

THOMAS BARTHOLIN¹ (1616–80)
AND NIELS STEENSEN² (1638–86)
MASTER AND PUPIL

by

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The Setting

THE University of Copenhagen was founded by Pope Sixtus IV in 1475 and remained under the auspices of the Catholic Church until the Reformation. It was then closed for a time, but in 1537 King Christian III of Denmark restored the University as a Lutheran institution. During the first century of its existence it acquired little scholastic fame, but in the seventeenth century it prospered by the presence of one family which dominated the University as no other family has influenced a seat of learning in the western world. This was the remarkable Bartholin family.³ Its members travelled widely, wrote voluminously and made many outstanding contributions to the natural sciences. As a consequence, many scholars were attracted to Copenhagen and for the first time its University could be said to have reached international status.

Although many of the faculties were headed by members of this family, it was in medicine and anatomy that their vitality, drive and originality came to full expression.

The head of the family was Thomas Fincke (1561–1656),⁴ who became professor of medicine in 1603 after an undistinguished career as professor of mathematics. He made few original contributions, but by political shrewdness he gathered power into his hands and, by the fortuitous circumstance that his four daughters all married professors, he was able to retain his pre-eminent position and achieve his aims. In addition, his son Jacob (1592–1663) held the chair of mathematics and physics. By retaining his vitality to the age of 95 years he was able to dominate and influence the intellectual life of the University for half a century.

His most distinguished son-in-law was Caspar Bartholin (1585–1629).⁵ In 1604 he started on a long and adventurous European journey with the idea of studying philosophy and theology. He spent three years in Wittenburg, but in 1607 he turned his interest to medicine which he studied at Basle. In 1608 he wrote a number of books on logic, physics, metaphysics and ethics which made his name famous throughout western Europe. On a visit to Naples in 1609 he was offered the chair of anatomy and in 1610 he was offered one in Greek at the Academy of Sedan in France. However, he continued the anatomical studies in Padua under Fabricius and his pupil Casserius, which were to form the basis for his famous book *Anatomicae Institutiones*, published in Wittenburg, 1611. On his return to Denmark in the same year he was given the chair of Latin, but in 1613 he changed to the medical faculty. In 1624 he left medicine to become

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professor of theology following a severe illness during which he had made the vow that were he to recover he would devote all his work and services to God. Four of his sons became professors, two of them in medicine.

The chair of medicine then passed to Ole Worm (1588–1654),⁶ another of Thomas Fincke's sons-in-law. He had previously occupied the chairs of Greek and physics. His name is perpetuated in the medical literature by the eponym given to the small irregular bones in the sutures of the skull, the name *Ossa Wormiana* being coined by his great pupil, Thomas Bartholin (1616–80), as a tribute to his uncle's contributions to osteology. Later Ole Worm's son, Willum (1633–1704), also became professor of medicine.

All the great talents of this unique dynasty seem to have been concentrated in Caspar Bartholin's son, Thomas. Energy, drive and scholarship were expressed in truly great scientific achievements. The generation after him continued to provide occupants for the chairs of medicine; thus Thomas Bartholin's son Caspar Bartholin (1655–1738) and two of his nephews, Holger (1650–1701), who also became his son-in-law, and Matthias Jacobaeus (1637–88), and Thomas Fincke's son's son-in-law, Christian Ostenfeld (1619–71) became professors of medicine. Nepotism almost certainly played a large role in their apparent success for none of them reached the eminence of their distinguished forefathers.

The Master?

Caspar Bartholin the elder died when his son, Thomas, was only thirteen years old, and Ole Worm took on the responsibilities of educating his intelligent nephew. He continued to do so until he had seen him firmly established in the medical hierarchy of the University. First, however, he and his father-in-law, Thomas Fincke, were to go through a great deal of anxiety. The young Thomas, after having spent three years at the University of Copenhagen, started in 1637 on his continental tour which lasted ten years. So enamoured was he of the life he led, the cosmopolitan atmosphere of the universities he attended, and the excitement of the new scientific spirit he encountered, that he continually postponed his homecoming despite the repeated exhortations by Ole Worm to return so that he would be available for a chair at the University. One must not forget that Copenhagen was a small town with only about 25,000 inhabitants, and that Denmark was impoverished by continuous warring with Sweden. Culturally and scientifically the capital was quite isolated and the atmosphere must have been very parochial. Christian IV (1588–1648) introduced many ideas of the Renaissance, but he was continuously engaged in wars, at least in part for his personal aggrandisement, which drained the resources on which the University could have reached its full potential. In contrast Leyden, to which Thomas Bartholin first went, had complete academic freedom which attracted many scholars with new ideas. Most of the faculties of the University were headed by men of considerable eminence and there was an excellent botanical garden and a fine library. For those interested in medicine, there was a *Theatrum Anatomicum* in which public dissections took place and a teaching hospital with clinical and post-mortem demonstrations. The country was rich, new ideas as well as wealth flowing in from the colonies; students came from every country in

Europe to attend the universities of Holland. It was truly the golden century of that country.

In medicine the burning issue of the day was Harvey's work on the circulation which appeared in 1628⁸ and of which Thomas Bartholin soon became an ardent proponent. The sarcastic cry of the physician of Galenic orientation to those with the new ideas was 'visne fieri circulator?'⁹

Another of the problems that interested the students was Gasparo Aselli's (1581–1626) work on the lymphatics.¹⁰ Bartholin made some animal dissections to determine the origin of the *venae lacteae*, but did not follow up this work until years later. He studied widely and made many friends among scholars. About this time he started his prodigious writings. He said later: 'It was my desire not only to find but also to communicate to others what nature has created.'¹¹ In 1641 with his teacher, Jan de Wale, he revised his father's book on anatomy.¹² Of particular importance was the incorporation of Harvey's work into this edition. As this was the first textbook to acknowledge the new approach it had a particular significance, and it was subsequently translated from Latin into French and German.

In 1640 he left Leyden because of illness and went to France in the hope that the drier atmosphere and the waters of the spas might improve his condition. He had been suffering from repeated haemoptyses and feared that he might have phthisis. On his way south, he passed through Paris, but did not stay long. This was partly because of his illness and partly because the medical faculty in Paris was the stronghold of Galenic tradition and therefore not attractive to a scholar of Thomas Bartholin's views. However, he was forced to stay in Paris that winter as there was an epidemic of plague in Montpellier, and because of the Thirty Years War he was unable to go to the spas in south Germany. In the spring he was delighted to get away from the filthy city; but in spite of the pleasant climate, Montpellier too was a disappointment because of the fanatic adherence of its teachers to Galenic teaching.

Padua was the obvious place for him to go, and in the autumn of 1641 he arrived in the great university town. The climate was exceedingly pleasant and the academic freedom produced an intellectual atmosphere that attracted students from all parts of the world. His father (1608) and his uncle Ole Worm (1609) had studied here, and a memorial plaque to his grandfather hung in the University, as it still does. He had travelled to Padua with his brother Caspar (1616–70) and during their stay they were joined by several members of the family (six of Thomas Fincke's grandchildren were studying in Padua at this time), and they and other Danes often gathered in the Danish doctor Johan Rode's (1567–1659) house.

