

Anatomy of reindeer – a historical contribution

Anatomy of a reindeer dissected in Copenhagen in 1672 by Niels Stensen as reported by Thomas Bartholin. I. Introduction by Troels Kardel. II. Translation by Paul Maquet

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Abstract: A report by Professor Thomas Bartholin on the dissection of a reindeer performed in 1672 by his former student Niels Stensen as Royal Anatomist in Copenhagen is presented in English translation with biographical introduction and bibliographical notes. The report is most likely the first of its kind being an early contribution to comparative anatomy.

Key words: Bartholin; reindeer; reindeer anatomy; reindeer dissection; Stensen; Steno; 1672.

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I. Introduction by Troels Kardel

There are good reasons to believe the author of the following report, Professor Thomas Bartholin (1616-1680), when he writes that he provides the first ever report of an anatomical examination of a reindeer. It took place in Copenhagen in October 1672. The report was printed in the first volume of Thomas Bartholin's own *Acta Medica et philosophica Hafniensia*, 1671 & 1672 (printed 1673), pp. 274-278. The first Danish scientific journal (Fig. 1) had obtained altogether five volumes¹ when it stopped at the death of the editor. An English

translation of the reindeer-dissection is presented here for the first time. The report was written by Bartholin while the dissection was made by his student, now the Royal Anatomist Niels Stensen (1638-1686).

Thomas Bartholin (Schioldann-Nielsen & Sørensen, 1994) was the son of the professor of anatomy in Copenhagen Caspar Bartholin, the author of a widely used book on anatomy. After studies at home in 1634-37 he went for a long academic peregrination to Leiden, Paris, Montpellier, Padua, Basel and Amsterdam. He returned to Copenhagen in 1646 when called as professor. Bartholin performed his first public anatomy there in 1649. He became univer-

¹ The five volumes of *Acta Hafniensia* were printed in 1673, 1675, 1677, 1677, and 1680.

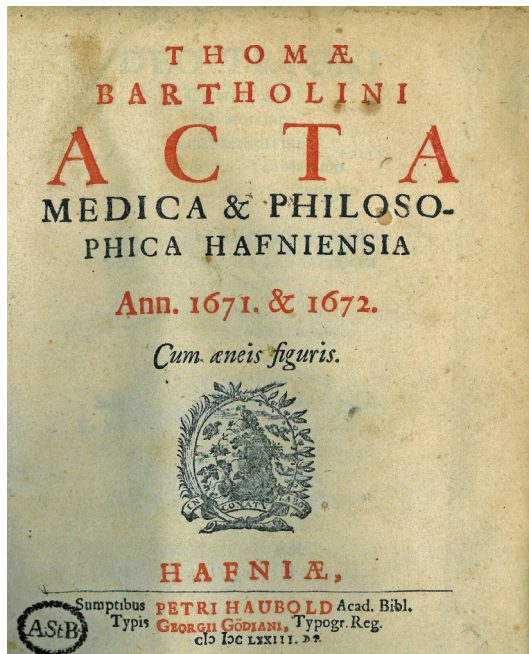


Fig. 1. Cover of the first volume of Thomas Bartholin's *Acta Medica et philosophica Hafniensia*, 1671 & 1672 (printed 1673). From University Library, Tromsø, Norway.

sally renowned for the reformed and illustrated edition of the anatomy book of his father published in several editions and translations.²

Thomas Bartholin edited and wrote numerous papers and books. His main achievement in science was the discovery of the web of tiny lymphatic vessels widely distributed in the body that was published in his *Vasa Lymphatica* in 1653. A fierce public dispute on priority ensued with the Swedish anatomist Olaf Rudbeck who made simultaneous discoveries.

Afterwards Thomas Bartholin laid down the anatomical scalpel to serve Copenhagen University in different disciplines to become an influential rector.

