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Jens Vellev:

Tycho Brahe's Paper Mill on Hven and N. A. Møller
Nicolaisen's Excavations, 1933-1934

Tycho Brahe and Prague: Crossroads of European Science.

Proceedings of the International Symposium on the History of Science in the Rudolphine Period.
Prague, 22-25 October 2001.

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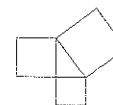
Tycho Brahe's Paper Mill on Hven
and N. A. Møller Nicolaisen's
Excavations, 1933-1934

Jens Velle, Aarhus

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Edited by
John Robert Christianson, Alena Hadravová,
Petr Hadrava and Martin Šolc



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The symposium was held under the auspices
of the rector of the Charles University Prof. Ivan Wilhelm, DSc,
and the president of the Academy of Sciences of the Czech Republic
Doc. Helena Illnerová, DSc.

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Josef Petrář (Charles Univ., Prague)
Alain-Philippe Segonds (Observatoire de Paris)
Martin Šolc (Charles Univ., Prague, LOC)

The symposium has been organized by the Research Center for the History
of Sciences and Humanities (RCHSH, founded by Charles University and
Academy of Sciences of the Czech Republic) in Prague.

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Jiří Stočes, Michal Šimůnek, Emilie Těšínská, Tomáš Zubec.

All sessions were held in the Patriotic Hall of Carolinum, the historical
building of the Charles University.

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Cf. <http://stelweb.asu.cas.cz/tycho/tbsymp.htm>.

Ne frustra vixisse videar ...

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Tycho Brahe's Paper Mill on Hven and N. A. Møller Nicolaisen's Excavations, 1933-1934

Jens Velle, Aarhus

In the winter season of 1936-37, the "Hvidehus" bookshop in Vejle put out a brochure advertising a lecture by the amateur astronomer N. A. Møller Nicolaisen (1874-1954): *Tycho Brahe, his contemporaries, and the historical excavations on Hven. Illustrated with coloured slides*. That is now more than sixty years ago, and most people today would probably imagine that the lecture was on the effort in the service of astronomy that made our noble countryman (1546-1601) world-famous. However, that is not the case. Møller Nicolaisen's theme was Tycho Brahe's production of paper. The brochure tells of the beginning of what was called an archaeological sensation of that time:

"Urged on by his historical interest in Tycho Brahe, he visited Hven for the first time in 1929, and thus began the great adventure. When walking about the grounds, Møller Nicolaisen's attention was drawn to a large mound which did not seem to be a geological structure, but rather the work of human hands, and after giving it some thought, he became convinced that this was the place where Tycho Brahe's storied paper mill had fallen into ruin. This interesting discovery induced The Scandinavian Tycho Brahe Foundation to grant financial aid to the great work of excavation led by Møller Nicolaisen. The result of the excavations was of such an impressive character that it attracted attention in scientific circles throughout Europe ... After completing the excavations, Møller Nicolaisen delivered his first lecture, on the actual site, to an exclusive circle of interested scientists. The lecture was attended by the Swedish Crown Prince and Princess, who were most interested in seeing the remains of our ancestors' work, of

which Tycho was the soul ... The lecture was later delivered in 'The Astronomical Society' in Copenhagen and several other places. The lecturer gives his lecture a more popular stamp, though on the scientific background, and the press as well as the audience – not least the youth – are very enthusiastic over the lecturer's vivid and exciting narrative, and over the approximately 100 colour slides, which include both historic figures, the actual work on the excavations, the rare findings, and a series of extraordinarily beautiful landscapes."

The above-mentioned examinations on Hven were carried out in two excavation campaigns in 1933 and 1934. Until then, Tycho Brahe researchers had certainly been occupied with the extraordinary site, but so far their interest had been concentrated on the controversial nobleman's famous buildings – *Uraniborg* and *Stjerneborg* – in the centre of the island, which he received as a fief from the Danish king in 1576. The main house, a combined castle and observatory, was completed in 1580, while the partially buried observatory could be put into use four years later. In the course of a few years he had changed the previously almost unknown island into a centre for advanced research on the stars and planets. The outcome of the numerous nocturnal observations was published in a wonderful set of books, the product of his own printing house. One serious problem, however, soon surfaced: He was dependent on deliveries of paper from European mills, which were far from always in a position to deliver the goods. He therefore decided to start his own production. The construction of a small factory must have already been well under way in 1589, since he wrote to a friend in Germany:

"You mention the paper mill which I said I wanted to build so that the paper, which was to come from Germany, would not cause delays to my publications so often and for so long ... The above-mentioned mill is already finished. A high, wide embankment regulates the water supply, which suffices in summer as well as in winter. The wheel, which is approximately 7 meters in diameter, is powered by the least possible amount of water, and besides the manufacture of paper, is the source of power for two industries. A number of fishponds are also laid out, so that these may also supply water for the mill when it is needed. And only a few years ago, this was all just dry land."

However, despite the clarity of these words, which possibly should be regarded as wishful thinking, the mill does not seem to have been completed until a few years later. After completing the work, a self-satisfied Tycho placed a monument on the embankment acclaiming the extraordinary

project, here translated from Latin:

"This embankment and paper mill with all their fixtures as well as the ponds situated opposite were built by Tycho Brahe of Knutstorp in a place where earlier there were no such things, from his own plans, under his own leadership, and at his own cost, for the benefit of the country, himself and his descendants. Begun in 1590, completed in 1592."

