

Was Antarctica Mapped by the Ancients?

Suggestions that Antarctica was mapped in ancient times by an unknown civilization are speculative. Evidence said to support ancient mapping has mundane explanations.

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EVERY SO OFTEN, it is suggested that Antarctica was mapped in very ancient times by an unknown civilization. The first antarctic landfall is generally considered to have been in 1820, and actual mapping did not occur until later. However, many sixteenth-century maps show a continent at the present location of Antarctica (Figures 1 and 2). To some eyes these depictions resembled the present shape of that continent minus the shelves of ice along its coast. This would imply that the mapping was done either at a time when the ice was much reduced, or perhaps through the ice using sophisticated scientific equipment. These depictions began to disappear from maps during the seventeenth century, and the South Pole region was usually left completely blank until the nineteenth century.

The major advocate of ancient mapping was the late Charles Hapgood.¹ Later writers of the von Däniken-Berlitz school have suggested that this mapping was done by space aliens.^{2,3} Speculations about ancient mapping of Antarctica were given a boost in 1984 by an article in the *New York Times* that approvingly described a work that had just been published by John Weihs,^{4,5} a geologist at the University of Colorado at Denver. He had concluded that modern geophysical evidence shows that the coastline of Antarctica several thousand years ago would have resembled maps of Antarctica printed during the sixteenth century.

I know of no historian of cartography who adheres to any of these ancient mapping theories. One told me these theories are "goofy." Nevertheless, these ideas have received considerable attention in the popular press;

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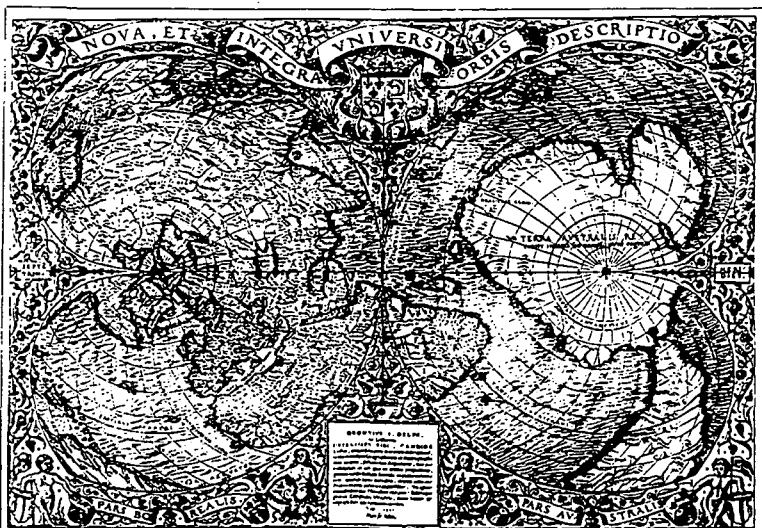


Fig. 2. The Orontius Finaeus Map of 1531 is notable for its completeness, and for its similarity with contemporary maps of the world. The southern continent, Terra Australis Re, bears a strong resemblance to Antarctica on modern maps. The great encirclement in the Pacific Ocean water, and the coastal and inland mountains, are comparable to similar features known today. Apparent ford-like valleys that penetrate the land from the sea are shown, where today massive glaciers fill the valleys of the Transantarctic Mountains.

FIGURE 1. The beautiful Orontius Finaeus woodcut world-map of 1531 is often cited as proof of the ancient mapping of Antarctica.

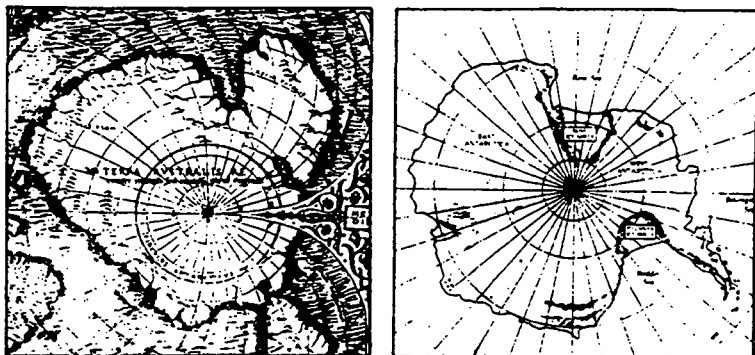


FIGURE 2. Antarctica is in the eye of the beholder. Do these two maps show the same thing? Note that the Finaeus map (left) would be much larger than the modern map (right) if the scales were equal.

and, since the “experts” have been wrong before, it might be worthwhile to review some of the evidence.