He studied anatomy under Johan Vesling in the famous anatomical theatre and medicine under Giovanni Domenico Sala. But Thomas Bartholin did not confine himself to medical subjects. It was his constant aim to combine medicine with philosophy. In Leyden he had studied Arabic; in Padua his friend was the Augustinian monk, Frater Angelicus; and through his compatriot Johan Rode he became deeply interested in medical history, particularly the work of Celsus.¹³ In 1643 he left Padua to spend the winter in Rome and paid a visit to the surgeon

Marco Aurelio Severino (1580–1656) in Naples. His travelling companion was Jan van Horne, who later became professor of anatomy in Leyden, and was to play an important role in Steensen's career.

In 1644 Bartholin was offered a chair at the University of Messina. He refused it, but went to Sicily to thank the authorities personally for their offer and stayed for a month on the island. Here he observed fossils and became interested in their origin. His intense curiosity tempted him to make a trip to Malta, which at that time was considered to be a hazardous voyage. He became fascinated by the well known *glossopetrae* fossils, observed them in their setting, removed and studied them, and sent his collection home to Ole Worm.¹⁴ He saw the Grotta d. S. Paolo where according to tradition the Apostle had lived when he was stranded in Malta. A certain type of soil was found in this and other grottoes which was thought to have medicinal properties on account of St. Paul's blessing. Tablets were made from this soil, and to give them an authentic touch, they were stamped with a picture of St. Paul.

Thomas Bartholin returned to Naples before the intense heat of the summer began and stayed with Severino, where he had to take to his bed because of an attack of renal colic. Some thought the cause was a faulty diet, others blamed it on the Italian wines, but Thomas Bartholin denied having imbibed too much and queried a familial disposition: *paternae imbecillitatis innata dispositio*.¹⁵ His father had died plagued by colic, arthritis and kidney stones, so he may have been correct. While in south Italy he published a monograph on dissecting aneurysm, *Anatomica Aneurysmatis Dissecti Historia* (Palermo, 1644), and in the winter of 1645, which he spent in his beloved Padua, he wrote a book on unicorns: *De Unicornu Observationes Novae* (1645). It is interesting that his father had written a book on the same subject in 1628.¹⁶ The most fantastic stories were associated with this legendary creature and its horn was considered a powerful medicament even by Bartholin.¹⁷ The scientific circles of the time were immensely impressed by this work. Even the harsh critic Caspar Hofmann, the professor of medicine at Altdorf, in Germany, was amazed to hear that it was written by a young man of but twenty-eight years.¹⁸ Later, however, he was to direct some sharp attacks on Bartholin's work.

Thomas Bartholin was in no great hurry to leave Padua, 'this Paradise on Earth', as he called it,¹⁹ but in 1645 he started on a protracted journey back to Copenhagen; first he went to Basle where he was awarded his doctorate for a thesis on pleurisy;²⁰ he then went to Paris from where his monograph on Christ's wound: *De Latere Christi Aperto Dissertatio* (1646) was sent to press in Leyden. He also wrote two small works on epidemic sore throat in children in south Italy, for which the professor of medicine in Paris, Rene Moreau (1587–1656), wrote a section on laryngotomy.²¹ He spent the spring of 1646 in Holland, and finally, much to the relief of Thomas Fincke and Ole Worm, returned to Copenhagen in the autumn.

These two men had not concealed their ambition of getting Thomas Bartholin on the staff of the medical faculty. He had shown himself to be a good student at the University of Copenhagen, and during the ten years abroad his standing among scholars had steadily increased. When he arrived back in Denmark in

Thomas Bartholin (1616–80) and Niels Steensen (1638–86) Master and Pupil

1646 at the age of thirty years, he was an eminent man in academic circles. It was, therefore, only natural, both for the sake of the faculty and for the family reputation, that they should do all in their power, which was considerable, to get him settled. Thomas himself was perhaps the most difficult obstacle. At first they had been worried about his illness, which started when he was in Leyden, and urged him constantly to look after his health by not working such long hours.²² His illness seemed to have given him less trouble while in Italy, and a portrait from the time shows none of the features suggestive of phthisis.²³ While he was in Padua, he constantly expressed his delight in life; the cosmopolitan atmosphere, the excellent opportunity for learning, the exhilarating company, the beauty of the town, and the pleasant climate, all contributed to his prolonged stay. As early as 1642 Ole Worm tried to persuade him to return home and told him in confidence that he could become his grandfather's *locum*, and that once he had got a footing in the University his future there would be secure.²⁴ These pleas were repeated frequently. In the spring of 1644 Thomas Fincke appears to have been very weak and one detects a sense of urgency in Worm's exhortation to Bartholin;²⁵ but he procrastinated and continued on his journey south. Here, it will be recalled, he was offered a professorship in Messina, and, although Ole Worm was delighted that Bartholin's reputation was so great, he was relieved to hear that his nephew had declined. While Bartholin was in Basle in 1645, Ole Worm again urged him to hasten home as there were two vacant chairs in the philosophical faculty.²⁶ It was the custom at that time for many people to start their careers in this faculty and later switch to their own particular discipline. This news had apparently little effect on him. Ole Worm informed him of another vacancy in 1646,²⁷ but Bartholin made it quite clear this time that he was not interested, and in no hurry to return to Denmark to the intrigues of university politics and the parochial atmosphere of the city; he would prefer to live in quietness, free from the envy of others in order to study and write.²⁸ Bartholin also realized that questions might be raised at his appointment as so many Bartholins were already attached to the University.²⁹ However, at last after ten years he was home. Initially he was appointed his grandfather's *locum*, and in 1647 he became professor of mathematics in succession to his paternal aunt's husband, Christian Longomontanus (1562–1647).

In 1647 he published two books on antiquity; one concerning the historical aspects of obstetrics,³⁰ the other about bracelets.³¹ He also published a work on the abdominal wound of Christ³² about which he fell into conflict with a Catholic priest, Barthold Nitus (1590–1657), because the latter interpreted Bartholin's opinions as indicating that Christ could not have died on the cross. Bartholin quickly urged Nitus not to take the issue too seriously and the dispute soon quietened down.³³ It was a wise step as it was generally considered ill advised for a member of the university to conflict with the orthodox theologians.

In the university statutes of 1537 provision was made for two chairs in the medical faculty. At the time Thomas Bartholin joined the university these were occupied by Thomas Fincke, *medicus primus* and Ole Worm, *medicus secundus*. In

1639 a German, Simon Paulli (1603–80)³⁴ joined the faculty, but he was paid by the King. He met considerable opposition, largely from Ole Worm, who probably had other ideas about this position. Partly because of this, and partly because his major interest was botany, Paulli retired from the faculty in 1649 and was appointed physician to King Frederik III (1648–70) and professor of botany. On his retirement a third chair financed by the University was created, and Thomas Bartholin, needless to say, was the choice.