The monument was – probably in 1740 – moved to Knutstorp, where it can still be viewed, although in a somewhat battered state.

After disagreeing with the king, Christian IV, Tycho left the island in 1597, and after some time settled in Prague, where he died in 1601. The buildings on Hven soon decayed. The paper mill was demolished in 1602. Its approximate position on the southeast side of the island was known from cartographic surveys of the time. The actual site was not located until when, during his visit in 1929, Møller Nicolaisen, while walking on the beach, with his penetrating powers of observation was able to determine that a tremendous, straight-sided embankment could not have been made by nature but must be the remains of the construction mentioned in Tycho's letter and on the monument.

In the following years the enthusiastic amateur astronomer threw himself into the task of getting permission to carry out archaeological explorations at the site – and at the same time raising the money for the project. He succeeded, and work began on 24 July 1933. Labour was recruited and a Swedish museum official, Torsten Mårtensson from Helsingborg was attached to the project, among other things to carry out the measurements. Work progressed quickly, and soon the first pieces of tiles and glazed flagstones appeared. They were on the right track. However, they did not find a clear building construction until a couple of metres down, where they found vertical poles and collections of fieldstones.

When the site was cleared, it turned out to be a stone-built trench filled with mud. At the bottom a piece of shaped wood appeared. And on 1 August, after it had been cleaned, it turned out to be the remains of the mill rim, apparently preserved at the bottom of the wheel chamber. Their enthusiasm was great, and before nightfall the workers had freed the fragment, which was approximately 2.5 m long.

Møller Nicolaisen published his results in several issues of *Nordisk Astronomisk Tidsskrift* (The Scandinavian Astronomical Magazine) from 1930–38. However, although a special edition of the articles was printed, the author felt that there was a need for a complete account. And this he was finally able to have published by Gyldendal in 1946: *Tycho Brahe's*

Paper Mill on Hven, on the occasion of the 400th anniversary of the famous astronomer's birth. Most of the text is taken word for word from the previously published articles, but the explorations had now been brought to a worthy conclusion.

Work on the excavations and the following collation played an important role in Møller Nicolaisen's daily life. He built his own observatory in Vejle, from where he devoted himself to his hobby. On the walls hang pictures, which were mainly enlargements of his own photographs. Obviously, they were taken in black and white, but several of them had been coloured by hand with unusual accuracy. And his extensive material with relation to the excavations could be found in drawers and cabinets: measurements, photographs, correspondence, newspaper articles and the colour slides mentioned in the brochure from the 1936-37 lecture season. The observatory still exists, including much of Møller Nicolaisen's material, amongst it a few findings from the explorations on Hven. The large private archive, which the heirs had preserved, was given to this author in 1996.

The investigation of the paper mill on Hven is still worthy of considerable attention. Through it, we are given insight into a piece of trade history with far more than local significance. A renewed treatment of the extensive source material – findings, maps, photographs, notes, correspondence – will provide surprising new approaches to the understanding of the earliest years of Danish paper production. At the same time, we will also see a more varied picture of a somewhat overlooked side of Tycho Brahe's multifaceted activities.

The many finds from the excavations are today kept partly in a small museum on Hven, and partly in the Museum of Cultural History in Lund, together with material from the excavations of Stjerneborg and Uraniborg. Material from reports, such as photographic negatives from the Swedish archaeologists who were attached to the examination is kept in various institutions in Helsingborg and Stockholm. The broad, if scattered material, is now being registered by the present author in connection with an investigation of Danish paper production in the 1500s and 1600s. Here twelve of Møller Nicolaisen's slides are shown, supplemented with a few other photos, giving an idea of the process and results of the successful excavation.

Notes

There is extensive literature on Tycho Brahe. Here I refer only to three works – in Danish – in which the quoted passages can be found:

N. A. MØLLER NICOLAISEN's little book of 72 pages from 1946: *Tycho Brahe's Paper Mill on Hven* (Tycho Brahes Papirmølle paa Hven), has been quoted in the present article.

Tycho Brahe. Stjärnornas Herre, which, with JOHANNA ERLANDSSON as editor, was released in connection with the exhibition in Landskrona in 1996. The articles here give new and as yet overlooked approaches to research on Tycho Brahe.

ALEX WITTENDORFF's extensive monograph (328 pages) from 1996, *Tyge Brahe*, gives a good view of his life and activities. It concludes with three pages of references.

The present account must be seen in connection with a more thorough-going investigation of paper production in Denmark in the 1500s and 1600s. Apart from the study of Tycho Brahe's paper mill, it treats the works established south of Aarhus in 1635 by Hans Hansen Skonning. The site has been rediscovered, and in 1997 and 1998 the author began archaeological excavations there.

Besides the mill facilities, the paper produced, preserved in books and letters, has also been included in the investigation. The slides from Møller Nicolaisen's archive, on which the illustrations used in the article are based, are from a series of 56, measuring 8.2 × 8.2 cm, which formed the basis for the many lectures he gave throughout the years.

