

## MERCATOR'S WORLD ATLAS "AD USUM NAVIGANTIUM"

In Vol. IX, No 2 of the *Hydrographic Review*, Nov. 1932, there appeared an announcement that the International Hydrographic Bureau had issued a full-sized reproduction of the original *Chart of the World* by Gerhard MERCATOR, published in 1569. The original of this reproduction is the chart in the possession of the Municipal Library of Breslau.

Dr. J. W. VAN NOUHUYS, Director of the "Prins Hendrik" Museum, Rotterdam, informs the Bureau that that museum has recently acquired an original copy of a *World Atlas for Navigation* compiled by MERCATOR from his world chart in the same year. The atlas was discovered in 1932 at an auction at Lucerne, where it evidently failed to attract the attention it deserved, and was afterwards purchased by private treaty on behalf of the Museum.

The following information concerning MERCATOR'S work, and especially the Atlas, has been kindly supplied by Dr. VAN NOUHUYS.

\* \* \*

In 1512 there was born at Rumpelmonde (near Antwerp), of Low-German parents, Gerhard KREEMER, or, as he was called according to the custom of the times, Gerhard MERCATOR. After apprenticeship and collaboration with the renowned North Dutch mathematician Gemma FRISIUS, during which he acquired a reputation in technical circles by his engraving on copper of the gores for his master's terrestrial globe of 1535, MERCATOR performed his first independent work, the preparation and printing of a map of the Holy Land in 1537. Some fifteen years later, PLANTIJN had still a number of copies of that map in stock, but as far as is known no-one of our generation has ever seen one.

It is thought that in compiling this map he made great use of that of the Utrecht draughtsman Erhard REUWICH. The latter, while still in the service of BREYDENBACH, visited Palestine for the purpose in 1483 and printed the map himself at Mainz in 1486.

Two years after publishing this map of Palestine, MERCATOR started to compile a map of the world on the special projection first used by the French geographer Orontius FINÆUS in 1531. This projection depicts the globe in two heart-shaped parts meeting at the equator. MERCATOR, who had previously spent some years at Bois-le-Duc, was at this time established at Louvain; his chart was not so much an improvement on that of FINÆUS as a transformation into a flat form of FRISIUS' globe.

As stated in the excellent biography of MERCATOR by AVERDUNK and MÜLLER-REINHARD, he had until then mainly adhered to PTOLEMY'S ideas. The choice of the above method thus marked his emancipation and that of the cosmographic and geographical sciences from the Ptolemaic concepts.

The favourable reception accorded to this first World Map is proved among other things by the fact that thirty years later, it is known from PLANTIJN'S records that no less than sixty-nine copies were sold in the autumn of 1567 alone. The only copy known to exist at present is the property of the Geographical Society of New York.

In addition to the improvement of previously edited maps, which he carried out consistently, MERCATOR edited a large number of maps himself, his attention being particularly occupied with the technical development of the graphical part. Thus he was the first to evolve a special italic script for the text, recommending it in an autographic memorandum. It is also beyond any doubt that at that time (and according to AVERDUNK until 1570) MERCATOR was performing the whole of the graphical work of the charts by himself, including the engraving of the copper plates.

The year 1541 saw the appearance of MERCATOR'S world-renowned terrestrial globe, and the corresponding celestial globe appeared ten years later.

It is more than probable that these two masterpieces were responsible for AVERDUNK'S description of him as the great master of the XVI century in this realm. The annual report of the Rotterdam Marine Museum for 1923 mentions the acquisition of this terrestrial globe.

Menaced by the Inquisition, MERCATOR in 1552 moved to Duisburg; there is good reason to suppose that the recommendation which his terrestrial globe had earned for him from GRANVELLE protected him from political dangers.

However outstanding MERCATOR's complex work may have been during his stay at Duisburg, it is that part of it referred to in the title of this article which chiefly concerns us here. Actually it was from that time that he became adviser to those who saw in the accurate charting of the coasts the means of making maritime traffic safer on the new passenger and commercial routes.

