The Restoration of a 34 cm Terrestrial Globe by Blaeu

One of the most distinguished publishers and makers of maps and globes during the 17th century was the Dutchman Willem Jansz Blaeu who started his business around 1598 in Amsterdam. This business was continued by the family well into the 18th century. The first pair of globes made and published by Blaeu goes back to 1599 (the terrestrial globe) and 1601 (the celestial) and they both have a diameter of 34 cm. The globe mentioned in this paper is also dated 1599 but since the name of the cartouche is Guille-mus Janssonius Blaeu and the name "Blaeu" was first adapted after 1621 it must be concluded that the globe is an updated version made after 1621 (II, see Fig. 1).

The general condition of the globe seemed good at first, but when looking closer several typical damages appeared. As the globe was not varnished the paper had been exposed to dust, direct light and touching hands. The northern hemisphere was rather dark and somewhat worn - several places the print had faded and was hardly visible. The southern hemisphere was much lighter but rather yellow - probably because of the original animal- glue-size; but also because of a glazing patina of ocre, which had been applied very carelessly all over the surface of the globe. There were several cracks on the northern hemisphere, around equator and at the poles. Only one of them was caused by a punch; the others derived from peelings of plaster. The fact that the shell tends to become slightly smaller by contraction and that flakes of plaster peel off because of contractions of the surface of the globe (for the gores more likely) is thoroughly described by A.D. Baynes-Cope (2). These contractions are most probably caused by fast drying of the globe after a period in very damp surroundings. Several factors indicate that the Blaeu globe had been exposed to extreme fluctuations of the relative humidity. The paper on the horizonning was pasted directly to the oakwood ring on the stand (see Fig. 2). Subsequently the paper was heavily deteriorated due to the large amount of tannic acid in oakwood. Furthermore, the wood had shrunk about 4 millimeters so that the paper was creased and wrinkled in the two places on the ring, where the grain of the wood allowed for contractions. This had caused the ring to split in its two joints (also placed along the grain), because of the meridians which are made of brass and therefore much more stable. The meridian was fitted exactly into the two notches in the horizonning and the guide in the bottom of the stand. This enabled the globe to rotate in the horizonning. However, this was
impossible because the internal diameter of the horizon ring was too small. Apart from that the rest of the stand was in a good condition. The four pillars were stained black and the whole stand was polished with wax. This type of stand was very typical for the Dutch globes, though it was soon adopted elsewhere probably because of its good and solid construction.

An interesting detail about the construction of the stand is the importance of the "bottom-board". It was constructed merely by means of four pillars, a horizon ring at the top and a couple of cross-stays at the bottom (to fix the pillars) the center of this cross (where the meridian ring is placed) will be weighted by the globe and it will slowly bend until it touches the ground. Dutch globemakers however, avoided this problem by supporting the cross with the bottom-board, which in this case was nailed to the cross from under.

Moreover, it was evident that the bottom-board was cut out of the same material as the horizon ring. By comparing the patterns of the end-grained wood of the horizon ring and the bottom-board they proved similar - and so did the shrinkage. Hence the working procedure has been as follows, (see fig. 5).

Two boards of oak approx. 2cm of thickness were glued together forming a square board. This was placed in a lathe and turned circular. The decorative grooves of the bottom board were carried out after which the ring was parted from the board using a parting tool. Four holes were drilled in the ring to receive the top pins of the pillars. As the horizon ring shrunk the pins stuck out after which the ring was parted from the board using a parting tool. Four holes were drilled in the ring to receive the top pins of the pillars. As the horizon ring shrunk the pins stuck out after which the ring was parted from the board using a parting tool.

The dust had sunk deep into the paper fibres and the surface was yellowing. The casual strokes of ocre patina proved impossible to remove. Around the polar regions, about 10 places on the northern hemisphere great care was taken though the colours were stable. One major difficulty about this treatment was the varying contrasts of the surface look after treatment.

Treatment

After having removed obvious surface dust with a very soft brush it became clear that further cleaning could only be done after consolidation of the plaster flakes. This was done by injecting animal glue into the cracks and pressing down the flakes in the same moment. Now cleaning tests were carried out on the globe using water and different solvents; but nothing seemed to work. The dust had sunk deep into the paper fibres and the surface was so worn that I had to be very careful not to damage the print. Furthermore, the paper surface of both the globe and the horizon ring seemed as if they had been coated with wax. As it was more or less impossible to remove all the dirt from the paper without damaging the surface, it was decided only to use methylcellulose and water. The methylcellulose was gently brushed onto the surface, after a few minutes it removed with a damp cotton swap. The methylcellulose used was a Tylose N 10.000 from Hoechst, Germany in concentrations from 2-5%.

To some extent it proved useful, it retained the water in the paper well and some dirt was encapsulated but not very much. The wax seemed to be the invisible barrier that would let the water pass through the paper but not loosen the dirt.

Those few places where colours were preserved or the northern hemisphere great care was taken though the colours were stable. One major difficulty about this treatment was the varying contrasts of the surface look after treatment. The cleaning of the southern hemisphere was easier. Paper, print and colours were much better preserved and there were only a few stains and cracks. Most of the yellow discolouration derived from the paper, but the ocre patina also contributed to the yellowing. The casual strokes became more pronounced impossible to get off - it must have some kind of oil - or perhaps casein based colour but since it did not disturb the general impression of the cartographic information it was decided to let it be untreated.