Niels Stensen (Scherz, 1987; Kermit, 2003; Kardel & Maquet, 2012), or Nicolaus Steno-

2 An English edition from 1668, *Bartholinus Anatomy*, is now electronically accessible from the British Library.

nis shortened Steno, the son of a goldsmith, studied medicine with Thomas Bartholin as his preceptor in 1656-59, a turbulent period with warfare between Denmark and Sweden in which Copenhagen for a long period was besieged. Stensen went abroad for studies in Amsterdam and Leiden. As the first he described the excretory ducts of the parotid and the tear glands. Stensen and Bartholin's letter-communication shows their mutual respect and interest in research. However, not being offered a position at Copenhagen University Stensen went on to Paris where he gave a famous *Discourse on the Anatomy of the Brain* in 1665. Stensen moved to become scientist to the court of the Grand Duke of Tuscany in Florence. There he concluded his studies on the muscles describing a model of muscular contraction in his *Specimen of Elements of Myology* in 1667 (Kardel, 1994a).

When requested by the Grand Duke Ferdinand II, he dissected the head of a huge *Carcharodon* shark caught off the coast of Livorno. Stensen reflected on the likeness of its teeth and the well known tongue stones, glossope-trae, found in rocks of Malta. He concluded that he found no objections against such fossils being remnants of fishes from a sea that in the past had flooded the rocks where they are now found. Stensen formulated several basic principles of the geological sciences in books published in 1667 and 1669 (Scherz, 1969; Kardel & Maquet, 2012).

At that time Stensen abandoned the Lutheran faith and converted to the Roman Catholic Church. By this step he disqualified himself from obtaining a position at the university in his orthodox Lutheran homeland. Thus, when called back by the king of Denmark, Norway and Iceland, Christian V, Stensen was offered a modest salary to function as "Royal Anatomist" from 1672. This function was to last for only two years.

As Royal Anatomist Stensen performed dis-

BOX 1: STENSEN'S DISSECTIONS AS ROYAL ANATOMIST 1672-74.

Stensen's dissections were recorded or listed by Holger Jacobæus (Jakobsen) in his manuscript *Exercitia Academica*, (see OPH, vol. II: 287-310). Stensen in 1672 dissected a hedgehog, a bear, a male corpse, a deer, a carp, a dormouse, a cat, and a little squirrel; then the male reindeer described in the following report, a bear, a hare, a long-tailed monkey and a female reindeer. These animals were provided by men of the nobility.

In 1673 he dissected an eagle, a dog, a calf, an Icelandic she-fox and a marten. On January the 29th (February the 8th st. n.) Stensen gave his great public anatomical demonstration of a female corpse in the Anatomical Theatre of the University with an opening lecture, the Prooemium. The dissection continued until February the 8th (18th) being reported by Holger Jakobsen. Further dissections in 1673: a parrot, a jackdaw and an eagle which he himself described in the *Acta Hafniensia*; further a tailed monkey, a hound, a dormouse, snakes from the egg, and in the autumn a dog done partly by Holger Jakobsen. Finally, in December a heron.

In 1674 Stensen dissected a parrot, a small pig, a sheep's head, a crow, a duck, a magpie, an owl, and a fox by Caspar Bartholin, jr. Most of the animals were provided by the disciples. On March the 26th (April the 5th st. n.) followed the last of the dissections handed over to us, that of a peacock dissected by Caspar Bartholin, jr. and a parrot dissected by Holger Jakobsen.

OPH: Nicolai Stenonis Opera Philosophica, edited by Vilhelm Maar, 1910.

sections in about thirty different animal species and in two human bodies in Copenhagen [BOX 1] (Kardel, 1994b). Most of this activity took place in private premises with small audiences of interested students among whom Holger Jakobsen and Thomas Bartholin's son Caspar Bartholin, jr. They were later to visit Stensen in Tuscany for their studies. Some of the students may have drawn the three illustrations for the reindeer report which are not in style with drawings made by Stensen. A token of interest was shown by a medical candidate, Matthias Moth, who translated a scientific letter written by Stensen on a calf with hydrocephalus that he had dissected in Innsbruck. The letter in Italian to the Grand Duke of Tuscany was translated from Italian to Latin and printed few pages ahead of the report on the reindeer in Bartholin's *Acta Hafniensia* (Steno, 1993). Stensen's ten reports printed in the *Acta Hafniensia* are listed. It is worth noticing that several were written on dissections performed in Paris, Florence and Innsbruck (Hansen, 1992) [BOX 2].

BOX 2: TEN STENSEN-PAPERS LISTED CONSECUTIVELY AS PUBLISHED IN THOMAS BARTHOLIN'S *ACTA MEDICA & PHILOSOPHICA HAFNIENSIA*.