Maps of the Ancient Sea Kings

Ancient mapping’s best-known proponent, Charles Hapgood (1904–1982), received his B.A. (1930) and M.A. (1933) from Harvard and did wartime service in the Office of Strategic Services. He taught at a number of schools,

including the Putney School in Vermont, Keystone Junior College in Laplume, Pennsylvania, and Keene State College in New Hampshire.⁶ He is widely known for writing about unconventional ideas in geography and geophysics and has become something of a folk-hero to those unhappy with conventional science. In *Earth's Shifting Crust* and in its revised edition, *The Path of the Pole*,^{7,8} he argued that the ice ages are an artifact of rigid slippage of the earth's crust. Albert Einstein supplied a foreword to this work and appeared to take a courteous and relatively favorable attitude toward Hapgood's work without explicitly endorsing it. Another Hapgood book dealt with spiritualism.⁹

His most influential work was undoubtedly *Maps of the Ancient Sea Kings*. Hapgood did a good deal of original research in developing his thesis, and his book should not be confused with pulp-fare about Mu, Lemuria, and Atlantis. Although I found the book quite entertaining, the lengthy discussions of map projections would certainly bore anyone seeking lurid tales of lost continents. Hapgood considered himself a serious investigator and was not trying to pander to mass gullibility. In the best scholarly tradition, he generously acknowledged the students who helped him and credited Captain Arlington H. Mallery for first suggesting the ancient-mapping idea.

Much of Hapgood's work was based on the Piri Re'is map, a hand-drawn Turkish map done in 1513. Only the Atlantic section survives. One note on the map states that it was compiled from "about twenty charts and Mappae Mundi—these are charts drawn in the days of Alexander, Lord of the Two Horns, which show the inhabited quarter of the world . . . and from the maps just drawn by four Portuguese which show the countries of Hind, Sind and China . . . and also from a map drawn by Colombo in the western region I have extracted it [*sic*]."¹⁰ The map was discovered in Istanbul in 1929, and is now regarded as a priceless document preserving in copied form a map of Columbus.¹¹

Piri Re'is chose his sources well. Interpreting his remarks, he used ancient Greek maps showing the "inhabited quarter," presumably meaning the area surrounding the Mediterranean. There is nothing mysterious about this. In the early sixteenth century, maps attributed to Claudius Ptolemy of Alexandria depicting that region were widely available. They were issued in Europe in many printed editions beginning about 1478, and these or similar maps are probably what Piri Re'is was referring to. For the East Indies ("Hind, Sind and China"), he used charts captured from the Portuguese, who at the time were actively exploring that area. For America, he used a map of Columbus that had fallen into Turkish hands. Another note informs us that he reduced all his source maps to a common scale and combined them to form one chart.

What then is the mystery? Hapgood convinced himself that a portion of the South American coast was really a misplaced section of Antarctica, shown without ice. He claimed to have identified a number of present antarctic features, such as bays and peninsulas, along this portion of coast. Perhaps so,

but it is not difficult to find correspondences between two jagged coastlines. If Hapgood intended to turn the world of ancient maps on its ear, he failed. Dr. Helen Wallis, now curator of maps at the British Library, called the book enjoyable to read, questioned Hapgood's assumptions, and praised the illustrations.¹² Mr. Hapgood died in Fitchburg, Massachusetts, in December 1982 at the age of 78, after being struck by a car while crossing the street. At the time of his death, he was said to be working on a revision of *The Path of the Pole*.

To gauge his influence on mainstream science, I scanned *Science Citation Index* from 1961 through 1983 for references to Hapgood. I found eight works citing Hapgood. One was a popular article, one a book review, two were unrefereed comments or letters, and the remaining four made passing references to Hapgood, mostly of the "some even claim" variety. He may not have revolutionized science, but he did live to be almost 80, had fun doing it, and wrote an entertaining book or two. Many of us would settle for as much.

