
The Problem of the Portolan Charts

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The Problem of the Portolan Charts

Portolan charts or atlases are nautical maps spread in the 14th century. In striking contrast to other medieval maps, they show a very modern like shape of the Mediterranean, Black Sea and part of the Atlantic coast. The similarity of all portolan charts is such obvious that A. E. Nordenskiöld (1832-1901) suggested all originate from one single "Normal Portolano".

Since the 19th century the origin of the portolan charts is subject of various research and conflicting opinions. It is still the greatest unresolved question in the history of science.

Recent Comments

"One of the world's greatest and most enduring mysteries" Washington Post, May 22, 2010. From same source:

"People think maybe the Romans made the first ones and they've been lost, or the Phoenicians, or even aliens," Evelyn Edson, author of "The World Map: 1300-1492"

"The ancient Greeks and Romans had traditions of map-making, there's Ptolemy, and there's a line of progression. But here, it just explodes out of nowhere. It appears to be a true invention of the Middle Ages." "The real mystery is that if you took all the notebooks from the sailors used in making these charts, along with the coordinates and descriptions, you still couldn't make this map." "Even with all the research that has been done on them the world over, there's not a single question about them that we can definitively answer." John Hessler, senior cartographic librarian at the Library of Congress.

The Development Paradox

Sudden Arrival

Hereford mappa mundi. North is left. The lower middle is the Mediterranean

The most obvious paradox of the portolans is their development. The Hereford world map right is from around 1300, the same time like the first known portolans.[1] This crude piece[2] is the most accurate none portolan world map we have till this time. A rapid development is still no paradox. Nevertheless the portolans represent a sudden jump to near modern accuracy without signs of development[3]. That is very unique.

Abandoned for worse

A typical portolan, the Ptolemy and a modern map. The 50% Error of the Ptolemy in longitude size is corrected here to allow a comparison.

But after almost 200 years heavy use, the portolans were abandoned by the later 15th century scientists. They favored the newly discovered Ptolemy, despite the much higher accuracy of the Portolans. According Newton[4] Ptolemy had the circumference of the earth within 6% but the size of the Mediterranean 50% too large, even in latitude.[5] This latitude error was corrected by the scientists of the 15th century. But the longitude error for a long time was not. This proves the scientists of this time (ca, 1500) had less navigational knowledge than those who created the Portolans at an unknown time before.

A printed map of the portolan area from 1570. It is a mix of Ptolemy and portolan. From Ptolemy it still keeps the size error of Mediterranean by 40%.

That ignorance of the Portolans continued for the next centuries. In a typical chart of Europe and the Med of 1570, the Med basin is still 40% too large. Although the shape of the North African coast, the Levante and the Black Sea is lent from the Portolanos.

A printed map of the Kingdom of Naples from 1642 in comparison with a modern map.

This printed map of the Kingdom of Naples from 1642 show already some input from land surveys. The shape of Italy is probably neither from portolans nor Ptolemy but from surveys. The other parts may still be from portolans. The errors of 30 to 45% are the results of dead reckoning maritime information. The mapmaker trusted more the data of his time than any traditional. The longitude (on Ferro) of Naples is only in error by 12%, probably the result of astronomical observations. This map presents the accuracy of land and sea surveys of the 17th century.

A printed map of Egypt from 1679 with 35% error in size of east-west extension.

In a late 17th century map of Egypt, at a time land based longitude measurements were already possible, the longitude error is still 35% in favor of Ptolemy.

Comparison of a world map by Homann 1722 and a modern. It is one of the last maps with the size error of the Mediterranean from Ptolemy.

In an almost modern worldmap by Homann 1722, the Mediterranean is still 26% too wide. That was one of the last maps with the medieval influence of Ptolemy.

Unrecognized till 19th century

In the later 18th century, with the help of the marine chronometer, our modern charts were created. Thus, not much before by the 19th century the scientists had a chance to realize how extreme accurate the portolans were. That was the main impetus for the large facsimile editions of portolans done in this century by Manuel Francisco de Santarem, Joachim Lelewel, Edme-Francois Jomard, Friedrich Theobald Fischer and Adolf Erik von Nordenskiöld. Some of this were more detailed than most editions of the 20th century.[6]

The Range Accuracy Paradox

It is rather easy to create a map of an area one can oversee. Like a map of a small town or of an island. Still a local

chart of an area smaller than 10 km is feasible with moderate skills in fair accuracy. But a chart of the Mediterranean with ranges of 1000 km and more seems almost impossible to do without a way to fix absolute positions by astronomical navigation.[7]

Cyprus on a 1662 portolan and from a modern map.

In closer investigation the portolans exhibit a striking paradox. In the long ranges beyond 200 km they have near modern like accuracy. But in local ranges below 20 km they are always of very poor accuracy and even worsening in the 15th, 16th and 17th century. On this short ranges most charts past AD 1500 almost left any link to reality and were useless for navigation

Crete on portolans and the North-West bay detail

For example Crete. Its size and position in the Mediterranean basin is quite well. Both are long range data. But the detail shape of its coastline is very poor. Not even the very characteristic "U" bay at the north-west end is found. It took over 300 years until the first portolan with a crude hint on it arrived. But this chart of 1624 had the general shape of Greece worse than portolans.

That local versus long range accuracy is just the opposite one would expect. Its a paradox because anyone able to do long range fixes could chart local features with ease. And for practical navigation before 1800, the local accuracy was the more important one. That even enhanced this paradox.

References

The oldest signed is after 1306. The oldest with year signed is from 1311
"the non-scientific maps of the later Middle Ages ... are of such complete futility ... that a bare allusion to the monstrosities of Hereford and Ebstorf should suffice." (Beazley 1906, p. 528). Some argue that the medievals had not the intention to create real maps but wanted to present a mythical religious worldview. That is in some contrast to a text in the Ebstorf world map. It called itself a "mappa mundi" and explained that "a mappa mundi is a figure of the world." There is no evidence they had any better geographical information available. After the portolans arrived past 1300 their shape of the Mediterranean was incorporated in such round "mappa mundi" See for example that of Marino Sanudo (ca. 1320) and Fra Mauro (1459).

There are arguments that the two oldest portolans, the Pisane and Cortona, show an early state of development. In a close examination that is not likely. They simply lack knowledge of the northern Atlantic coast. And the Pisane has a slightly poor compiled Italy. The chart maker probably copied it from an Atlas. But the over all accuracy of both charts is well in the level of other portolans.

Newton (1975, p. 46) if the 37800 km there is accepted

Newton (1975, p. 48)

That's even true for the reprint of Nordenskiöld. Unlike the first edition, the charts were now fixed folded between pages. There is the suggestion by a German surveyor, Helmut Minow, that the Med coastline was triangulated by Roman surveyors. A triangulation assumed Loomer (1987) too. Such a triangulation net could be improved by astronomical fixes. For Roman times the necessary knowledge was available but not for the Middle Ages.

Literature

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