He was married the same year³⁵ and moved into a house provided by the University, which adjoined the anatomy building and the botanical gardens. Professor Adolf Vorst of Leyden wrote: 'May this marriage afford you as much happiness, dear Bartholin, and may you achieve as much fame from your children as you have until now by your books. Perhaps your *Obstetrics in Antiquity* may be of some help to you.'³⁶ One detects a sarcastic note towards the prolific and successful family.

The professor did not receive a high salary, but this was compensated for by 'fringe benefits'. The University owned a great deal of property and land, and with each chair went the income of a certain estate. For example, it was the tradition that the *medicus secundus* could dispose of the income of Grevinge Church in Odsherred which amounted to between four and five hundred Rigsdaler. Food for themselves, fodder for their horses and fuel were part of the benefits.³⁷

Abroad, his attitude to Fincke's and Worm's constant beseeching to return home clearly indicates that his main concern was scholarship; power was not his prime motive. This is confirmed by his refusal on settling down in Copenhagen to become connected with the court; rather than follow Ole Worm's suggestion of accompanying Christian IV's ailing son on a journey, he preferred to devote himself entirely to his academic work.

On joining the medical faculty he immediately started his teaching in the *Domus Anatomica*. When there were three professors in the department, it was not compulsory for the first and second *medicus* to give anatomical demonstrations or lectures, so most of the teaching was at this time done by Bartholin. He was a keen dissector. On one occasion while travelling in Zealand he had a grave opened so that he could examine an embalmed corpse, and wrote a short paper on his findings which was accompanied by a copperplate engraving.³⁸ He dissected a hare and noticed that its stomach was unlike other animals that ruminate, and commented on the passages in the Bible in which the hare is included as an animal that chews the cud, and therefore not to be eaten.³⁹ He was interested in medical aspects of biblical problems. In 1649 in the course of a lecture on Jesus and the lame, he urged the students not to confine themselves to medicine but to combine theological and medical studies.⁴⁰

In 1649 the University celebrated its Reformation. For the occasion Bartholin delivered a speech on the ills of Christianity, referring particularly to the religious wars.⁴¹ During the winter of 1649 he arranged a weekly demonstration of a particular aspect of anatomy to be carried out by his students. One of these, the fifteen-year-old Peder Schumacher (1635–99), demonstrated the ureters. Bartholin praised the young man for his brilliance and maturity.⁴²

Later Schumacher went into politics and played an important role in Niels Steensen's life.

Didactic anatomy was an essential part of Renaissance anatomy. Although it had its origin partly in the medieval autopsies the approach was entirely new. Autopsies had been undertaken out of respect for the person; the subjects were respectable citizens and a papal brief was required for the hospital. The anatomical demonstrations on the other hand took place in specially built amphitheatres and were usually carried out on criminals; they were festive public events organized by the academicians. In Italy and in the northern countries they were celebrated around Christmas and sometimes in the Carnival season. Programmes were issued in advance and the ordinary citizen had to buy an admission ticket. The success of an *anatomy* like that of any other theatrical performance depended largely on the size and response of the audience. For this reason a good demonstrator and eloquent speaker was a great asset.⁴³ Bartholin excelled in both these aspects; 'few are his equals, none his superior', Willum Worm said.⁴⁴

The procedure was conducted with great formality. The University bells rang as distinguished guests, professors and doctors filed into the anatomical theatre in order of precedence to take their seats on the front tiers around the dissecting table. The theatre in Copenhagen which Simon Paulli had built had four tiers of seats, but in the most important centres they were usually much larger. King Frederik III and his court occasionally attended the demonstrations. He was keenly interested in anatomy, which meant a great deal to the department of medicine as prejudice still existed against dissecting human bodies.

When Bartholin gave demonstrations, he urged the spectators to behave with dignity if a woman was to be dissected and in general he asked the audience to refrain from laughing and talking.⁴⁵ *Membra naturalia*, as organs such as the heart, kidney and liver were known, were passed around for inspection. People in the audience must on occasion have helped themselves to these parts for the ordinances of the surgeons of Amsterdam had a standard fine for anyone caught in the act. Questions from the public were permitted provided they were decent and of a serious kind. The money collected on these occasions were used for buying instruments, paying hangman's fees and holding sumptuous banquets for the demonstrators.⁴⁶

When Thomas Bartholin succeeded to the chair of anatomy, his fame in most European centres rested more on his literary works than on his scientific achievements. The exception to this was his anatomical text, *Institutiones Anatomicae*, which, judging by the number of editions that appeared and the number of languages into which it was translated, was widely used. The credit for this book, however, he shared with his father. Largely because of the inclusion of Harvey's observations the book became the object of attack by the two greatest defenders of Galenic theory, Caspar Hofmann of Altdorf and Jean Riolan in Paris. Hofmann was a senior and very powerful man in the profession, and a less courageous person would have fought shy of defending himself against this tyrant. But Thomas Bartholin felt strongly that injustice had been done to his dead father. While waiting to take up his professional duties, he arranged to

defend himself in five disputations directed against Hofmann.⁴⁷ He acknowledged Hofmann's reputation and praised his scholarship, but stated repeatedly in his defence that the gentleman was now senile and unable to comprehend the new developments. Having refuted some of Hofmann's attacks on his book, he turned to consider Hofmann's own *Institutiones Anatomicae* (1645), and remarked scathingly: 'In order that the sand should not be short of chalk, he has glued together others' work with his own prejudices just like dogs who pass their water against a wall to give the impression that they have contributed something to the building; he is chained to others' postulations, and hence his bark is worse than his bite.'⁴⁸ In 1648 Hofmann died. The polemic with Hofmann was bitter but short; the attacks from Jean Riolan (1580–1657) were, however, just as vehement and lasted much longer. The medical faculty at the University of Paris, of which Riolan was head, was still one of the strongholds of Galenic teaching and as such was strongly opposed to the ideas of such men as Harvey, Aselli and Bartholin.

Riolan criticized Caspar and Thomas Bartholin because they wrote an anatomical text without having done any dissections of the human body; he chaffed Thomas for his father's change from medicine to theology, and pointed out that if he wished to go on publishing his father's book he should at least correct the mistakes. Altogether, Riolan concluded, Thomas Bartholin had little experience, was a groping beginner in anatomy, unoriginal and one whose opinions should not be considered seriously.⁴⁹ Bartholin defended himself arrogantly, and referred Riolan to the opinions of the leading anatomists in Padua, Leyden, Naples and other places where he had won fame for his dissections and contributions.⁵⁰

While he was working in Leyden (1637–40) Thomas Bartholin had carried out some experiments on the lymphatic system. Aselli had described the lymphatics, and it was regarded in many ways as important as Harvey's work. The course and function of these vessels was, however, not fully understood. In 1650 Bartholin dissected a waiter who had died while serving at table, and clearly observed the lymphatics of the mesentery.⁵¹ He, Ole Worm and Simon Pauli had also noticed the white distended chyle ducts in fish.⁵² Following these preliminary experiments letters arrived from his brother Rasmus (1625–98) in Paris describing Jean Pecquet's (1622–74) work,⁵³ and the latter's *Experimenta Nova Anatomica* appeared in 1651. Pecquet reported the revolutionary observations that the *venae lacteae* do not go to the liver as had previously been thought, but to the receptaculum, and that from there the chyle is conveyed via the ductus thoracicus and then emptied into the blood stream in *vena subclavia sinistra*. Thomas Bartholin realized the immense importance of these new observations and he and his German student, Michael Lyser, worked hard to establish Pecquet's findings. In 1652 he published his findings confirming Pecquet's work in the human: *De Lacteis Thoracicis in Homine Brutisque*.