Problems with the Ancient-Mapping Theory

Hapgood's work ranges over the sources of our Western cartographic tradition, projection methods, and a number of fascinating side issues. I will focus here on whether Antarctica was mapped in ancient times. That phase of Hapgood's work has gained what some might view as academic respectability with the publication of Weihaupt's paper in *EOS*, and it figures prominently in ancient-astronaut speculations. I would like to present the more conventional view, what some might refer to as "the orthodox handout."

Much of the cartographic evidence used to support the ancient-mapping theory consists of a series of printed maps published beginning in the early sixteenth-century. These include the 1531 map of Orontius Finaeus,¹³ a 1538 derivative of that map by Mercator,¹⁴ and a number of later maps, all depicting a southern continent. These depictions probably have their roots in ancient and medieval times, when it was widely believed for various theoretical reasons (such as north-south symmetry) that a southern continent must exist. Among authorities professing such a belief were Aristotle, Eratosthanes, Macrobius, Albertus Magnus, and Roger Bacon.¹⁵ One conventional view is that Finaeus and others simply placed an amorphous blob at the South Pole to conform to this widespread belief. This is not contradicted by evidence on the Finaeus map itself. Three legends appear on the continent. One is a misplaced reference to Brazil, a land already discovered by Cabral. A second legend, *Regio Patalis*, is a name taken from Pliny the Elder, who describes an island of that name in the Indian Ocean, but at a different location.¹⁶ The third legend calls the continent "recently discovered but not yet completely known," perhaps referring to the voyage of Magellan. These inscriptions hardly make a case for ancient documentary sources in the hands of Finaeus. On the contrary, they suggest the use of well-known sources.

Magellan navigated the strait bearing his name in 1520. Within the frame-

work of a theoretical belief in a southern continent, it made sense for geographers to assume that he had navigated a narrow strait between America and the suspected continent. The connection of Magellan's discovery and *Terra Australis* is indicated on many maps. For example, on a 1587 world-map by Mercator,¹⁷ there is a legend on *Terra Australis* stating in plain Latin, *Hanc continentem Australem nonnulli Magellanicam regionem ab ejus inventore noncupant* (Some people call this southern continent the Magellanic region after its discoverer). There is no indication in this legend that Mercator possessed secret information about any earlier discovery which he used to draw his 1538 map. In addition, the outline of *Terra Australis* on the 1587 map does not conform to that on the 1538 map. Clearly Mercator did not consider his 1538 map or the Finæus map to be reliable.

It is possible that geographers simply drew an amorphous mass of land around the South Pole with the single determined point being the Straits of Magellan. A good example of such an extrapolation of a single observation is Weihaupt's Figure 1.¹⁸ The necking of North America to a narrow isthmus on the eastern seaboard was the result of Verrazzano's 1524 sighting of water on the landward side of the islands off the North Carolina coast. He assumed that Pamlico Sound was an inlet of the Pacific Ocean. Verrazzano was unable to return for further exploration because the fierce Carib Indians ate him, and the nonexistent isthmus persisted for some time on maps of the period.¹⁹

In the early seventeenth century, doubts developed about the reality of the southern continent. A quaint précis of thinking at this time appears on a very rare map by William Grent: "This South land undiscovered commonly knowne by the name of Terra Australis incognita or Magellanica cannot certainly be affirmed either continent or Islands[.] Only some few coasts thereof have appeared to Sea men driven thereupon by extremity of weather whose names are set downe. The rest must remaine clouded in obscuritie till future times and Further discoveries produce them to light."²⁰ These were wise words, and as the seventeenth century rolled on *Terra Australis* began to disappear from maps.

Several pre-Magellan maps contain hints of an antarctic land mass. The Roselli world map of circa 1508 shows an east-west coastline about 15° south of the Cape of Good Hope.²¹ A 1515 globe by Johannes Schöner shows a south-polar land mass in the shape of a ring.²² The central sea is accessible through a strait communicating to the South Pacific Ocean. It is known that Magellan had access to a chart that showed a strait connecting the Atlantic and Pacific, and therefore also showing a southern land-mass.^{23, 24} This chart, now lost, perhaps resembled the Schöner depiction. Other examples could be cited. However, surviving pre-Magellan depictions of an antarctic continent do not resemble its present shape, and plausible sources for most of these depictions have been suggested.²⁵

Hapgood operated by concatenating unproven assumptions. He admitted that the Finæus depiction of Antarctica is too large but *assumed* that Finæus

misinterpreted his ancient source. This is convenient, since he was now able to explain the absence of the long Antarctic Peninsula by *assuming* that Finaeus omitted it because it would have bumped into Cape Horn. He admitted that the Finaeus depiction more closely resembles Antarctica if it is rotated by 20° and *assumed* that Finaeus had done this. Where an old map seemed to him to correspond to a modern feature, he credited ancient wisdom; but, if there seemed to be differences, then the sixteenth-century mapmaker must have misinterpreted his sources or made a copying error. It is an approach that makes his hypothesis unfalsifiable since all contrary evidence is easily discarded.