1. Human Embryo with Malformations (Paris 1665), 1:200-203. OPH 20.
2. Uterus of a Hare (in continuation of the former), 1:203-207. OPH 21.
3. On a Calf with Hydrocephalus (Innsbruck 1669), 1:249-262. OPH 28.
4. On Egg and Chick (Paris 1665), 2:81-92. OPH 19.
5. On movement of the heart (Leiden 1662), 2:141-147. OPH 10.
6. Eggs of Viviparous Animals I (Florence 1667), 2:210-218. OPH 25.
7. Eggs of Viviparous Animals II (see above), 2:219-232. OPH 26.
8. Diversity of Lymphatic Ducts (Leiden 1662/63), 2:240-241. OPH 12.
9. Muscles of an Eagle (Copenhagen 1673), 2:320-345. OPH 32.
10. Preface to Anatomical Demonstrations in the Copenhagen Theatre 1673 – the Prooemium, 2: 359-366. OPH 31.

OPH-numbers are from Nicolai Stenonis Opera Philosophica, edited by Vilhelm Maar, 1910.

It is evident from the recordings that the anatomical activity of Stensen in Copenhagen was decreasing. When it then came to religious disputes Stensen asked and received permission to leave and returned to Tuscany in 1674. He left science for good to become moral teacher for the son of the Grand Duke and was ordained a priest in 1675. Two years later he was called as bishop in Northern Germany where he died in 1686. Niels Stensen was beatified by the Roman Catholic Church in 1988.

F. J. Cole (1944) commented on Bartholin and Stensen and their achievements in science: “The genius of Bartholin was not profound, and displayed little searching of the mind, and it is clear that he relied for inspiration on his famous colleague Steno, to whom he frequently refers in terms of unusual praise as a ‘great prosector, subtle of hand and modest in speech.’” As of the following report on the anatomy of a reindeer reported by Thomas Bartholin and the eight studies in comparative anatomy by Stensen himself in Bartholin’s *Acta Hafniensia*, we must be grateful to both men for contributing, respectively for distributing, this insight.

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II. From Thomas Bartholin's *Acta medica et philosophica Hafniensia*¹
1671 & 1672, pp. 274-278 with 3 plates.

CXXXV.

Anatomy of a Reindeer
Reported in 1672 by
Thomas Bartholin

Translated from Latin by Paul Maquet, Aywaille, Belgium.
August Ziggelaar, Copenhagen, Denmark
translated the final poem and reviewed the translation.

Among other animals which the very famous anatomist Mr *Niels Stensen*, having come back to us, publicly and privately dissected with his undefatigable hands and displayed to onlookers, a reindeer deserves the first place, such an animal having never been subjected to the knife of an anatomist so far. It is indeed seldom brought to us from Norway and, when brought here, seldom survives. Our Mecena, Mr *Peder Griffenfeld*, knight and from the most secret councillors to the serenissime king, bred two, a male and a female, in his court (precincts). The animals, less used to our air, progressively became ill. Mr *Griffenfeld*, in his love of the people which is his only care, gave them to our anatomical theatre to subject them to public demonstrations. [p. 275] They were young as revealed by their horns, tender and hair coated. In older ones indeed, they are large as can be seen in the museum of the Academy. Thereabout, however, *Conrad Gesner*, *Johann Ionston* and other authors of natural matters are greatly mistaken when they write and describe that the reindeer is provided with three horns, since only two surge both of which are provided with several small branches [Plate I]. I have reported here all the rest which was observed in the dissection carried out by the before-mentioned *Steno*

in our anatomy theatre in the month of October 1672 and found it worth noticing here. The dissection of the male was carried out first. That of the female followed in the month of December. The following was seen in the male:

1. There were three curved interruptions in the rectus abdominis muscle. The lower one had a width of one inch; the other two were narrower so that these interruptions seemed to be tendons between flesh.
2. The intestinal coecum was half a cubit long.
3. The upper bowels are wound up in seven loops, the lower in nine. But they are wound up in two different ways. In one, the loops were wound up about each other in the same plane, which plane was turned to the right side. In the other way, these loops, superimposed on each other, form a small bag comprising an extended hand. In the bowels, however, there are two kinds of fibres, the outer ones longitudinal, and the inner ones helicoidal. The loops of the bowels begin from the coecum. The bowels are 4.4 cubits long. Nice also is the anastomosis of the veins in the mesentery which is displayed in the figure. [Plate II]
4. The kidneys kept in reserve presented with the shape of a kidney and the size of an olive, provided with a cavity. [p. 276]

¹ The original edition can be down-loaded from books.google.com.