The archive also includes another series of 55 slides with the theme "Tycho Brahe as an astronomer".

Finally, I would like to thank the Bodil Pedersen Foundation, which supported the author's studies on Hven as well as a trip to study paper museums and factories in Switzerland and Italy in 1998.

The present article was translated from Danish by PATRICIA LUNDDAHL, "Center for Cultural Research, University of Aarhus". A Danish version of the article appears in "Grafiana. Årbog for Danmarks Grafiske Museum / Dansk Pressemuseum", Odense 2000: *Tycho Brahes papirmølle på Hven – og om N. A. Møller Nicolaisens udgravninger 1933-34*, p. 27-37.

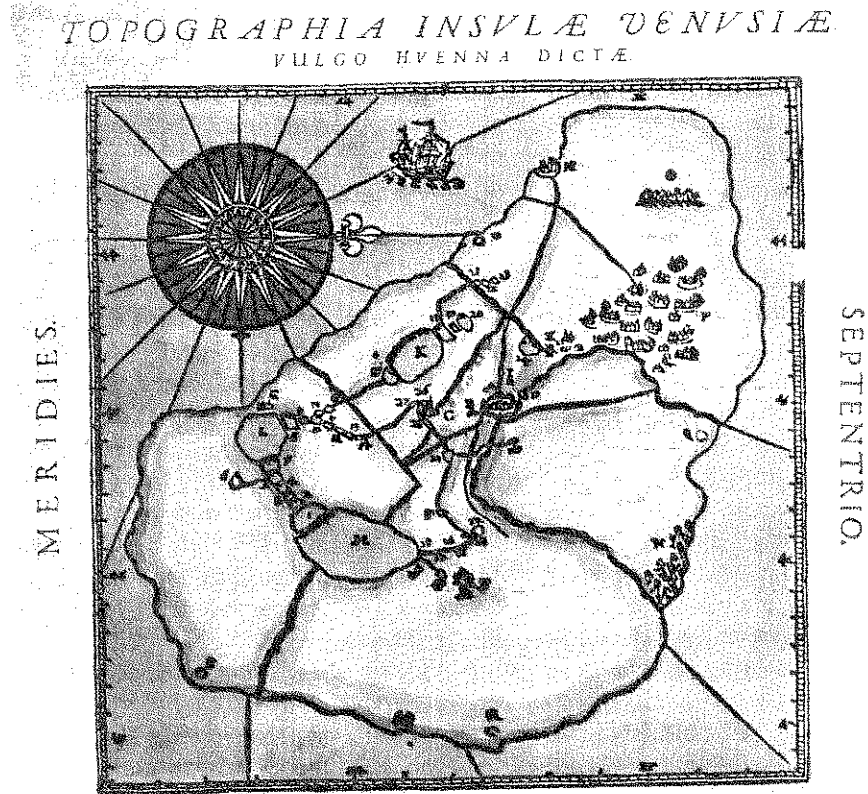


Figure 1: Map of Hven as the island looked at the time of Tycho Brahe, with many dammed-up ponds leading rainwater to the paper mill at the coast. The hand-coloured map was printed and published on Hven in 1596.



Figure 2: The mill embankment as photographed by Møller Nicolaisen in 1929. The small building situated on the left in the photo was later demolished. In other versions of the photo, the house has been retouched away – it blocked the view of the actual site where the paper mill had been.



Figure 3: A photograph from the first day of the excavation: 24 July 1933. The question was whether anything at all was preserved. It was. After only a few hours of digging finds surfaced: roof tiles.

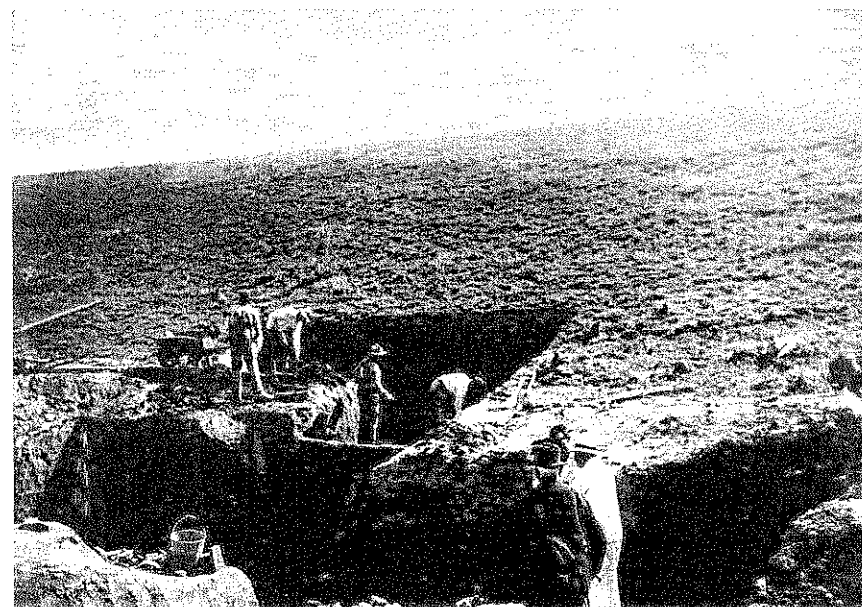


Figure 4: It was soon necessary to expand the area and dig deeper. The leaders of the excavation consult in the foreground while digging goes on.