Hapgood's book contains numerous errors and many assumptions of an ad hoc nature. Some of his assumptions may seem plausible at first glance, but he generally invoked unlikely explanations where much simpler ones would suffice. For example, on page 176, he noted that a 1487 Mediterranean chart showed a bay at the mouth of the Guadalquivir River in Spain. He claimed that this represented the river as it was before sediment had accumulated at its mouth, i.e., thousands of years ago. However, when I compared the map with a modern map, it was clear that the 1487 mapmaker had exaggerated all promontories, inlets, small islands, and so on, to make them more visible to the user. This is not an unusual cartographic convention. On pages 176–177 he showed the 1487 depiction of the Aegean alongside a modern map (Figures 97 and 98). He noted that the islands on the old map are larger and concluded that the sea level was lower when the presumably ancient source-map for the 1487 map was surveyed. My previous comment on exaggerating small features explains that. He also noted that the old map showed many more islands than the modern map, implying a much lower sea-level when the original map was done. This would indeed be a mystery, but when I consulted my household atlas I found that his modern map mysteriously omits numerous islands.²⁶ In fact, the 1487 map resembled my atlas more closely than did Hapgood's modern map. Hapgood supporters are invited to take this "map comparison test." The only mystery is where Hapgood obtained such a bad modern map of the Aegean. Such carelessness does not inspire confidence. I do not think that Hapgood was intellectually dishonest—merely that he uncritically accepted any evidence supporting his views and did not try very hard to come up with alternative explanations. Ultimately, he became a victim of his own enthusiasm.

There may remain for some a vague feeling that the depiction of *Terra Australis* on the Finaeus map bears a superficial resemblance to modern Antarctica, or that it seems too definite in shape to have been invented from whole cloth. On a speculative basis, it is possible to suggest a source he may have employed. Wieser²⁷ discussed a broadside publication, *Zeytung auss Pressilg Landt*, dating from about 1515, which describes a voyage to southern latitudes, and suggested that Schöner used this as a source for depiction of the southern continent on his globe of 1520.²⁸ The broadside seems to liken the coastline of part of the southern continent to northwestern Africa, and

Wieser claimed to recognize features on the globe's depiction of Antarctica resembling the Gulf of Sidra and the Gulf of Guinea, although the entire southern continent on the globe does not resemble Africa. He also suggested that otherwise mysterious identification of *Terra Australis* with Brazil derives from this same source.

The *Zeytung* appeared in several editions, suggesting widespread circulation, and it does not strain credulity that Finaeus had seen a copy. The *Zeytung* is not easily understood. An exasperated Wieser branded it a grammatical labyrinth.²⁹ It is not inconceivable that the Frenchman Finaeus misunderstood or incautiously extrapolated the reference to Africa, and simply transplanted a second African continent at the South Pole! To my eye, the shape and size of *Terra Australis* resemble early depictions of Africa more than modern Antarctica.

Another hypothesis has been advanced by Enterline.³⁰ He suggested the Finaeus map may be based in part on actual discoveries in the early sixteenth century for which we now have no detailed account. For example, the large indentation on the Pacific coast of *Terra Australis* (which Weihaupt believes represents the Ross Sea) may represent early reports of Australia's Gulf of Carpenteria. Thus the Finaeus map may be a blend of imagination and fact. Enterline's thesis, while ingenious, still depends on making assumptions that cannot be proved. However, he presented a plausible sequence of events that could easily be true.

The simplest theory is that Finaeus drew an asymmetrical, bi-lobate blob of no special shape to conform to ancient belief in a southern continent and to Magellan's discovery. The blob-theory is consistent with the varying shape of *Terra Australis* on maps both before and after the Finaeus map. If there were actual observations or maps of the coastline, one would expect a more consistent representation.