5. The shape of the kidneys is round and oblong. Their substance is quite tender. The right kidney had made a grove in the liver. The left kidney had been pushed to the right side. It is uncertain whether this was a sequel of a disease or due to the dissectors.
6. Around the plane of the bowels, the mesentery was 3 or 4 fingerbreadths wide where the vena porta also surrounded the last loop of the bowels, and 17 small glands were observed arranged through the same loop, some of which oblong, others similar to beans.
7. The lungs, partly of red colour, partly of somewhat darker colour, were divided into small lobes tightly connected to each other by a common membrane, like the kidneys in a bear or rather in a bull-calf. Three lobes were seen in the left side of the lungs and four in the right side, of which the orifice of the only right part was above and in front of the usual bifurcation.
8. The spleen adhered to the stomach and the diaphragm. Its width was $\frac{3}{10}$ cubit, its length $\frac{1}{4}$ cubit. [Plate III]
9. Two clear stones (hydatids) were found in the periphery of the fat (omentum), one as big as a chicken egg, the other as small as a dove egg. Both contained the purest water. But the former one, besides water, contained some limy substance of a size larger than a pea. And a smaller lymphatic vesicle was present in the bigger one, as if pregnant. These stones seem natural in stags and I have seen them previously in other species. Some people wonder whether they contribute something to the velocity. In this actual reindeer which had been weakened by a disease, besides these lymphatic vesicles, several purulent abscesses had infected the abdomen and there was putrefaction in the lower parts of the abdomen as they hindered the hand of the dissector.
10. The liver was found without any lobe; otherwise there were two clefts, one above the kidney, the other about the middle of the liver.
11. Much crystalline humour and somewhat more compressed.
12. In the oesophagus, two kinds of spiral fibres descended from opposite parts and alternately crossed each other.
13. The small upper gland of the brain [pineal body] was bigger than in a she-bear which the famous anatomist dissected at the same time in the theatre, as was also the third pair of tubercles. Besides, the ratio of the third pair to the fourth was greater than in the she-bear.
14. The choroid plexus was more noticeable than in the she-bear.
15. The white lamellae of the cerebellum were thicker than in the she-bear. [Plate I] [p. 277]
16. The exterior salivary duct goes down towards the lower angle of the mandible, like in the bull-calf.
17. The striae of the corpus striatum were more distinct than in that of the she-bear. There were even many striae conspicuous inside the substance of the second pair of tubercles which otherwise are called the thalamus [chiasm] of the optic nerves the delineation of the striae of which is conspicuous in the figure.
18. There was a two fingerbreadths space between the root of the tongue and the epiglottis with interposition of a membranous substance.
19. In the tonsils there were nine small pits located along a straight line, opposite to others on the outer side, similar to the small pits in the lungs of birds.
20. Whenever his occupations permit, *Steno* himself will deliver other observations in both reindeers as well as in other animals in which our students are busy every day under the guidance of *Steno* as well as in a human cadaver recently dissected publicly. [p. 278]

At the same time, the before-mentioned *Steno* dissected a she-bear which we had thanks to the benevolence of *Sir Hugues de Terlon*, the illustrious French ambassador, in the courtyard of whom we saw it strangulated. Given the opportunity, he will not deny people what he will show as worth seeing or what he will have observed.

On both the anatomy of a reindeer and that of a bear, *Georg Huber*, our poet, Caesarean laureate, the delight of the Muses, as he also came to see by himself, composed the following in his *Mercurius*:

Reindeer and Bear were proud of their brain,
 Each one of them gave its head to be shown
 in dissection.
 One believed to be much worth because of its
 genius,
 And the other one did no less extol its own
 brain.
Mercurius stood by, laughed and said: Oh, lucky
 You are not at all in genius, in brain.
 If in your heads had been any sound mind,
 Would it not have been better to stay in the
 forests?
 Now both of you lie cut into thousand pieces
 One is so much devoid of its brain as the
 other one lacks its.