Figure 5: More expansions were necessary before the shape of the building could be seen. Here they are digging in its south-western part.

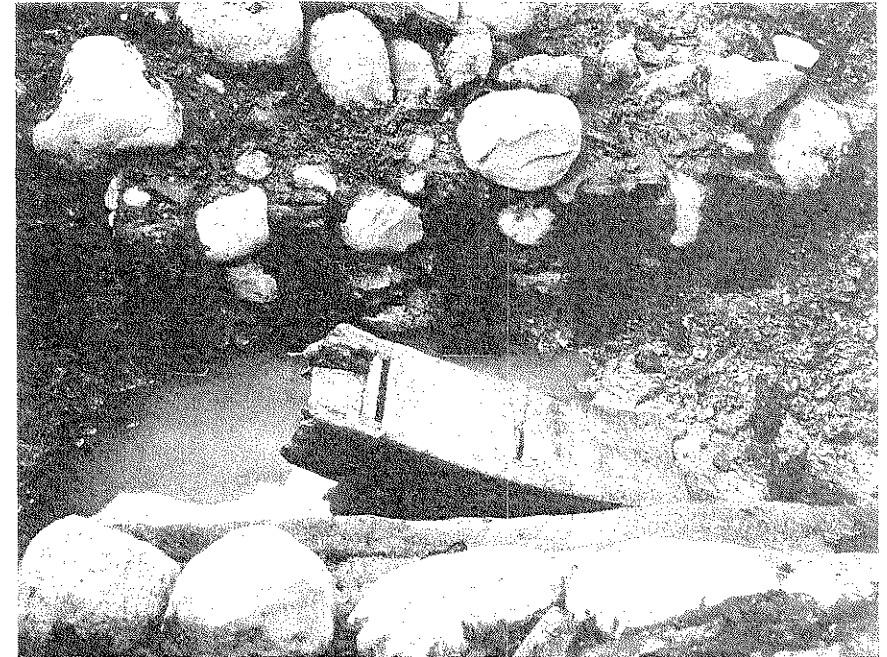


Figure 6: August 1, 1933 was a remarkable day for the excavation team. That is when the first end of the mill's water wheel appeared in the wheel chamber. The wood was very well preserved, and after preservation by the National Museum in Copenhagen, it could be transported back to Hven, where it can still be seen in the small museum located near Uraniborg. Analyses of the wood showed that the shovel cases were made of pine, while the 26 cm-wide wheel rim with its punched out grooves was made of oak. The fragment found was 2.5 m long. The diameter could be quite accurately calculated to 6.94 metres.

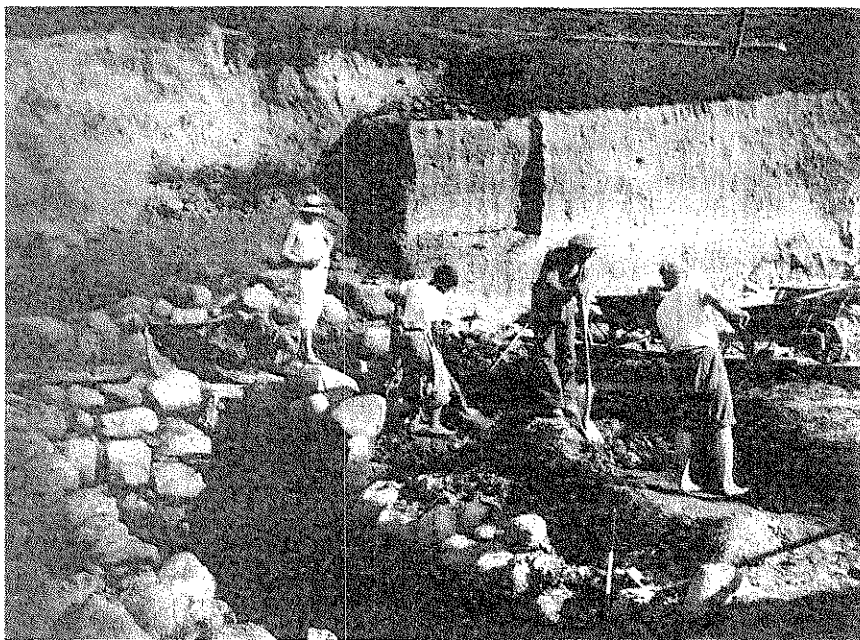


Figure 7: Møller Nicolaisen inspects the last clearing during the excavations in 1934. Shortly after, the cleared area was covered over. The location of the building was marked with four concrete posts, which still mark the place where the most remarkable industrial facility of the Scandinavian Renaissance lay.