Clearly there are plenty of prosaic ideas about how Finaeus might have drawn his map. All have some factual components, while there is no evidence whatever of ancient sources for the shape of the coastline. One cannot rule out ancient sources, but why postulate something for which there is no evidence to explain that which needs no explanation?

Weihaupt's Contribution

When I first saw Weihaupt's paper, I assumed he was attempting to update Hapgood's work and was surprised to find no mention whatever of Hapgood. The aforementioned *New York Times* article and several other commentators on Weihaupt's work have noted this omission.³¹⁻³³ However, Weihaupt arrived at his hypothesis by an independent route.³⁴ In addition to the mapping evidence, Weihaupt discussed some geophysical evidence. As I understand it, he contends that during the Hypsithermal Interval (from about 7,000 to 500 B.C.) the Ross ice shelf was greatly diminished. This would, in his view, cause the outline of Antarctica to more closely resemble the Finaeus depiction.

To support this contention, he cited observational evidence, along with some theoretical models. In a reply to Weihaupt, Louis Lliboutry hotly disputed Weihaupt's conclusions about the ice sheet.³⁵ Lliboutry, president of the International Commission on Ice and Snow, cited evidence that the ice shelf has not changed significantly over the time span considered by Weihaupt. Lliboutry concluded, "It seems that, in spite of some hard facts and in spite of warnings against simplistic theories, the idea of fast changes in the Ross Ice Shelf and in its main nourishment area, Marie Byrd Land, is widespread in the United States." Such strong language suggests he may have an ax of his own to grind. Worse, Lliboutry also presented his own view of how sixteenth-century cartographers arrived at their depiction of Antarctica as established fact. In his reply, Weihaupt properly chided Lliboutry for the latter, and presented additional evidence to rebut Lliboutry's geophysical assertions.³⁶ Apparently at our present state of knowledge, one can select evidence to either support or refute the occurrence of recent changes in the ice shelf.

Weihaupt attempted to bolster his case with cartographic evidence, but his choice of maps was unfortunate. He cited a map of Mercator, but failed to point out that Mercator also published a map of the *north* polar regions that shows a fictitious *north-polar* continent.³⁷ This nonexistent land is furnished with rivers, well-defined river deltas, mountains, and a sharp coastline with numerous small bays. An inset shows the mythical arctic island of Frisland, complete with named cities! Obviously, a definite-appearing coastline does not imply reality. A claim by Weihaupt that the Finaeus map shows "fjord-like depressions" and the Transantarctic Mountains must be viewed in this context. Mercator was not reluctant to include hypothetical lands on his maps for theoretical reasons or on the basis of legends or flimsy explorers' reports. Since he was one of the more scientific early cartographers, one shudders at the reliability of maps by his contemporaries. Weihaupt's Figure 2 shows a 1540 map of America by Sebastian Münster.³⁸ In the caption Weihaupt identified a partly visible land-mass south of the Straits of Magellan as a "southern continent." However, the world map from the same atlas clearly shows this to be a large island off the tip of South America, and no polar continent whatever is shown.³⁹ Weihaupt also cited a map by the notorious charlatan Philippe Buache. Figure 3 shows another map by him in which an entirely imaginary sea occupies the American Northwest.^{40, 41} Even in the middle of the eighteenth century, two centuries after Mercator, imaginary features were freely added to maps to make theoretical points.

In a curious slip, Weihaupt employed the name *Terra Australis Re* throughout his article. This is a meaningless phrase mistakenly derived from the legend "*TERRA AUSTRALIS REcenter inventa, sed nondu[m] plene cognita*" (southern land recently discovered but not yet completely known). The *RE* is part of the hyphenated word *REcenter*, as can be seen in Figure 1. This suggests he may not have read the entire inscription, whose words by themselves almost refute his case.