In 1554 there appeared at Duisburg MERCATOR's famous map of Europe,  $132 \times 159 \frac{1}{m}$  ( $4.3 \times 5.2$  ft.), taken from fifteen copper plates; a beautiful specimen of the cartographic engraver's art, and "an entirely classic model for the critical treatment of the materials intended for the cartographic representations of his day" (AVERDUNK).

Long legends on the chart throw light on the conception underlying its execution, biblical representations speak of his profoundly religious feelings; the explanations and astronomical matter are also mainly due to principles peculiar to MERCATOR himself.

Upwards of one thousand copies of the map certainly left MERCATOR's workshop, but have succumbed to the final fate of all things. In 1572 he published a reprint, two copies of which are known: one at Basle and the other at Weimar; about half the copper plates were improved for this purpose by erasing the out-of-date parts and engraving the new data.

MERCATOR reached the height of his cartographic career in 1569, when he published his great world chart of twenty-four sheets covering an area of  $212 \times 134 \frac{1}{m}$  ( $7.0 \times 4.4$  ft.); the particular construction used was designed expressly for navigators, as is emphasised in the legend by the words *ad usum navigantium*. AVERDUNK certainly did not exaggerate when he affirmed that this was the work which immortalised the name of MERCATOR. WIEDER expresses himself no less categorically when he says that after WALDSEEMÜLLER's great world map of 1507 "a new era opened in the development of geography".

A world map of such irreproachable workmanship, with its complete legends, planned by the brain of such a master as MERCATOR, may well be described as a synopsis of the state of the cartographic and hydrographic science of that time, while the technical and artistic execution reveal the noble character of the manual work. A comparison of the map with Laur. FRISIUS' *Carta Marina* of 1530 is instructive in this respect.

The map shows decisively, among other things, MERCATOR's idea of suppressing the arbitrary principle resorted to by PTOLEMY for tracing his "first meridian", namely through the western extreme of the world as known to him, somewhere in the Canary Islands. By collating magnetic observations made at various places on the earth, including Ratisbon, MERCATOR hoped to be able to determine the position of the magnetic pole as a fixed point *on the earth*. With a view to keeping as close a link as possible with PTOLEMY's prime meridian — in deference, perhaps, to his great predecessor — he selected as his first meridian that which was separated by ninety degrees from the meridian passing through the magnetic pole. It was only when he realised that the magnetic poles were not fixed points, and that the isogons were neither meridians nor great circles, that he recognised the failure of this method.

To proceed, however, to the Museum's new acquisition :

According to recent information, only four copies of the original masterly map were in existence: one at the Bibliothèque Nationale of Paris, formerly the property of Prof. KLAPPROTH; one in the Municipal Library of Breslau, where it was discovered in 1889 by Dr. HEYER; one in the University Library of Basle, from the AMERBACH Library; and one owned by Count MIRBACH.

The atlas just discovered, and acquired by the Museum, is compiled entirely from the cartographic material of 1569 and takes the form of a large folio book. One's first impression is of the fine colouring; the next, surprise that no reluctance was felt in destroying a map of the world intended as a highly effective wall-map. The latter emotion, however, is soon found to be unjustified.

There is no doubt, writes Dr. VAN NOUHUYS, that it was MERCATOR himself who gave the volume the title of "Atlas", and that by this word he understood what the whole world understands by the word *now*: a judiciously compiled collection of maps or charts of geographical regions, carefully brought up to date and forming a coherent whole — in this case comprising the whole world over land and sea. Dr. WIEDER, in the Review of the *Koninklijk Nederlandsch Aardrijkskundig Genootschap* of 1915, in an article entitled "LAFREDI verso ORTELIUS" expressed himself in favour of the latter on the question of whether the designing of what we to-day understand by an "atlas" is due to LAFREDI or ORTELIUS. ORTELIUS' claim is supported by the publication in 1570 of his world atlas *Theatrum Orbis Terrarum*, but it may be questioned whether ORTELIUS' pro-

duction was not rather a collection of heterogeneous items than the outcome of an entirely personal conception.

