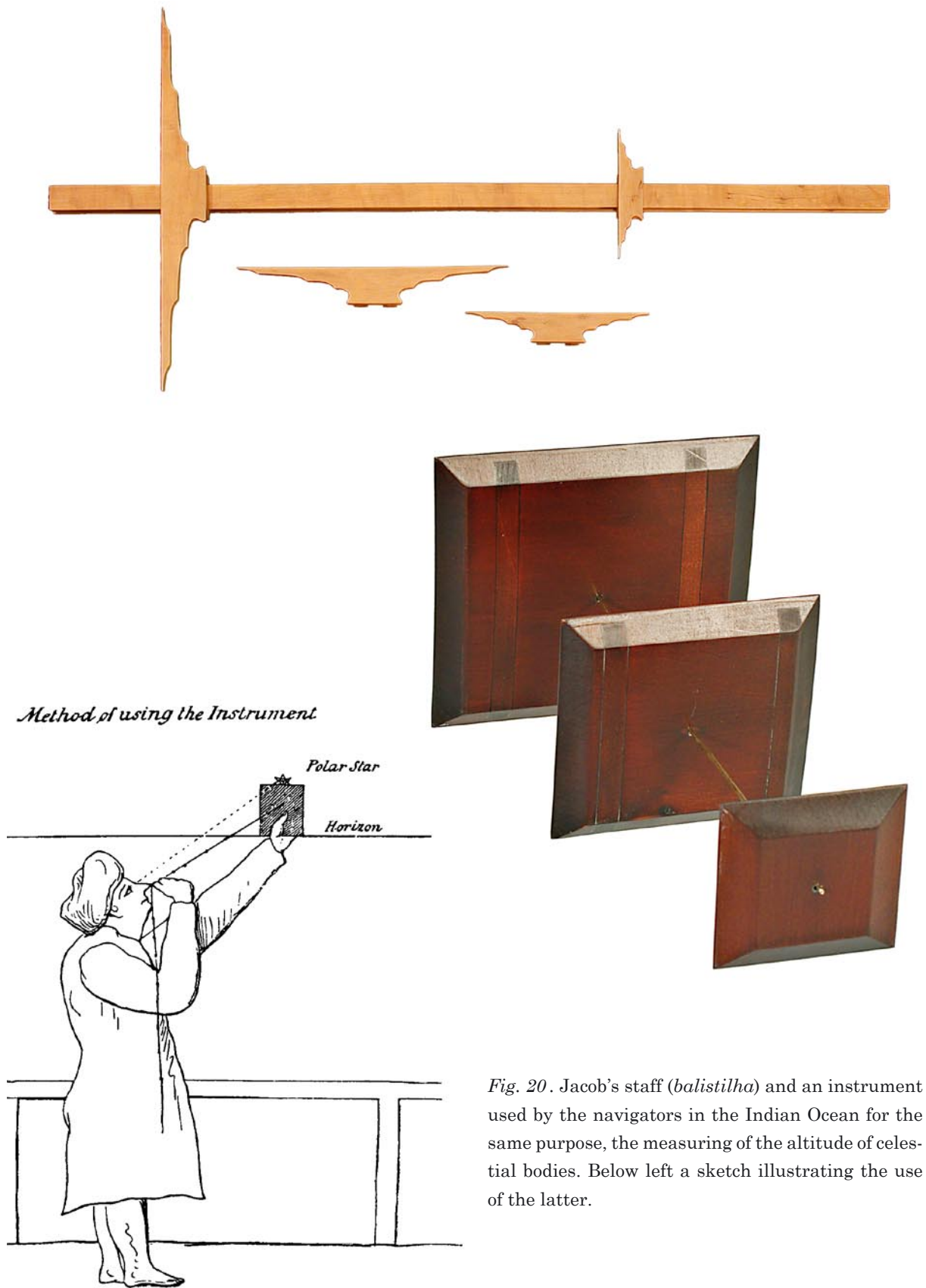


Fig. 20. Jacob's staff (balistilha) and an instrument used by the navigators in the Indian Ocean for the same purpose, the measuring of the altitude of celestial bodies. Below left a sketch illustrating the use of the latter.