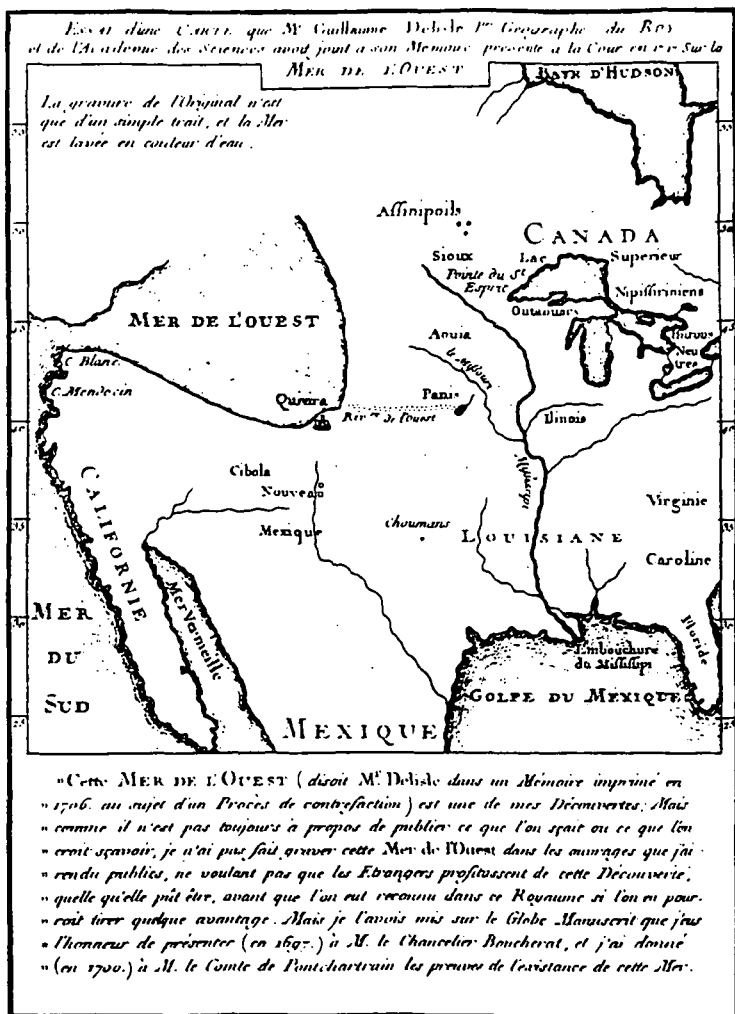


FIGURE 3. A map published by the French cartographer Philippe Buache in 1753 to give credence to his geographical theories. To enhance the map's credibility, Buache falsely attributed it to his deceased father-in-law, the famous cartographer Guillaume de l'Isle. With unintentional irony, Buache showed his mythical Mer de l'Ouest washing the shores of the fabled and equally non-existent kingdoms of Quivira and Cibola. The only kind comment one can make about this map is that few copies have survived. Since this particular map was done in an age of scientific cartography, and two centuries after the early maps showing an antarctic continent, it is clear that caution must be used in interpreting those earlier maps. Both Hapgood and Weihaupt cite a Buache map of Antarctica as supporting ancient mapping. Is it any more reliable than this map?

It must always be kept in mind that old maps often show lands of myth and legend, such as St. Brendan's Island in the Atlantic and the large lake

in South America on which was located the fabulous city of El Dorado. California was frequently depicted as an island, and the North Pacific was filled with strange land-masses. Many of these misconceptions persisted well into the eighteenth century. These nonexistent lands are often shown with detailed mountains, bays, rivers, cities, and so on.

Anyone interested in pursuing early mapping theories should first read *Maps of the Ancient Sea Kings*, followed by *The Mapping of the World*,⁴² a compendium of early world maps that shows how the conception of the southern continent changed over the centuries. Nordenskiöld's *Facsimile-Atlas to the Early History of Cartography*⁴³ and Bagrow and Skelton's *History of Cartography*⁴⁴ also provide helpful overviews. Enterline's paper⁴⁵ and Wieser's monograph⁴⁶ give scholarly information specifically related to Antarctica. The recently published *Sea Charts of the Early Explorers*⁴⁷ illustrates numerous charts dating back to 1290. This work shows that the so-called portolan charts of the Mediterranean evolved from crude prototypes and were not derived from ancient sources as Hapgood claimed. Cortasão's treatise⁴⁸ discusses the methods of early chartmakers. O. A. W. Dilke's *Greek and Roman Maps*⁴⁹ provides a recent scholarly summary of cartography in classical times. One illustration of particular interest shows the so-called Farnese Atlas, a Roman copy of an earlier Greek statue of Atlas holding a celestial sphere on his shoulders. Dilke notes that "there are no constellations in the antarctic areas, invisible from the Mediterranean," implying that southern navigation was little known or unknown then. For those with more eclectic tastes, two scientific articles mention Hapgood's polar-wandering theory in passing.^{50, 51}