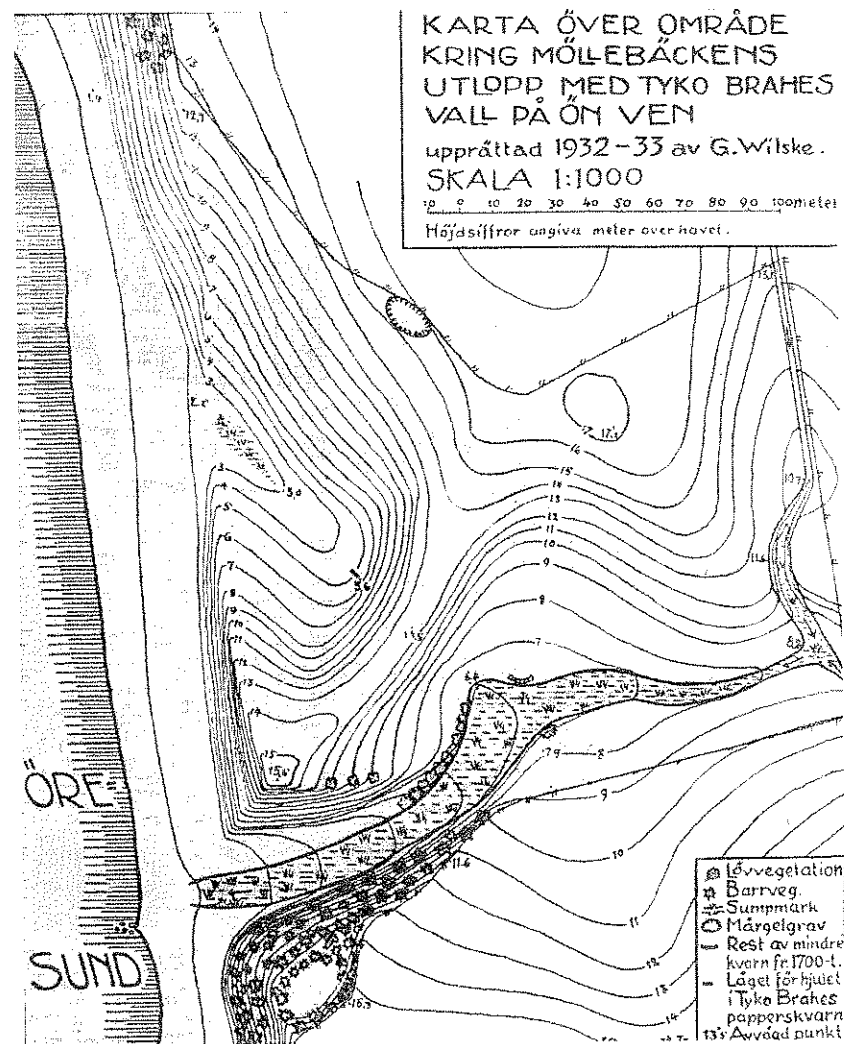


Figure 8: A contour map of the area by the mill river. Previous researchers had all thought that the mill lay on the river's present outfall into the Sound (Øresund). On his visit in 1929, Møller Nicolaisen could establish that the site should be localised to an area approximately 80 metres further north, at the bottom of the embankment whose maximum level was at the thirteen-metre contour. He localised the mill at the five-metre contour.

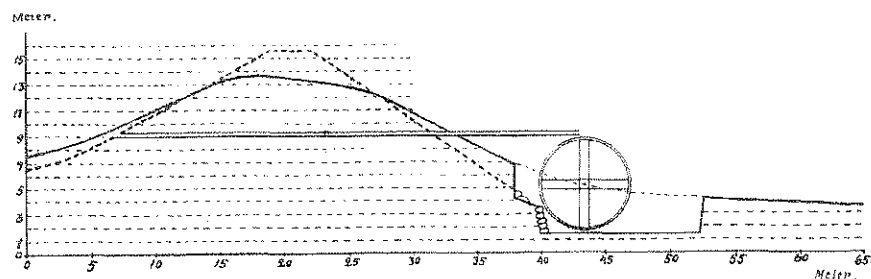


Figure 9: The huge so-called overshoot wheel was supplied with water from the last big millpond before the main dam, which was supplied with a passage in the shape of a pipe near the bottom of the millpond, so that the accumulated water could be led out over the wheel. Møller Nicolaisen carried out an excavation from the top of the dam, and four metres downwards, where at the expected height he found remains of the passage in the shape of wood and iron fittings. The site is marked with an x on the profile drawing.