After repeated dissection in humans, and experiments on dogs, he demonstrated new vessels which contained fluid which was clear, not cloudy like chyle. He showed that these vessels do not enter the liver, but carry their contents away from it and into the blood stream. He did not, however, realize

that the *venae lacteae* from the mesentery and the *vasa lymphatica*, as he named the others, are parts of the same system and that the difference in the colour is due to the difference in fat content, those arising from the mesentery having a much higher content, particularly following fatty meals. He published the result of this work in 1653, *Vasa Lymphatica*, and dedicated it to his persistent critic, Riolan, as the world's and the city of Paris's greatest anatomist. If Bartholin did this in order to placate the old Galenist, he was to be disappointed. Riolan was in no mood to give up the fight; if anything, he intensified his attacks on the supporters of Harvey and Pecquet over the next few years. Later the same year, Bartholin published his *Dubia Anatomica*. It was an account of additional experiments that he had performed, and of the milk of the lymphatic system of the breast that he had observed in a young mother. It also contained, of course, his retaliation to Riolan's attacks.

A young gifted Swede, Olaf Rudbeck (1630–1702), had independently come to the same conclusions as the Dane, and in 1653 he published *Nova Exercitatio Anatomica*. On the title page of his monograph he described the 'lymphatics' as a new finding. He went, shortly after its publication, to Holland where he met Ole Worm's son, Willum, who became a professor of medicine in Copenhagen in 1665. After their meeting Willum Worm sent a resumé of Rudbeck's work to Thomas Bartholin hoping that it might be of help in his work, and it does indeed appear that Bartholin was not aware of Rudbeck's work until Christmas of 1653.⁵⁴

In 1664 the Dutch physician Sibold Hemsterhuys published, without the knowledge of the original authors, as was frequently done in this era, a book containing Pecquet's work on the thoracic duct (1651), Rudbeck's on the lymphatics (1653), and Bartholin's on the thoracic duct (1652), anatomical questions (1653) and lymphatics in animals (1653). The book, *Messis Aurea*—the Golden Harvest—was dedicated to Bartholin, 'the eye of the anatomists'. In the section containing Bartholin's contributions the dates of his various observations appeared. Rudbeck saw these before the book was published and wrote to Hemsterhuys accusing Bartholin of having added these dates to his manuscript in order to be able to claim priority of the discovery. On Rudbeck's request the letter was published in the *Messis Aurea*.

When the book appeared it must have caused a great deal of comment in scientific circles and must have been of considerable embarrassment to Thomas Bartholin. But he refused to defend himself saying that he had a clear conscience and despised arguments of this sort. However, his indignant colleagues refused to remain quiet. In 1654 Bartholin's German born assistant, Martin Bogdan,⁵⁵ published *Insidiae Structae Cl. V. Thomae Bartholini*. The polemic was heated as usual and became at times viciously personal.

The most fierce and unprecedented attack came, as one had expected, from Riolan in 1653,⁵⁶ which caused considerable consternation among Bartholin's colleagues. He referred to Bartholin as a young upstart of an anatomist who disregarded all classical teaching and had the audacity to dedicate his book to him—Riolan. He referred condescendingly to a young Parisian anatomist by the name of Pecquet who had taken the age-old function—haemopoiesis—

away from the liver. 'To know these vessels is unnecessary, to examine them is stupid, and it gives no help in practising better Medicine'.⁵⁷ One must not be too harsh on Riolan for this latter remark; similar ones have been repeated daily from his time until the present by physicians everywhere.

In 1654 Bartholin wrote *Spicilegium Secundum Ex Vasis Lymphaticis*, which he dedicated to Pecquet, and in which he countered Riolan's repeated accusations and defended himself against the English physician Francis Glisson, who in *Anatomia Hepatis* (1654) had criticized Bartholin's work. In 1657 Riolan died—the last important defender of the classical theories.

Bartholin was intent on demonstrating the lymphatics in man. In the beginning of 1654 few corpses were available, but in March, Ole Worm brought the death of an alcoholic with tuberculosis to Bartholin's attention.⁵⁸ The plague had recently started in Copenhagen and considerable danger was attached to handling corpses. In spite of this, Bartholin set off and started the dissection in the dead man's house. After having exposed the mesentery of the emaciated man, they saw to their great delight, vasa lymphatica. After a year's research he had demonstrated their presence in man for the first time. In May 1654, he published his findings, *Vasa Lymphatica in Homine Nuper Inventa*, for which he was much praised. Pecquet wrote from Paris that any time Bartholin chose to sharpen his dissecting knife, there would be no problem too difficult for him to solve.⁵⁹ However, he was to perform little more original work. Owing to the strenuous past year, his illness, probably renal colic again, and the great plague, *Pestilentia magna*, which raged in Copenhagen, causing the University to be closed, Bartholin moved to the country after he had finished writing his scientific treatise on his latest discovery.

Rudbeck and Bartholin probably published their work on the vasa lymphatica independently; Rudbeck was the first to demonstrate them, Bartholin, however, was the first to publish the results.⁶⁰

In 1654 Ole Worm died and Thomas Bartholin succeeded him as Chancellor of the University and as *medicus secundus*. Thomas Fincke, now 93 years old, was still *medicus primus*. Two years later (1656) however, the great fountainhead of the Fincke-Bartholin family died at the height of this illustrious family's fame and influence. Thomas Bartholin moved up into the senior position in the faculty, Christian Ostensfeld,⁶¹ married to a granddaughter of Thomas Fincke, was made *medicus secundus* and Rasmus Bartholin (1625–98), Thomas' brother, was elected to the third chair.

At this time Thomas Bartholin's main effort was directed towards establishing a natural history museum. It was, however, difficult to collect the necessary funds and although he contributed considerable sums of his own, it was not until after the death of Thomas Fincke that the heirs agreed to contribute sufficiently to make this plan a reality.

Just before Fincke died, in February 1656, Thomas Bartholin decided to retire from his active career in the *Theatrum Anatomicum* on account of his health, and he gave a last great public demonstration in the anatomy theatre with King Frederik III present. He still continued, however, to take a keen interest in the university and to devote himself to his literary activities.



Fig. 1

THOMAS CASPERSEN BARTHOLIN
(1616–1680)

Copy of a portrait by Henrik Dittmar painted c. 1675. From *Det Nationalhistoriske Museum, Frederiksborg, Denmark*.