Conclusion

Our knowledge of early cartography is limited, since much material from the sixteenth century is now lost. While this affords ample opportunity for speculation, there have been many scholarly studies of this period. These studies were not done by dunces, but by individuals who spent years acquiring the skills and perspective necessary to interpret the evidence. Professor Hapgood, to his credit, spent almost ten years studying the evidence and consulting experts in the field. His ideas were rejected in scholarly circles not because of animus but because he had not proved his case. Too many leaps of faith were needed to establish his thesis. I fear it is impossible to be equally charitable toward some later advocates of the Hapgood thesis, whose methods do little credit to his memory.

Hapgood was the quintessential enthusiastic amateur. In *Maps of the Ancient Sea Kings* he quotes Edison as saying that a certain problem was too difficult for the experts—it would be necessary to wait for some amateur to solve it. Hapgood felt that nonexperts were free of bias and could make advances in areas where experts were baffled. The world needs a few Hapgoods to make life interesting, but we should expect more from those with

scholarly training.

I encourage anyone interested in ancient-mapping theories to consult the references provided in the Notes below and form their own conclusions. Early cartography is a fascinating field of research. Within my own experience, fresh ideas, supported by evidence, have always been welcomed.

Acknowledgment

Dr. Robert Karrow, Jr., curator of maps at the Newberry Library, called my attention to Enterline's paper, and Gail Ivey, of the Massachusetts Institute of Technology, provided translation assistance.

Notes

1. C. H. Hapgood, *Maps of the Ancient Sea Kings, Evidence of Advanced Civilization in the Ice Age* (Philadelphia: Chilton, 1966).
2. E. Von Däniken, *Chariots of the Gods* (New York: Bantam Books, 1972), pp. 14-16.
3. C. Berlitz, *Mysteries from Forgotten Worlds* (New York: Dell, 1973), pp. 16-23.
4. W. Sullivan, "New Analysis Hints Ancient Explorers Mapped Antarctica," *New York Times*, p. C2, Sept. 25, 1984.
5. J. G. Weihaupt, "Historic Cartographic Evidence for Holocene Changes in the Antarctic Ice Cover," *EOS, Trans. Amer. Geophys. Union*, 65: 493-501, August 28, 1984.
6. Biographical information on Hapgood is conflicting. The dust-jacket on *Earth's Shifting Crust* contains the phrase, "Lately, in addition to completing his doctorate at Harvard and writing this book . . ." Harvard states that they have no record of this doctorate, and later books omit that claim. Further information can be found in an obituary in *Pursuit*, 16 (1):45 (1983).
7. C. H. Hapgood, *Earth's Shifting Crust: A Key to Some Basic Problems of Earth Science* (New York: Pantheon, 1958).
8. C. H. Hapgood, *The Path of the Pole* (Philadelphia: Chilton, 1970).
9. C. H. Hapgood, *Voices of Spirit: Through the Psychic Experiences of Elwood Babbs* (New York: Delacorte Press, 1975).
10. Translation taken from *Maps of the Ancient Sea Kings*, pp. 220-224. The ellipses are mine.
11. L. Bagrow and R. A. Skelton, *History of Cartography* (Cambridge: Harvard University Press, 1964), pp. 108, 210.
12. H. Wallis, [Untitled book-review] *Geographical Journal*, 133:394-395 (1967).
13. O. Finæus, *Nova et Integra Universi Orbis Descriptio*, Paris, 1531.
14. G. Mercator, [Untitled world map] Louvain, 1538.
15. Franz Ritter von Wieser, *Magalhães-Strasse und Austral-Continent auf den Globen des Johannes Schöner* (Innsbruck: Wagner, 1881), Chap. 7.
16. C. S. Plinius, *Historia Naturalis*, Liber VI (Rome: Unknown scribe, 77), reprinted as *Natural History* (Cambridge: Harvard University Press, 1969), vol. 2, pp. 390 ff.
17. G. Mercator, *Orbis Terrae Compendiosa Descriptio*, Geneva, 1587 (illustrated in Nordenskiöld, plate 47, and Shirley, Plate 129).
18. See Note 5.
19. W. P. Cumming, R. A. Skelton, and D. B. Quinn, *The Discovery of North America* (New York: American Heritage Press, 1972), p. 71.
20. W. Grent, *A New and Accurate Map of the World Drawne According To the truest Descriptions, latest Discoveries, and best Observations, that have been made by English, or Strangers* (London, 1625). (Illustrated in Shirley, plate 238.)
21. F. Roselli, [Untitled world map] Venice, circa 1508 (illustrated in Shirley, plate 32, where coloring somewhat obscures the printed coastlines).
22. J. Schöner, [Untitled globe] Nuremberg, 1515 (illustrated in Nordenskiöld, pp. 78-79; Wieser, Plate 2; and Winsor, p. 118).
23. J. Winsor, *Narrative and Critical History of America* (Boston: Houghton Mifflin,