Fig. 21.
Mariner's compasses,
as used by navigators
in the Indian Ocean.

and the dense traffic around Africa it is very likely that in the course of the centuries ships drifted across the Atlantic time and time again. At any rate the Brazilian coast and some of the Caribbean islands appear to have been known. The reports about Islamic expeditions mentioned above also support this view. Unfortunately the currently available sources do not permit any further conclusions. Columbus however substantially underestimated the distance across the Atlantic even though he doubtless knew from Arabic-Islamic sources that one equatorial degree equals $56\frac{2}{3}$ miles. Confusion between Arabic and Italian miles and the notion that the western hemisphere of the earth was not indeed spherical but drawn out like a pear towards the south (based upon some misapprehen-

sion)¹⁰⁰ might have caused this error. Anyway, he reckoned with 70° rather than 220° and apparently still believed on his fourth and last journey that he had reached Asia.

Let me conclude with a brief review of the matter discussed above: there is historic evidence that Muslims resp. Arabs tried repeatedly to travel westwards across the Ocean from the first half of the 4th/10th century on, at first from Portuguese and later from West African harbours. The aim was quite often defined as reaching "the [opposite] end of the Ocean". Based on our knowledge of the cartographic achievements and the remarkably advanced navigation in the Arabic-Islamic culture area along with the cartographic materials mostly surviving in European

¹⁰⁰ Cf. GAS, vol. X, p. 219.

copies, I arrive at the considered opinion that it must have been Muslim navigators who had not only reached the new oceanic continent certainly by the beginning of the 9th/15th century but even started to survey it. The passage from Fra Mauro already quoted above (p. 6, 31) in which he states (in the year 1457) that in 1420 a ship coming from the Indian Ocean had passed the Cape of Good Hope and travelled via the Cape Verde Islands apparently on course to the 'Isles of Men and Women' in the Caribbean and back to the Cape of Good Hope, implies at least that this route was already known in 1420 and that reports about these activities had reached Venice by 1457. Also, the documents I have quoted above as examples of pre-Columbian cartographic representations of the region must have taken a long time to generate, judged by the exactitude of the geographic coordinates, the area covered and the numerous details included. Amongst the extant cartographic documents the map of the Atlantic (fig. 4) by Pīrī Re'īs¹⁰¹ seems to be the most exhaustive and important. Contrary to the conventional wisdom concerning its derivation it is probably based on the Italian version of an Arabic original which had been sent in the year 1474 by the Florentine Paolo Toscanelli to the Canonicus Fernam Martins in Lisbon. Columbus had a copy of this map in his possession.¹⁰²

Paul Kahle's theory that a Spaniard, who had participated in

the first three voyages of Columbus, carried a map (which was made by the latter, showing the parts of the American islands and mainland that had been explored) when he was captured by Ottomans in 1501¹⁰³ which was subsequently delivered to Pīrī Re'īs involves quite a stretch of the imagination. I find it more likely that a map also comprising the southern areas, possibly including additions and corrections by Columbus and circulating in several copies, reached the Ottomans. Pīrī Re'īs himself states in one of the inscriptions on his map that he had taken the western part of his world map from the Columbus map¹⁰⁴ and specifies in another inscription that he had adopted the coastlines and islands in the western part of his world map from the said original.¹⁰⁵ As far as I am concerned this leaves no room for speculations that only the northern part of the Atlantic region was based on the "Columbus map" while the southern part had to be derived from other, supposedly Portuguese, originals. This map bearing the name of Columbus is indeed quite different from the sketch which was drawn upon repeated demands of the Spanish crown by Columbus' brother Bartoloméo who had participated only in the first and the last voyage with the former. Besides various errors and confusions and the fact that the new landmasses are designated

¹⁰¹ Cf. GAS, vol. XII, map 39, p. 78.