The Rotterdam atlas, in Dr. VAN NOUHVYS' opinion, throws fresh light on the subject; for if at first one feels a sense of regret at seeing the famous map thus mutilated, one soon realises that this large volume is a world sea-atlas in its ideal form, composed of twenty-six chart sheets, conforming entirely with one's own conception of such a document, and of the same date as the world map itself, i.e. 1569.

For compiling the atlas, no less than three copies of the world map were required. The majority of the charts are veritable track charts, to obtain which it was sometimes necessary to combine overlaps — as for instance to obtain a track chart from the West Coast of America (Isthmus of Panama) to the continent of Asia, the full width of the Pacific Ocean. On the other hand, two sheets of the size of the atlas sufficed for the whole route from western Europe to the West Indies including the Gulf of Mexico.

As originally printed, MERCATOR'S map has a superficial area of about 22,000 sq.  $\frac{c}{m}$ , while the total surface of the various maps which together form the atlas is over 35,000 sq.  $\frac{c}{m}$ .

The decorated border of the world map, being useless for the atlas, was removed by cutting or, when it came in the margin, blacked over.

The title has been cut out of the chart and re-arranged to form the title of the atlas on the first blank leaf; beneath is the dated privilege. Following this title page is the frontispiece, a large allegorical composition with a dedication to WILLIAM Duke of JÜLICH, CLEVES, etc. in latin hexameters; then comes the large and beautifully framed vignette in which MERCATOR, in two massive columns of text, sets forth the threefold purpose of the cartographic work.

The system of "increasing degrees" used for the chart sheets is not practical in latitudes above 70°, and for this reason a special chart of those regions is included. On it the magnetic pole appears in two different places, in accordance with the uncertain observations then extant. There is also given separately the *Organum directorium* as an aid to the determination of courses and measurement of distances; two threads at the angles serve to facilitate the operation; nowhere however in the detailed description of the chart itself could any allusion to these threads be found. On the opposite page is explained the arrangement and use of the *organum*.

In the cutting of the original chart sheets and their grouping into units the brain and hand of the master are clearly recognisable; this is not the place, however, to discuss the details.

The chart sheets have black edges. By using the property of transparency and by measurement one realises that under the black are concealed parts of the exquisitely decorated border. Where the black band served also to bring the sheet up to the full height of the atlas, pieces of the decorated border were used and have been entirely covered with black; obviously the artistic border was of no value for the atlas.

It should further be noted that the colouring was everywhere applied *after* the fragments had been adjusted in place or applied on the mounting paper; this has convinced Dr. VAN NOUHVYS of the certainty that the whole of the work was done in 1569 in MERCATOR'S workshop, very probably with his own hands. The paper on which the world map was printed — at least those copies of it which were used for the atlas — is not only identical in structure with the mounting paper and the three blank fly-leaves at the end, but bears the same watermark as that of the Breslau copy of the world map. Against any supposition that the atlas may date from before 1569 it may be urged that at least one of the three copies of the world map used in its construction was a *printer's proof* pulled from the copper plate *before the latter was complete*.

The material of the atlas is in a good state of preservation. The sheets were bound together immediately after printing, and the paper is as fresh as when it came from the press except that the first two leaves are soiled by dirty water, evidently through some sudden mishap, and that the front fly-leaves are missing, possibly for the same reason.

The dimensions of the atlas are  $47 \times 34 \frac{c}{m}$  (18.5"  $\times$  13.4") and it consists of 29 sheets including charts and inscriptions. Each of the charts is a self-contained unit for navigational purposes. After mounting, the charts and the frames of the inscriptions were coloured red.

The following are the details of the sheets: —

1. Blank paper on which (recto) is mounted the title of the atlas composed of words cut out from chart sheets *A2, A3, A4 & A5* (2, 3, 4 & 5), arranged in five lines: *Nova et aucta — orbis terrae — descriptio ad — usum na — vigantium emendate accomodata.*

Under the title, the framed inscription of the privilege dated *Duysburgi an. D: 1569 mense Augusto*, taken from sheets *C5* and *C6* (17 & 18). Verso blank.