Around the polar regions, about 10 places on the northern hemisphere and in the area representing equatorial Africa (where the globe had received a great punch) plaster and paper were missing and the paper machine would have been less or less visible. Round these areas the gases or parts of them were removed by using steam (see fig. 6). The paper dissolved easily as it was obviously dried out several places. In order to stabilise the globe surface the holes were re-plastered. As the plaster would have to resemble the original one of the globe it was made from a solution of rabbit skin glue and water (1:7) and precipitated chalk mixed to a consistency like that of curdled milk. The plaster was applied hot and was allowed to dry between each application. Finally, the surface was sanded down with sandpaper and sized with wheat starch paste. After the edges had been pasted back on the globe, the holes were repaired with hand laid paper of approximately the same thickness and texture as the original paper. All repairs were retouched with watercolour and the whole globe was re-sized three times with a 2% methylcellulose solution.

![Fig. 6 Restoration of plaster](image_url)

![Fig. 7 Peeling off the horizon ring](image_url)
Treatment of the stand
The restoration of the stand was perhaps the most exciting part of the enterprise. As mentioned above, the horizon-paper and the horizon-ring did not fit very well together as the wooden ring had shrunk. In order to save the badly deteriorated paper from being completely disintegrated by tannic acid, it was decided to try to peel off the horizon-paper. Another advantage gained by this procedure was the opportunity to restore the wooden ring as well as the paper to its original size. Being aware that such a treatment perhaps was a very hazardous solution to the shrinkage problem, every precaution was taken not to damage the paper. The paper was cleaned in exactly the same way as the globe. Here it was clearer that the paper had been wax-polished, so again several organic solvents were tested but without satisfactory results. After having cleaned as much as possible with the methylcellulose/water swaps, the paper was ready to be taken off. The horizon-paper was pasted down in 4 pieces, the joints following 4 scratches on the wooden ring. The paper was covered with lens-tissue and a thick solution of methylcellulose was pasted through it in order to safeguard the fragile paper on the ring and to retain the moisture in the paper. After this steam was applied by use of a hand steam-cleaner (Rowenta DA-55) and the paper was removed using tweezers and a scalpel. The lens-tissue was a great help during this process; fragments were kept together and it served as a transport.

After the removal of the four horizon-papers, they were gently washed in hot water and deacidified from the back with a 0.2% solution of CaOH. In order to remove the protective lens-tissue from the surface, the papers were lined on the back with a very thin kozo paper and wheat starch paste. Furthermore, the papers were lined with a rather thick kozo paper which had previously been treated with a 0.2% solution of CaOH - this should serve as a buffer when pasted onto the oak-ring. Before pasting on the paper, the ring was restored to its original size by inserting two pieces of oak-wood in the broken joints. By gently stretching the paper it was made fit the enlarged horizon-ring.

Treatment of the metal parts
The horizon-ring was cleaned with a glassbrush to remove flyspots and polished to a medium grade of gloss. It was important to keep down the gloss so that the brass would white to the somewhat worn globe. The horizon-ring was restored to its original size so that the globe and the meridian-ring would fit properly into the stand. The horizon-ring was soldered and a new pointer was produced. The paper parts of this globe were not varnished after treatment but coated several times with methylcellulose in order to protect and stabilize it.

Notes:
1) P. van der Krogt; p. 55
2) A.D. Baynes-Cope; "Problems in Reshaping Globes" in "Der Globusfreund" no. 35-37, 1987 pp. 33-35.

Materials:
Methylcelluloses: Tylose MHB 10000 from Hoechst, 8230 Frankfurt am Main 80, Germany.
Rabbitskin glue (French) from Kenabiiens Farvehandel, Bakkestræde 8, 1209 Kopenhagen K, Denmark.
Knot starch from Struers Chem, Valhalla Alle 176, 2610 Randers, Denmark.
Hand Steam Cleaner, Rowenta DA-55 bought in Germany.
Handmade paper: "Vellum Parchment" from Barham Greene & Co. Ltd., Hayle Mill, Kent, Great Britain.
Kozo paper 100g/m2 RK-1 on roll from Paper Neo, 1-29-12-201 Senceku, Bunyaku-ku, 112 Tokyo, Japan.
Kozo paper 70g/m2 from Japico Drissler & Co., Inshanger Str. 18, 6000 Frankfurt am Main 20, Germany.

Literature:
Peter van der Krogt; "Old Globes in the Netherlands", HES Uitgevers, Utrecht 1984.
Gillian Lewis, Anne Leane and Sylvia Sumira; "Globe Conservation at the National Maritime Museum, London" in The Institute of...
Abstract

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All paper on the globe was cleaned with methylcellulose and water, but the result was only slightly satisfactory as wax and dirt ingrained in the surface would not dissolve.

Apart from cleaning the globe the stand was restored. Removing the paper from the horizonring was the most difficult part of the project. The woodden horizonring had shrunked, but it was restored to its original size so that the globe and the meridianring would fit properly into the stand.

The hourring was soldered and a new pointer was produced.

After treatment the paper parts was not varnished but coated several times with methylcellulose in order to protect and stabilize it.

Michael Højlund Rasmussen
paperconservator

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