1886). vol. 2. pp. 604-605.

24. S. E. Morison. *The European Discovery of America: The Southern Voyages 1492-1616* (New York: Oxford University Press, 1974), pp. 380-383.

25. See Note 15.

26. *Atlante Internazionale del Touring Club Italiano* (Milano: Touring Club Italiano, 1923-24), Plates 75-76.

27. See Note 15.

28. J. Schöner. [Untitled globe] Nuremberg, 1520 (Western Hemisphere illustrated in Wieser, Plate 1. and Winsor, p. 119).

29. Es ist freilich keine leichte Aufgabe, sich in dem grammatischen Labyrinth der Zeytung zurechtzufinden (p. 65).

30. J. Enterline, "The Southern Continent and the False Strait of Magellan." *Imago Mundi*, 26: 48-58 (1972).

31. W. R. Corliss, "Who Mapped Antarctica in Pre-Medieval Times?" *Science Frontiers*, no. 36 (Nov.-Dec. 1984); "Antarctica Revisited, Hapgood Acknowledged," *ibid.*, no. 38 (Mar.-Apr. 1985).

32. C. Fuller, "I See by the Papers," *Fate*, January 1985, pp. 22-24.

33. D. J. Milton, Letter in "Forum," *EOS, Trans. Amer. Geophys. Union*, 65: 1226-1227 (Dec. 18, 1984).

34. In a telephone conversation (May 22, 1985) Dr. Weihaupt explained that in connection with his interest in the evolution of antarctic ice he had asked the Library of Congress to provide him with early maps of Antarctica. His inspection of this material suggested to him that the earliest maps may have been surveyed at a time when much less ice was present. He was unaware of Hapgood's work when preparing his paper.

35. L. Lliboutry, Letter in "Forum," *EOS, Trans. Amer. Geophys. Union*, 65: 1226-1227 (Dec. 18, 1984).

36. J. G. Weihaupt, Reply to Milton and Lliboutry, *EOS, Trans. Amer. Geophys. Union*, 1226-1227 (Dec. 18, 1984).

37. G. Mercator, *Septentrionalium Terrarum Descriptio* (Duisberg, 1595). (Illustrated in Nordenskiöld, p. 95; Bagrow and Skelton, Plate 96.)

38. S. Münster, [Map of America having variant titles] Basle, 1540 and succeeding years.

39. S. Münster, *Typus Orbis Universalis* (Basle, 1540). (Illustrated in Shirley, Plate 67.)

40. P. Buache, *Exposé des Découvertes au Nord de la Grand Mer. Présenté au Roy le 2. Septembre 1753*, Plate 5.

41. W. P. Cumming, S. Hillier, D. B. Quinn, and G. Williams, *The Exploration of North America 1630-1776* (New York: Putnam, 1974), p. 181.

42. R. W. Shirley, *The Mapping of the World: Early Printed World Maps 1472-1700* (London: Holland Press, 1983).

43. A. E. Nordenskiöld, *Facsimile-Atlas to the Early History of Cartography* (New York: Dover, 1973, reprint of 1889 edition).

44. See Note 11.

45. See Note 30.

46. See Note 15.

47. M. M. du Jourdin and M. de La Roncière, *Sea Charts of the Early Explorers: 13th to 17th Century* (New York: Thames & Hudson, 1984).

48. A. Cortesão, *History of Portuguese Cartography*, 2 vols. (Coimbra: Junta de Investigações do Ultramar, 1969-71).

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