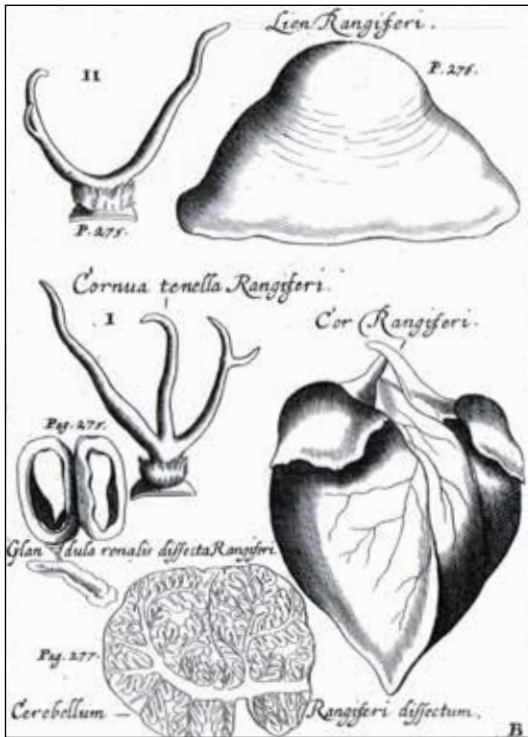


Plate I.

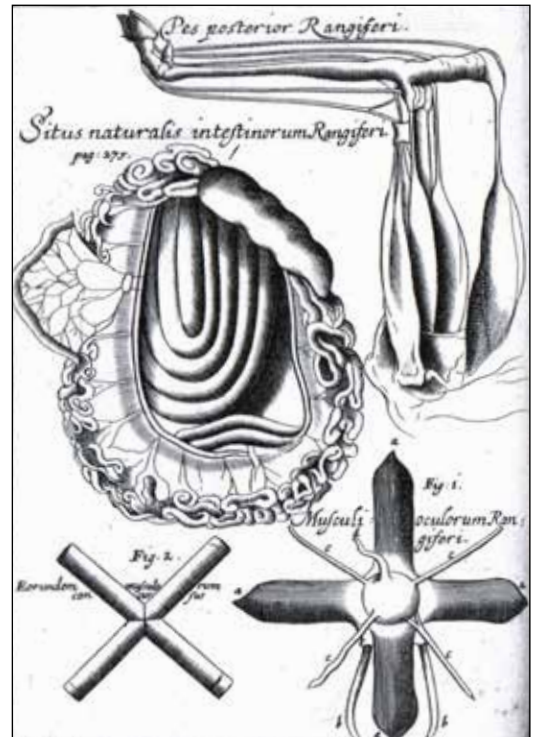


Plate II.

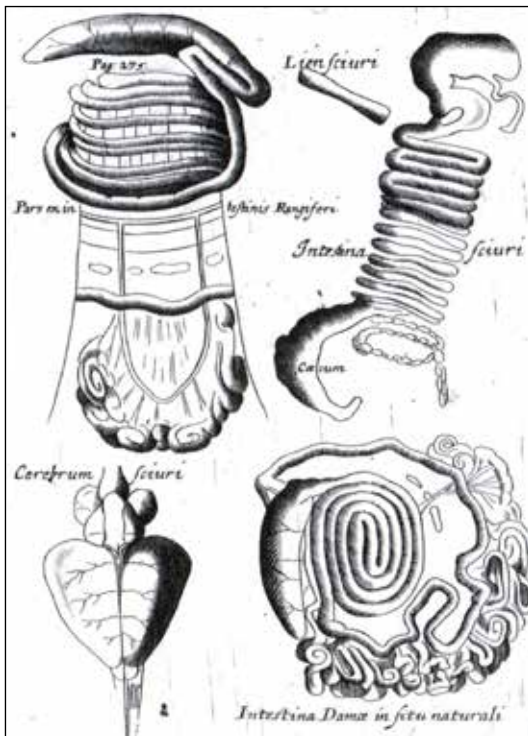


Plate III