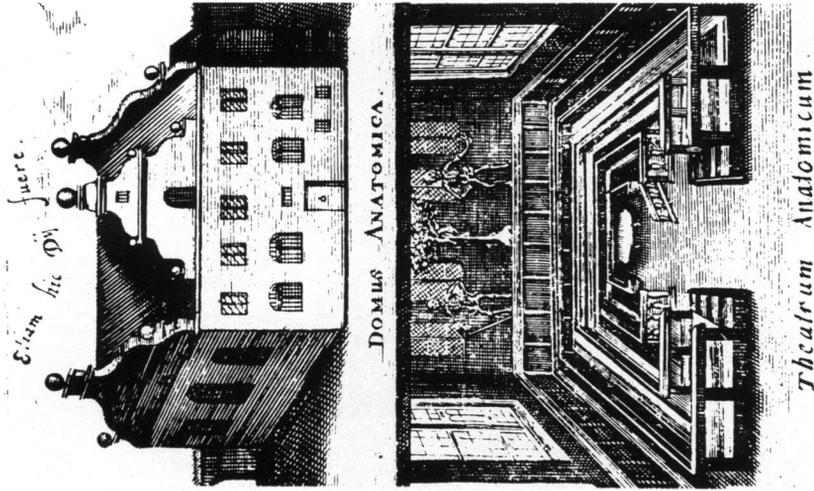


Fig. 2

From the copy of Thomas Bartholin's *Cista Medica Hafniensis*, Copenhagen, 1662 in the *Medicinsk Anatomisk Institut, Copenhagen*.

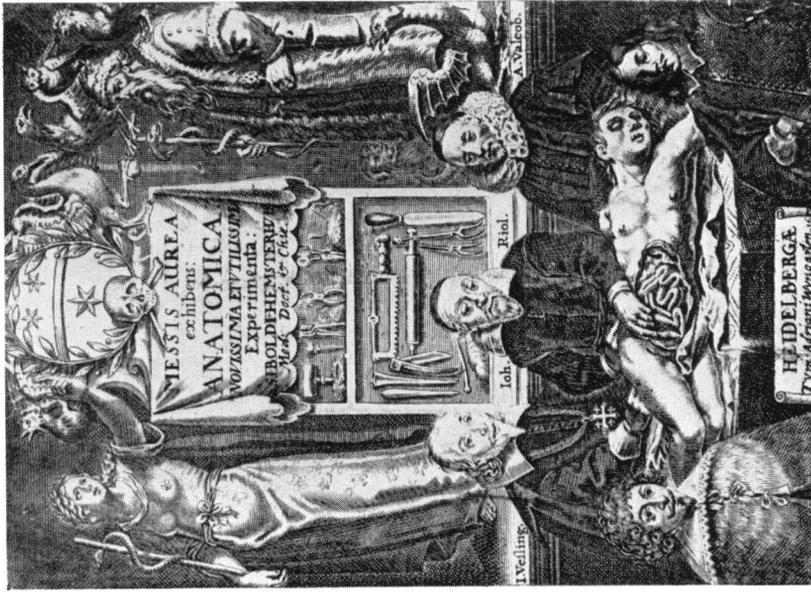


Fig. 3
 Title page of *Mensis Aurea* by Hemsterhuys (2nd ed., 1659). From the copy in the University Library, Uppsala. Portraying Vesling, Riolan, Valcob, Patin, and probably Olaf Rudbeck, lower left, with his right fist resting on his hip.

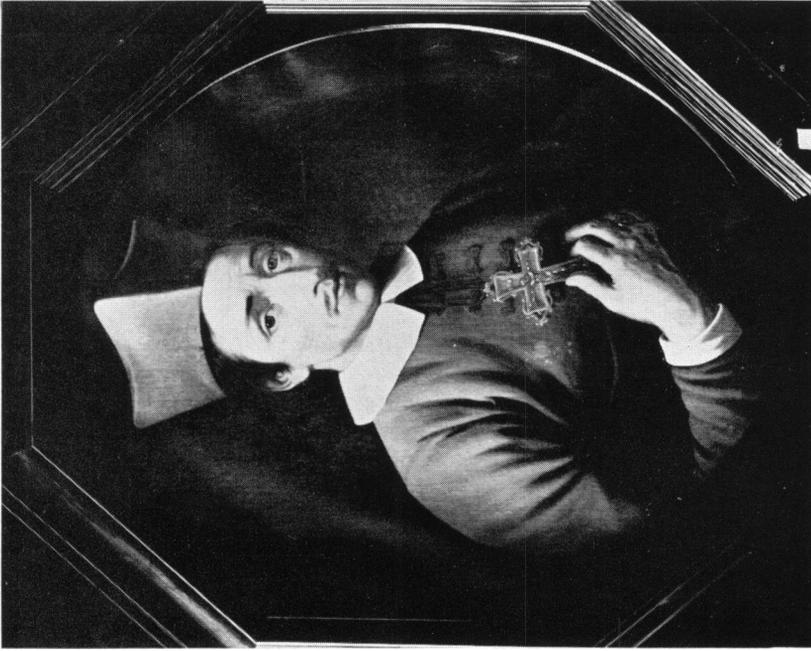


Fig. 4
 Niels Steensen as Bishop.
 From the *University Medical History Museum, Copenhagen*. Painted by C. A. Lorentzen from an older portrait.

Experimental exactitude, reproducible results.

Niels Steensen's motto.

The medical faculty was one of the few departments of the University with an international reputation. The University was still suffering from lack of religious freedom. In addition, it was short of money because the aristocracy and wealthy citizens traditionally sent their sons to foreign universities, and because of the wars with Sweden.⁶³

It was in the autumn of 1656 that Niels Steensen became a student at the University under Thomas Bartholin. He was influenced in his choice of study and preceptor by his former teacher Ole Borch (1626–90), who was particularly interested in the natural sciences.⁶⁴ Under the influence of Bartholin's great enthusiasm, ability and reputation it was natural that Steensen should become attracted to the study of anatomy.

Almost throughout the time Steensen studied at the University Denmark was at war with Sweden (1657–60). During the siege of Copenhagen in the winter of 1658–9 the students joined in the defence of the town, Bartholin left for the country and teaching came to a standstill.⁶⁵ After the war Steensen left for Amsterdam to study with Gerhard Blasius with letters of introduction from Bartholin. It had been noticed, in spite of the troubled times, that Steensen was an outstanding and unusual student.

Holland was at that time a favourite place for the Danes and during this century exerted a great influence on them.⁶⁶ The mental and emotional kinship, high academic standards, great influx of ideas from visiting scholars, and wealth from the colonies, made this an attractive place for the young student. Gerhard Blasius, professor of anatomy in Amsterdam, had studied in Copenhagen, and his father had been architect to King Christian IV.