2. Blank paper on which is mounted (recto) the title plate with framed dedication from sheets *A1* and *A2* (1 & 2). The scrolls on the under side of the frame are carefully cut out and the gaps restored with pen and ink and coloured, and the clouds removed with the ornamented border have been replaced with pen and pencil. Under the dedication are the latin verses. Verso blank.

3 & 4. Two blank leaves on which (verso of 3 and recto of 4) is mounted the framed inscription *Inspectori S.* from sheets *A1*, *A2*, *B1* & *B2* (1, 2, 7 & 8).

5 & 6. Chart sheets *A3*, *A4*, and the upper part of *B3* and *B4* (3, 4, 9 & 10). Contains the North Atlantic, including Cape Race, from lat. 47° to 79° N. and long. 60° E. to 52° W., showing the approaches and entrances to the N. E. and N. W. Passages. Like all the other chart sheets it is edged with black to a width of 1 to 1 1/2  $\frac{c}{m}$  (.39 to .59 in.).

7 & 8. Similar to the above. A double chart composed of sheets *B2*, *B3* & *B4* (8, 9 & 10) forming a complete track chart of the Atlantic. Area covered, lat. 55° N. to 16° S., long. 31° E. to 85° W.

9. A single-leaf chart composed of parts of sheets *A2*, *A3*, *B2* & *B3* (2, 3, 8 & 9) containing part of North America with its coasts. Area covered, lat. 22° to 73° N., long. 20° to 63° W. The parallels have the figures 30, 40, etc. written in.

10 & 11. A double chart composed of sheets *B3*, *B4*, *C3* & *C4* (9, 10, 15 & 16). Contains the South Atlantic from the Straits of Magellan to the Cape. Area covered, lat. 1° N. to 63° S., long 55 1/2° E. to 60° W. The inscriptions *Quod Nigr in Nilum fluat* and *De vero Ganges et Aureae Chersonesi* are removed and replaced by paper, the chart being restored with pen and pencil. The words *Pars Continentis Australis* are written in ink, probably by MERCATOR'S own hand.

12 & 13. The left-hand sheet opens out, the whole being a double chart, 47×85  $\frac{c}{m}$  (18.5×43.5 in.). Forms a track chart of the Pacific from the Isthmus of Panama to the East Coast of Asia. Area covered, lat. 54° N. to 13° S., long. 150° E. to 59° W. Blank paper is substituted for the inscription at the top of sheets *B1* & *B2* (7 & 8).

14 & 15. A double chart composed of sheets *C2* & *C3* (14 & 15) containing the Straits of Magellan and approaches. Area covered, lat. 6° to 66 1/2° S., long. 3° to 115° W. Blank paper has been used to fill in gaps, etc.

16 & 17. A double chart composed of sheets *A4*, *A5*, *B4* & *B5* (4, 5, 10 & 11) covering the Mediterranean, Baltic and Iceland, including the southern part of Greenland and the greater part of the N. E. Passage. Area covered, lat. 29° to 75° N., long. from the first meridian to 112° E. The inscription at the top of sheet *A5* (5) is replaced by blank paper.

18 & 19. A double chart composed of sheets *B4*, *B5*, *C4* & *C5* (10, 11, 16 & 17) covering the seas round Africa with the Indian Ocean as far as Point de Galle. Area covered, lat. 39° N. to 38° S., long. from first meridian to 114° E. The inscription *Brevis usus organi directorii* is removed and the framed inscription about VASCO DA GAMA substituted for it, the chart being restored with paper and with pen and pencil drawing.