¹⁰² Cf. P. Kahle, *Die verschollene Columbus-Karte*, pp. 40–42 (reprint l.c., pp. 202–204).

¹⁰³ Ibid, pp. 15, 35, 48 (reprint pp. 179, 199, 212).

¹⁰⁴ Ibid, p. 14 (reprint p. 178).

¹⁰⁵ Ibid.

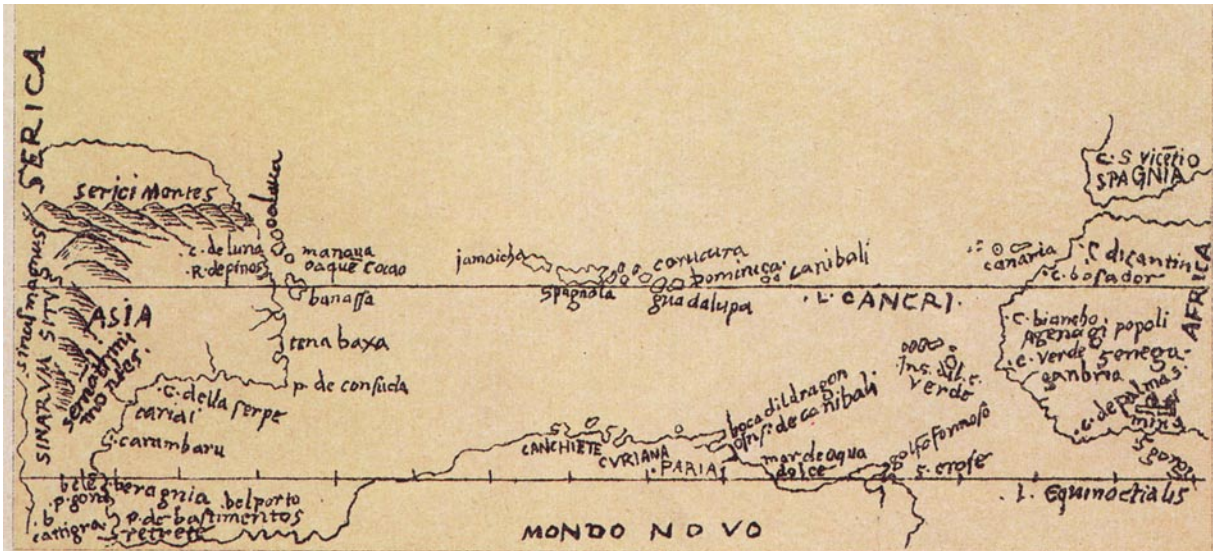


Fig. 22. Sketch by Bartolomé Colombo (1503).

as the East Coast of Asia, the most remarkable thing about this sketch is how small Columbus and his companions had conceived the distance between Asia and Europe-Africa (fig. 22).

This context brings about yet another question, namely about the landmass delineated on the *Pirī Re’is* map south of the American continent extending eastwards. According to my former interpretation I was inclined to see this as a relic of the Ptolemean concept of the oceans being enclosed by continents. After continued study of this matter I am now considering whether this might rather be a trace of an early, however fleeting contact with the Antarctic. The Dominican

missionary Guillaume Adam who lived in the Islamic World between 1305 and 1314, during which time he spent twenty months travelling in the southern parts of the Indian Ocean, made a note at one of his stations situated Lat. 23° South of the equator (apparently on the East-African coast) that merchant vessels embarking at this port used to sail southwards up to a position “where the altitude of the South Pole is 54°” i.e. they advanced very far in the southern hemisphere.¹⁰⁶ This is confirmed by the Italian geographer Livio Sanuto (1588) who reported that the Arabs travelled from Zanzibar on target for the Antarctic and thus passed the Cape of Good Hope.¹⁰⁷



¹⁰⁶ Cf. GAS, vol. XI, p. 386.

¹⁰⁷ Ibid, p. 387.