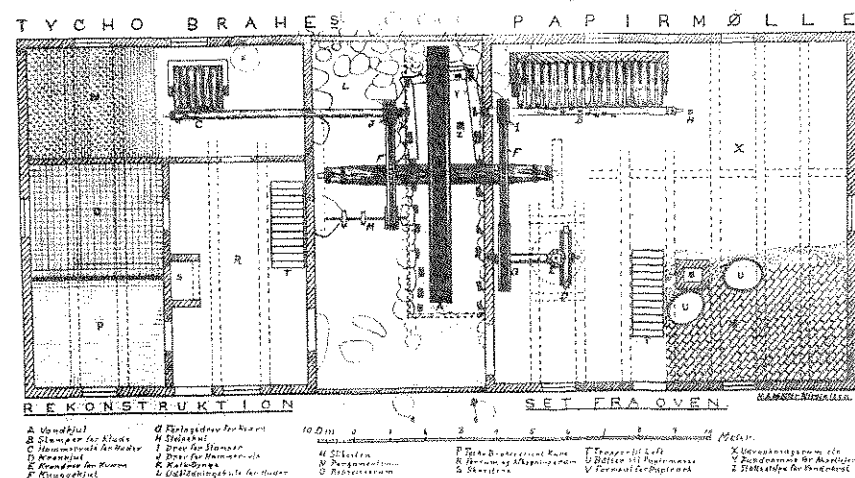


Figure 10: After completing the excavation, Møller Nicolaisen continued working on the material collected. With the measurements as a starting point, he reconstructed the ground-plan, showing the functions of the various rooms of the building in so far as they were known from Tycho Brahe's descriptions in books and letters. It was not an easy task, and almost all the solutions can be questioned. However, overall, the attempt gives an inspiring impression of the excavator's ability to familiarise himself with a complicated research field. – Text in box: Reconstruction / Seen from above: A. water wheel, B. beater for cloth, C. hammer mill for hides, D. crown wheel, E. main drive gear for grindstone, F. spoke wheel, G. drive for grindstone, H. posthole, I. drive for beater, J. drive for hammer mill, K. limestone piles, L. soak-hole for hides, M. grindstone/whetstone, N. parchment room, O. living quarters, P. Tycho Brahe's private quarters, Q. chopping room, R. chimneys, S. stairs, T. drums for pulp, U. forming room for sheets of paper, V. room for rinsing, etc., Y. frame for axel, Z. supporting post for water-pipe.

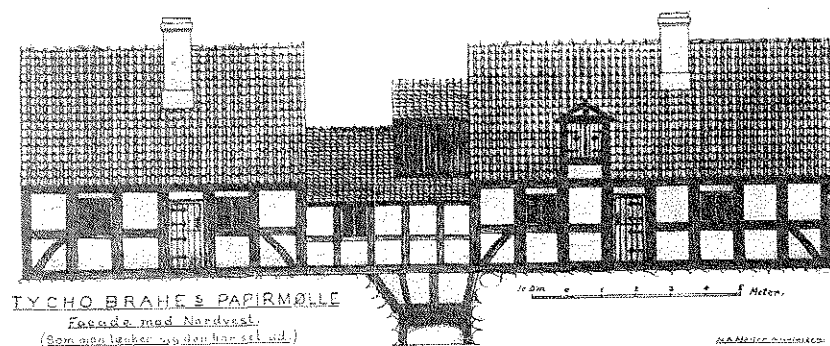


Figure 11: Møller Nicolaisen was also able to give an account of the exterior of the building. Many of the reconstruction's suggestions for individual solutions must, of course, be seen in connection with the reconstruction of the ground plan. – Text in box: Tycho Brahe's paper mill. North-west façade, as we imagine it.

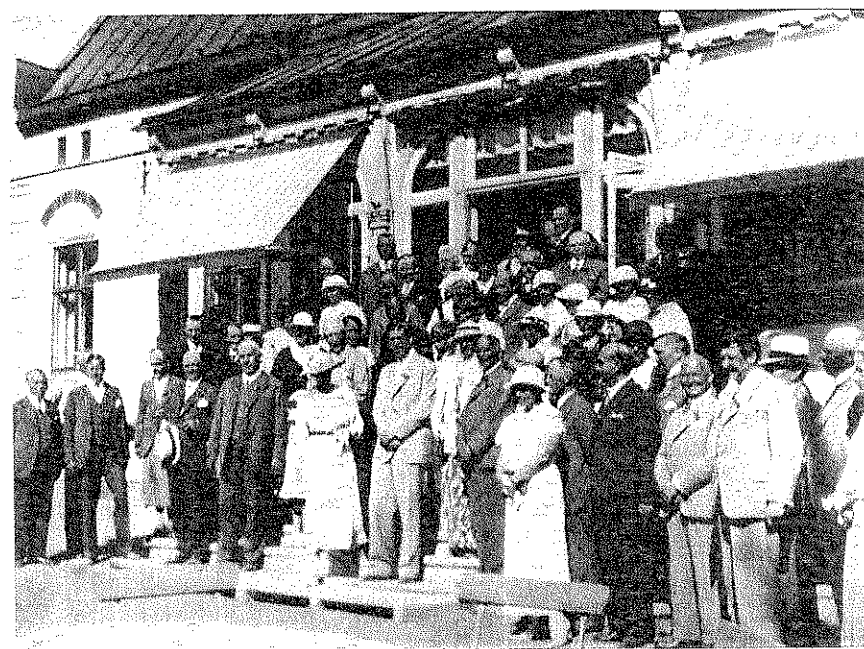


Figure 12: The excavations received remarkably extensive attention in the daily press. Møller Nicolaisen was able to collect an impressive number of newspaper articles in voluminous folders. Many interested spectators turned up at the site, where Nicolaisen willingly held forth. July 22, 1934 was a special day, when he could show the Swedish Crown Prince and Princess around the site. Shown here on the stairs in front of Kungsgården, together with a large following.