Dissection of human cadavers was expensive for students and could at times be dangerous. There were few official sources of cadavers, and no inquiries were made into their origin. It was, therefore, not uncommon for churchyards to be robbed. As it was often the custom for public dissections to be attended by the social as well as the intellectual aristocracy, they took on a flavour of frivolous entertainment in the eyes of the lower classes; it was, therefore, with a certain amount of displeasure that they viewed the possibility of their relatives being the centre of this attention. In addition, rumour had it that vivisection on occasions took place, which turned superstitious anxiety into realistic fear.⁶⁷

On arrival, Steensen bought a sheep's head for dissection. While probing various openings he suddenly entered a long duct about which he knew nothing, and to which he had come across no reference, even in Wharton's recent work (1656) on the submandibular gland.⁶⁸ He dissected out the duct with care and repeated the exercise in several other animals.⁶⁹ He asked Blasius for advice but he was unable to give him any help. He told his colleagues Sylvius and van Horne in Leyden about his observations. Sylvius (1614–72) confirmed the finding in the human body and van Horne named it *ductus Stenonianus*.⁷⁰ Although excited about his find, Steensen was modest about his

contribution, pointing out that his work was merely an extension of Wharton's recent findings. He wanted to call the duct 'vas salivale exterius'.⁷⁰ Blasius, sensing the excitement that his pupil's discovery was causing, immediately claimed priority for the observation, got some friends to confirm it, and in his book *Medicina Generalis* included the finding as his own.⁷¹ Initially Steensen kept fairly subdued, but soon the atmosphere at the faculty in Amsterdam became so unpleasant that he moved to Leyden. After the publication of Blasius's book, Steensen decided to bring the arguments before the public, partly to defend his own reputation, and partly to justify his position with Sylvius and van Horne. With van Horne in the chair, he delivered a splendid disputation in two parts to the University.⁷² These were greatly acclaimed, with the result that Blasius became even more bitter and vehement in his attacks. Finally, he wrote to Thomas Bartholin and complained about their pupil.⁷³ Bartholin, however, in a very diplomatic way, quieted the whole issue.⁷⁴ Throughout this time, Steensen wrote frequently and confidentially to his former preceptor who, as we have seen, was not unacquainted with medical polemics, and who gave him experienced advice and praised him highly for his excellent work.⁷⁵

In the second part of his disputation in 1661, he discussed the origin of the oral secretions.⁷⁶ His observations, based on anatomical and physiological studies, indicate that they were much more precise and without the preconceptions of many of his contemporaries. His conclusions again stirred up heated controversy, but this time on the advice of Bartholin he kept quiet and continued his work on the salivary system.⁷⁷

One of his earlier interests, mathematics, again came to the fore, a subject that had considerable influence on all branches of science of the seventeenth century largely owing to the work of Descartes. In 1662 Descartes's *De Homine* was published. As a result of reading this, Steensen was stimulated to continue his research work, particularly on the central nervous and circulatory systems, in order to show up the defects of Descartes's theories.⁷⁸ The first contribution he made was to show that the heart was nothing more than a collection of muscle bundles separated by fibrous tissue and supplied with nerves and blood vessels.⁷⁹ To understand the significance of this contribution, which must rank as one of his major ones, it should be remembered that Harvey's work had been published in 1628 and that in spite of this, most people still viewed this organ as something unique bestowed with subtle characteristics and unnatural properties. Steensen showed by dissection exactly what it was, and he was able to foreshadow von Haller's contributions (1752) on the inherent irritability of muscle.⁸⁰

1664

He is indeed a genius worthy of the country's expectation.

OLE BORCH, about Steensen, to Thomas Bartholin.⁸¹

After four years in Holland, Steensen had reached international fame. With his first discovery he had had the not unusual experience in medical circles of being greatly acclaimed by the younger group of investigators who recognized his worth, and of getting into serious trouble with some of the older colleagues who recognized their declining influence. Blasius, his teacher and host, was the

Thomas Bartholin (1616–80) and Niels Steensen (1638–86) Master and Pupil

most vocal and vehement of these, and this must have caused Steensen considerable embarrassment. Others who joined Blasius in attacking the young Steensen were Hoboken⁸² and Bilsius. As was the custom of the times, the arguments often took on a strong personal flavour. Steensen's public remarks, however, were discreet, and he limited his attacks, as he could well afford to do, entirely to the scientific aspects of the argument, which made his criticism the more weighty. Partly because of financial difficulties and partly because of the death of his stepfather, he decided to return home. He was welcomed by his old teachers and friends alike, but to his great sorrow his mother died shortly after his return.

He published *Observationes Anatomicarum Specimen* (1664), which he dedicated to King Frederik III. In addition, he gave several public demonstrations in the *Domus Anatomica* to invited audiences. He was apparently a masterly dissector and very eloquent, and Thomas Bartholin praised his pupil's performances in flattering phrases.⁸³ Steensen was then twenty-six years old, with an established reputation in anatomy and with, apparently, no enemies at home.

In the autumn of 1664, however, he left Copenhagen to continue his studies abroad. His short stay at home and misinterpretation of the situation at the University have led many of Steensen's biographers to conclude that he left his country out of disappointment at having been passed over in the choice of a professor. The blame for this apparent act of injustice fell on Bartholin, who has subsequently been pictured as a two-faced tyrant, worried that his great reputation should be eclipsed by his brilliant young pupil and interested only in furthering the fortunes of his family.⁸⁴ Two authors even implicated some women as the cause for this gross case of nepotism.⁸⁵

That Bartholin was a powerful man no one will deny. His personality, reputation and position all contributed to this. His prolonged stay abroad, however, his refusal to attend the court, and his industry in the *Theatrum Anatomicum* all indicate a true love of scholarship and science. His attitude towards his students, to whom he was a constant source of inspiration and help, does not seem to confirm the picture of him as a ruthless and selfish man. On the contrary, his life was one of devotion to scientific research and the study of medicine in Denmark; he was instrumental in creating the first museum of natural history, the first regulations for the practice of medicine, the first Danish scientific journal (*Acta medica et Philosophica Hafniensis, 1671*) and the first Danish pharmacopoeia (1658).⁸⁶

In 1664 the medical faculty consisted of Thomas and Rasmus Bartholin, Christian Ostenfeld and Jacob Henrik Paulli,⁸⁷ who was abroad on study leave.⁸⁸ The vacancy which these authors considered Steensen should have filled in the department was one which Jacob Henrik Paulli would have left for the chair of history and geography which would have fallen vacant on the retirement of Rasmus Vinding (1615–84). There is no indication, however, that Vinding did retire. He had many administrative tasks and merely wanted someone to relieve him temporarily of his teaching duties.⁸⁹ Matthias Jacobæus, Thomas Bartholin's nephew, was given the task, but he was never referred to as a professor in 1664.⁹⁰ Paulli was abroad so he could hardly have taken on this function.

In fact, there probably were no vacancies at the University in 1664, so after Steensen had settled the family affairs he resumed his European tour.

Subsequent events do not indicate either that Steensen bore a grudge against the Bartholin family, or that Thomas Bartholin lost interest in Steensen. In 1667 Jacob Paulli decided to give up anatomy in favour of diplomacy. Thomas Bartholin immediately tried to persuade Steensen to return as *anatomicus regius*; ⁹¹ he did not in fact return until 1672 and in doing so abandoned circumstances in which he was entirely comfortable and happy intellectually and spiritually. Years later when he was again living in Florence, Thomas Bartholin's children and his nephew, Holger Jacobæus, studied and received much help from Steensen.