20 & 21. A double chart of north-eastern Europe and the N. E. Passage from the White Sea through Vaigach (Kara) Strait including Anian Strait (?). The left-hand leaf is a folding one, the chart being 75  $\frac{c}{m}$  (29.5 in.) wide. Composed of sheets *A5*, *A6* & *A1* (5, 6 & 1) with parts of *B5*, *B6* & *B1* (11, 12 & 7). Area covered, lat. 47° to 78° N., long. 67° E. to 168° W. Inscriptions untouched except the one at the rock of the magnetic pole, which is erased. Various entries on this chart are of great interest in determining the authenticity of the document.

22 & 23. Contains the Red Sea (*Sinus Arabicus*), Indian Ocean (*Mare Rubrum*), Malay Archipelago as far as the west end of New Guinea, China Sea and Japan. Composed of sheets *B5* & *B6* (11 & 12). Area covered, lat. 55° N. to 15° S., long. 65° E. to 180°.

24 & 25. Blank paper on which (verso of 24 and recto of 25) is mounted the framed inscription *De vero Ganges...* taken from sheets *C3*, *C4* & *C5* (15, 16 & 17). On the verso of 25 is mounted the framed instruction for the use of the *Directorium* taken from sheets *C5* & *C6* (17 & 18). Both these leaves, with the paper inserts, are fine specimens for proving the identity of the paper.

26. Composed of sheet *C6* (18) from long. 130° E. to 180° E. with the southern

portion of sheet B6 (12) up to Java Major. At the right-hand side of the chart is a small part of the decorated border, with along it a part of the coast-line of the southern continent. The decorated part there, and at the bottom of the chart, is blackened.

The *Organum Directorium* has the two threads recommended by MERCATOR fixed at the corners. They are without a doubt the original ones, and do not exist on any of the other known copies.

27. Blank paper on which is mounted the northern Polar Cap on POSTEL'S projection from sheet C1 (13) with a very small strip of the left-hand frame taken from the separately-printed decorated margin. The framed inscription at the top of the polar chart is included, the top of the frame being completed from sheet B1 (7).

28 & 29. Composed of sheets B2, B3, C2 & C3 (8, 9, 14 & 15). Contains the seas around South America including a part of Central America. Area covered, lat. 14° N. to 57° S., long. 5° to 120° W. The inscription *Distanciae locorum mensurande modus* is removed, also a piece of frame in the Antarctic regions.

30, 31 & 32. Blank fly-leaves.

The scale of the maps is of interest. It is curious that as far as we know there is no literature on this subject, and MERCATOR does not allude to it in any of his letters or other documents. In the Rotterdam atlas the mean length of a degree on the equator works out at 5,508  $\frac{m}{m}$  (giving a total equatorial length of 1,9829 m.) as compared with the corresponding figures of 5,389  $\frac{m}{m}$  and 1,9434 m. in the Berlin reproduction of the Breslau copy.

Allowing for possible distortion of the paper, these lengths are in substantial agreement with the Portuguese fathom (1.8 m.) and the Italian *canna mercantille* of 1,9926 m.; but it seems likely that MERCATOR, who was strongly influenced by the customs and manners of the Netherlands, based his scale — if he had a preconceived scale in mind at all — on the Rhineland foot of 31,395  $\frac{c}{m}$ , and so on the *rijnlandsche roede* of 3,767 m. of which 30,000 should be equivalent to one degree. The length of a minute on the equator should be, in this case,  $500 \times 3.767 = 1883.68$  m., giving a scale for the maps of about 1:20,500,000. Dr. MÜLLER-REINHARD, taking the length of the equator on MERCATOR'S world map to be 1,944 m., has pointed out that this would correspond to the *toise* of 1,949 m. Or MERCATOR may have used as a unit the *stadium* of 60 *schuch*, the circumference of the globe according to the opinion of the times being 252,000 of the latter (700 to the degree).

In Dr. VAN NOUHUYS' opinion, the discovery of the atlas proves conclusively that to Gerhard MERCATOR alone belongs the honour of conceiving, naming and bringing into being the first world atlas as we understand it to-day. The "Prins Hendrik" Museum has thus enriched itself with an item of the greatest cultural and historical interest.