Figure 13: The monument with Latin inscription which Tycho Brahe had erected next to the paper mill on Hven was – probably in 1740 – moved to Knutstorp in Scania, where the later so famous astronomer was born in 1546. There it still hangs on the outside of the preserved main building. The Latin inscription is extremely worn, the monument is split in half from top to bottom, and the back half has disappeared. Old studies of the inscription, together with a more recent study of the preserved part in 1996 have given better insight into the monument's fascinating story.

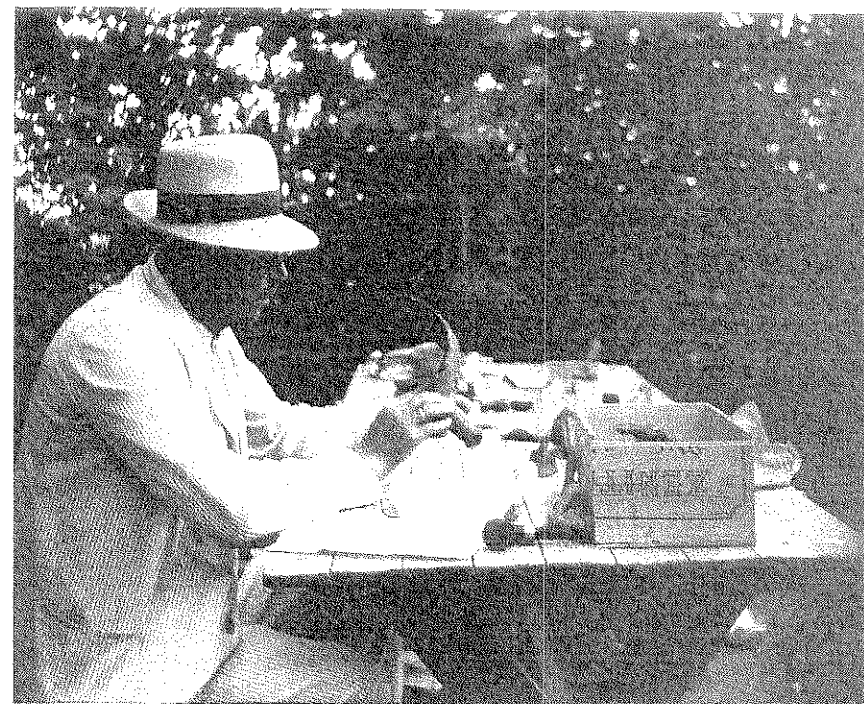


Figure 14: The photographs preserved from the excavations show that Møller Nicolaisen often wore a light-coloured suit, including a hat, while working. A preserved 6 × 6 cm negative marked 1934 was probably been sent to him by one of the interested visitors. The photo shows the excavator studying some of the finds. The best of those are today exhibited in the small museum on the island, while the rest, comprising many boxes filled with pottery, tiles, flagstones etc., after having been kept in the loft of the museum, can now be seen in the storage rooms of the Museum of Cultural History in Lund.

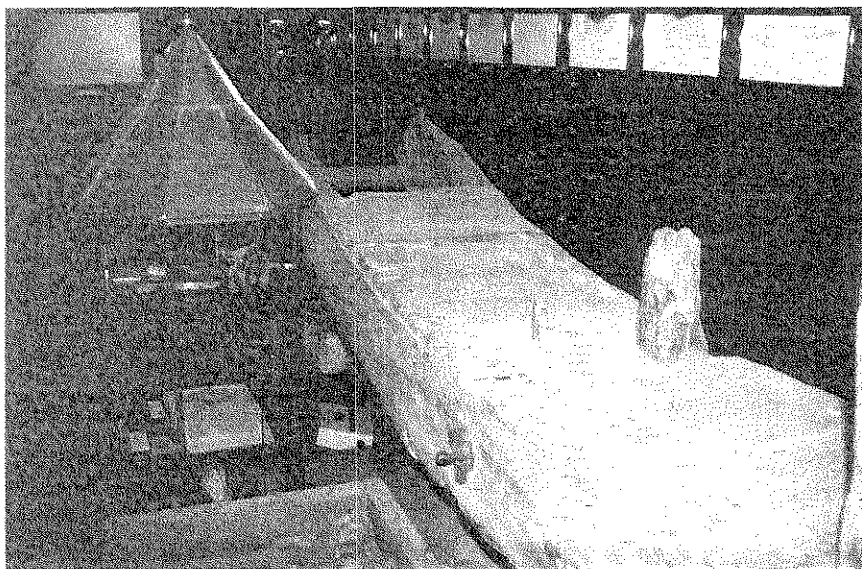


Figure 15: The large fragment of the paper mill's wheel, found in the excavation 1 August 1933, is now, after restoration at the National Museum in Copenhagen, exhibited in the museum on Hven. Photo: JV, Aug. 24, 1996.