In 1664 he travelled to Paris via Cologne and Amsterdam. In Paris he was put up by Melchisedec Thévenot, Louis XIV's librarian, and shared this hospitality with his former friend from Leyden, the well known biologist Jan Swammerdam (1637–80). Thévenot introduced him to all the distinguished scientists who two years later were to form the *Académie Royale des Sciences*. ⁹² In 1664 he received his doctorate from Leyden without a thesis. It was apparently Sylvius who persuaded the faculty to grant Steensen this honour on the basis of his previous outstanding contributions. ⁹³ In the winter of 1664 he left Paris for a lecture tour to the south of France, where among others he met many prominent English scientists. ⁹⁴

When he dissected the sheep's head and found the parotid duct, his original intention had been to investigate the brain, and subsequent investigations of the glands led him to infer that their secretions did not arise as was thought at the time, from the brain; his response to reading Descartes's *De Homine* was to intensify his investigations of what he considered the most vital organs, namely, the brain and the heart. An important stimulus to his interest in the central nervous system was the constant influence that Sylvius had on him. In Paris in 1665 he delivered a lecture on the anatomy of the brain to a gathering of scientists. ⁹⁵ It was a masterpiece as a survey of what was known about the structure of brain, and brilliant as a guide to future investigators both in regard to theoretical and technical aspects of research. His work on the muscles and glands was perhaps the most revolutionary, but his essay on the brain indicates an understanding and breadth of vision unusual in the investigator. It was recognized at the time as an extraordinary piece of work, and sixty-seven years later Winslôw incorporated the entire essay unaltered in his *Exposition Anatomique de la Structure du Corps Humain*. In 1665 he left France for Florence where he had his headquarters until 1672.

1665–72

Steensen spent a short time in Rome and then went to Florence where he became Grand Duke Ferdinand II's (1621–70) doctor and was provided with a steady income and an abode. At first this must have been an exceedingly happy time for him, and it is probably here that he felt most at home. The climate and the beauty of the environment were ideal. The court of the Medicis was a centre for scholars and many of the most eminent men of the day were attracted

to it. Ferdinand II's brother, Cardinal Prince Leopold, founded the famous scientific society, *Accademia del Cimento*, in 1667. Steensen published his first work from here in 1667 and dedicated it with gratitude to the Grand Duke.⁹⁶ It was in essence a continuation of his previous work on muscles and contained the famous Steensen experiment in which he demonstrated the paralysing effect of ligating the descending aorta on the musculature of the lower limbs. He also dissected sharks and made some important observations on their skin and its glands.⁹⁷ His work on dogfish was the basis which led to the conjecture that the ovarian follicles were probably eggs.⁹⁸ He continued these experiments on various mammals and in 1675 he published the observations shortly after the results of Regnier de Graaf had appeared.⁹⁹ This was probably his last important contribution to scientific medicine.

By remarkable intuition he had noticed the similarity between the teeth of the sharks he was dissecting and the *glossopetrae* found in certain caves around Arezzo in Tuscany. It will be recalled that Thomas Bartholin on his travels had taken a great interest in these fossils but Steensen in his *Prodromus* (1669),¹⁰⁰ in which he displayed keen powers of observation and reasoning, presented a persuasive argument that these exhumed bodies which looked like the parts of plants and animals were in fact just that, and therefore extraneous bodies in the strata enclosing them (*De Solido Intra Solidum Naturaliter Contento Dissertationis Prodromus*).¹⁰¹ His analysis of the process of petrification and the formation of strata enunciated for the first time some of the basic principles of the science of stratigraphy; by this means he demonstrated that in the formation of the earth's crust, the strata which contained extraneous bodies could not have existed from the beginning, but must have been laid down in succession, one on top of the other.

On the assumption that each stratum was formed in a fluid medium, Steensen pointed out that the fluid had to be bounded below and on its sides by solid material. Although the under surface and side surfaces would conform to the shape of the enclosing material, because of its fluid origin, the stratum's top surface would be level. If the top surfaces of strata were no longer parallel to the horizon, an alteration of position must clearly have taken place since the solidification, and the mountains of the earth contained the proof that such alterations had occurred. Steensen suggested that the strata were raised by the pressure of gases in the earth. Erosions then ate away the under strata until the upper ones collapsed, creating a valley, and leaving the edges of strata at the point of fracture exposed in the resulting mountains on either side of the valley. The rubble of the collapsed parts then became the building materials for secondary mountains with a heterogeneous composition.

Within a year Steensen had been able to discover the historical character of geological processes, but when he turned to the elaboration of the history, the records of Genesis were invoked. Because of the succession of strata, the Flood was ruled out as a means of depositing the fossils. The last part of his works was devoted to the Universal Flood, to which he ascribed a large role in disrupting the strata. The entire investigation was justified by Steensen as an attempt to 'set forth the agreement of nature with Scriptures by reviewing the chief difficulties

which can be urged regarding the different aspects of the earth'. To Leibnitz he confided 'that he congratulated himself with having come to the aid of piety in supporting the faith of the Holy Scriptures and the universal deluge on natural proofs'.¹⁰²

Although his *Prodromus* was far in advance of contemporary geological thinking, it is wrong to suppose, as most biographers do, that his work was neglected. It may be correct that the full significance of it was not appreciated, but the fact is that almost every work on fossils during the remainder of the seventeenth century mentioned Steensen. Henry Oldenburg, the first secretary of the Royal Society, even translated the *Prodromus* into English in 1671. It is doubtful if any work in Steensen's age on the subject of fossils and stratification was better known than the *Prodromus*, and in addition Steensen met and influenced many of the naturalists personally.¹⁰³

During the eighteenth century most of this work appears to have caused less comment, but during the nineteenth, Humboldt reawakened interest in it and named Steensen the father of geology.¹⁰⁴ Unfortunately, he never published the projected major work on the subject, the *Prodromus* having been merely a preliminary communication, but he gave his material to his friend and pupil Holger Jacobæus,¹⁰⁵ who in 1674 became professor at the Danish University in history and geography, in 1681 in anatomy and in 1698 in medicine. In 1681 he married Thomas Bartholin's daughter, Anne Margrethe (1660–98). He was thus not only Thomas Bartholin's nephew, but also his son-in-law.

In 1667 Steensen was converted to Catholicism¹⁰⁶ and later the same year he was recalled to Denmark by King Frederik III. He travelled a while in Europe first and he was still in Holland in 1670 when he heard that the King had died.¹⁰⁷ On receiving this news, he returned to Florence where he was welcomed by Cosimo III, who offered him the opportunity to continue the theological studies which had so occupied him since his conversion.

In Denmark one had not given up hope of getting him back. It was his and Thomas Bartholin's friend, Peder Schumacher (now ennobled as Griffenfeld), who managed to extend religious freedom to Niels Steensen. However, it was not as professor of anatomy, but as *Anatomicus Regius* that he finally returned.¹⁰⁸

In 1673 Steensen performed a public dissection on a woman. He was highly praised in advance by Thomas Bartholin; later he gave his inaugural speech in the anatomical theatre in Copenhagen. The delivery and language were most eloquent. The theme of his speech was that anatomy was more than a servant of medicine, and should bring its disciples into the acknowledgment of God.