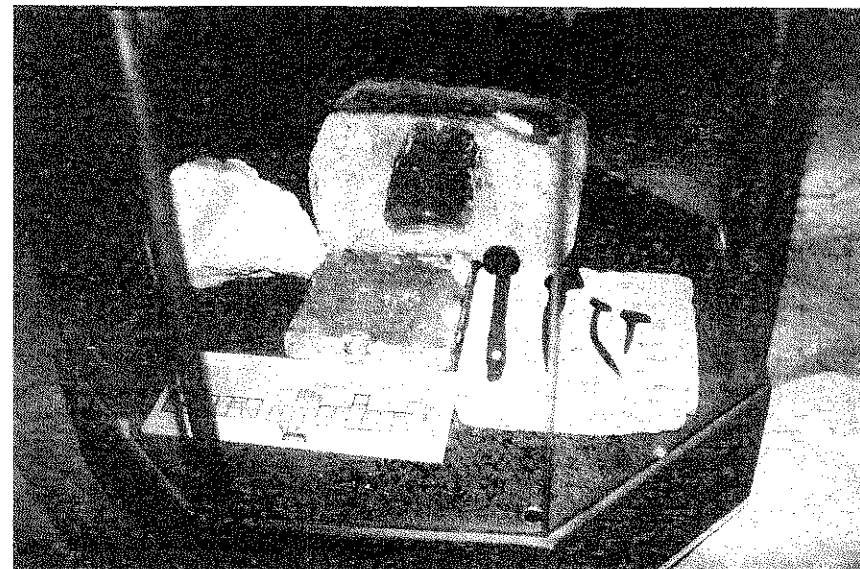


Figure 16: Selected findings from the excavations are exhibited in a small showcase in the museum on Hven. The bearing stone with clear traces of wear gives a glimpse of everyday life in the mill, information not found in contemporary written sources. Photo: JV, Aug. 24., 1996.

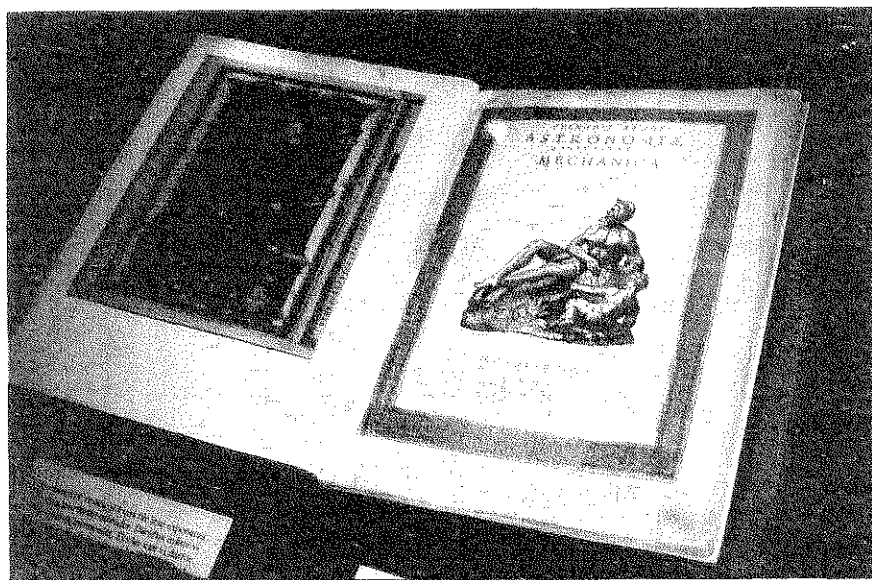


Figure 17: On the occasion of the 450th anniversary of Tycho Brahe's birth in 1996, a series of outstanding exhibitions was arranged, using a wealth of original material to describe the famous astronomer, instrument maker, paper producer and printer in great detail. It began in Landskrona with "Tycho Brahe. Stjärnornas Herre" (Tycho Brahe, Master of the Stars), then with a slightly different focus, the exhibition was shown at the Ole Rømer Museum near Copenhagen and finally at The Steno Museum in Aarhus. The latter exhibitions were called "Tycho Brahe 450 years of age. The New Star". The story of the paper mill was told in brief, with the aid of a newly built copy of a part of the millwheel. The art of printing was demonstrated through a series of original books. Here we see *Astronomiae instauratae Mechanica* from 1598. Opposite the title page, with its often used woodcut of "Astronomy" with the words "Svspiciendo – Despicio" (by looking up I am looking down) the vain author's self-portrait is placed. Photo: JV in Landskrona, Sept. 10., 1996.

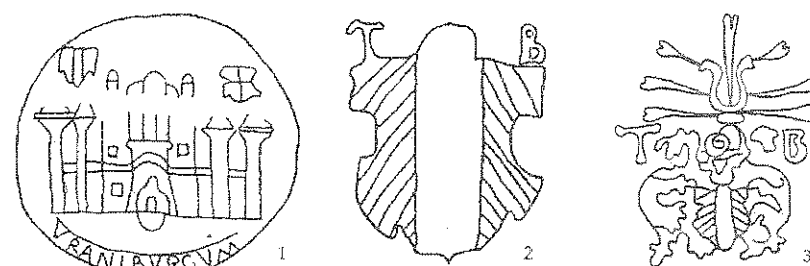


Figure 18: The study of the paper produced in the paper mill on Hven, is, despite more than a hundred years of research, far from being complete. New findings appear on a regular basis, but a complete account is still lacking. Here, three of the most famous watermarks are shown. It appears that mark one and two were used for the production of books, and mark three for writing paper. Mark no. one shows, as the text VRANIBVRGVM says, the castle on Hven, whereas marks nos. two and three show the coat of arms of the Brahe family.