Beautiful is that which we see,
More beautiful that which we understand,
But most beautiful is that which is not intelligible. (Author's translation.)

This speech, in which he mentions God almost more than anatomy, could hardly have strengthened Steensen's position with those who doubted the wisdom of employing a Catholic in the University.¹⁰⁹

One month after Steensen arrived in Copenhagen (3 July 1672) he wrote to

Thomas Bartholin (1616–80) and Niels Steensen (1638–86) Master and Pupil

Maria Flavia,¹¹⁰ a nun in Florence, that he did not think it would be possible to do anything for Catholicism amongst his kin, 'because bad Catholics have made such an impression on them that they can or will not think about the Catholic teaching'. He was active in the Catholic community in Copenhagen, judging by reports he sent to the clergy in Rome,¹¹¹ and in the books of St. Ansgar church in Copenhagen his name is present several times as godfather.

During this period, except for the first description of Fallot's tetralogy,¹¹² he produced little new, partly because of his recent religious conflict, and partly perhaps because of his position in Copenhagen. Johan Brunsmann, the headmaster of a famous school, Herlufsholm, had in 1673 written a book about an Italian, Francesco Spira, who vacillated from Catholicism to Protestantism and ended up a psychological wreck.¹¹³ He sent this book to Steensen and the usual polemic arose. Brunsmann was crude and personal in his attacks; Steensen remained cool and factual in his replies, but it confirmed his impression that his religion was not welcome in official academic circles, so in 1674 he again left Denmark.

He seems to have been a restless spirit, always on the move; the recent public argument may have been his official excuse to leave. There is no indication that his relationship with the Bartholins had deteriorated during these two years at the University. On the contrary, Thomas Bartholin constantly praised him highly, and his son-in-law, Holger Jacobæus, studied under Steensen and when the latter left in 1674 to go to Florence, Jacobæus joined him there and spent a considerable time living and studying with Steensen.

Cosimo III offered him a position at his court, and when Steensen arrived at Christmas time in 1674 he was given the task of educating Cosimo's son. He continued for a short time with anatomy, but his main interest was now theology, and at the end of April 1675 he was admitted to the priesthood.¹¹⁴ In 1677 he left Italy to take up an appointment as Vicar Apostolic of Hanover and Bishop of the titular diocese of Titiopolis. He tackled his duties with missionary zeal in this predominantly Protestant community, and lived a life of extraordinary poverty and devotion. He had to leave this mission, however, in 1680 owing to the death of the Catholic Duke, Johan Friedrich, and the succession of his Protestant brother Ernst August. Outside his religious activities this period was marked by his friendship with the natural philosopher, Leibnitz, who at this time was mainly concerned with the unification of the various branches of the church. Steensen next took up an appointment in Münster, but had to move owing to the death in 1683 of his superior, Bishop Ferdinand von Fürstenberg. He was again appointed to an inferior position, this time in Hamburg, where he practised even harsher poverty and worked with increasing fanaticism. Because of deteriorating health, he was given a short leave of absence and went to Denmark (1684). When it was suggested that his services might be needed in Mecklenburg, he immediately left Hamburg and took an appointment in Schwerin as a parish priest. The difficulties he met here and the work he imposed on himself broke him. He was an ill man living and working in appalling conditions. On 25 November 1686 he died at the age of forty-eight years.

A memorial service was held in the cathedral of Schwerin, and the Grand Duke Cosimo made arrangements for him to be buried in San Lorenzo church in Florence.¹¹⁵

The major part of his scientific work had been done between the ages of twenty-two and thirty (1660–7). Much of the work he did never appeared in print. We know that he gave Holger Jacobæus the notes of his geological work, but they have unfortunately been lost. Studies on the natural history of *Mollusca* are mentioned,¹¹⁶ but were never published. From 1668 to 1875 it is known that he carried on scientific experiments which again never appeared in print. He mentioned his dissatisfaction over not having completed much of his work. His observations on the heart distracted him from continuing his experiments on the glands, these were in turn interrupted by deaths in his family, and while he was deeply involved with his geological studies he was called back to Denmark to the department of medicine.¹¹⁷

One of the most impressive aspects of Steensen was his versatility. He was a gifted linguist,¹¹⁸ skilled mathematician and a talented draughtsman. The arts delighted him and he was reputed to have a pleasing voice. As a scientist he was a superb experimenter and had a discerning intellect. As a teacher and public speaker he was said to be captivating.¹¹⁹ From a contemporary standpoint, perhaps his greatest weakness was his lack of interest in, and knowledge of, the theoretical aspects of natural philosophy. He was sceptical about the teaching of Galen and the theories of Spinoza; he mentioned Galileo once and Bacon never. He had very little interest in scholasticism and metaphysics; he had no use for iatrochemistry, -physics and -mechanics, and none for the medico-theological science which was fashionable at this time, and of which Thomas Bartholin had been such an enthusiastic proponent. Though it may perhaps be considered a weakness in a contemporary setting, it is because of this lack of adherence to a school of thought, the lack of prejudice and freedom from ties, that many of his observations and broad generalizations retain their validity to this day. Steensen in fact had that rare gift in science of being an astute observer of minutiae and of being able to draw large and penetrating conclusions from facts not immediately or apparently related.

By comparison with others of the same time, Steensen's scientific writings are distinguished for two reasons; one is his very careful and accurate description of the steps he took prior to making any observation, and the other is the unprejudiced way in which he discussed the conclusions which might be drawn from the results. With few exceptions these are rare features in seventeenth-century scientific literature. Many notable contributions were made during this era, but the bare facts are described in secondary sources. If one reads the superficial treatment given to descriptions of methods, and the highly speculative inferences drawn from the findings, less credit would be given to many notable figures.

Steensen had travelled a great deal and was welcomed by any society, with perhaps the exception of Blasius and his friends in Amsterdam, and widely admired as a scientist. Among many of his modern biographers it is stated that with his death, his memory soon passed into oblivion, and that his scientific

work was lost sight of until reappraised in the nineteenth century.¹²⁰ This, of course, is a view put forward largely to give emphasis to the picture of him as a brilliant man, ill-appreciated by his dull contemporaries and forsaken by his arrogant and vain countrymen, particularly, of course, the Bartholins. It is apparent, and a little disturbing, that once this rather emotional view had been formed by his early biographers in the nineteenth century, it was handed on without any critical examination of the available material. At home in Copenhagen, two of his pupils, Holger Jacobæus and Casper Bartholin, son of Thomas, both became professors of medicine and it is unlikely that they should have forgotten their kindly and admired tutor. His writings were widely read and rather than passing into obscurity, many of them remained of great interest to scientists for the next hundred years. Oldenburg, of the Royal Society, translated the *Prodromus* into English in 1671, Winsløw incorporated Steensen's lecture on the brain in its entirety into his widely used anatomy book in 1732, and in the middle of the eighteenth century the Berryat collection which appeared in Paris contained much of Steensen's work in translation.¹²¹ In 1763 a new edition of his *Prodromus* appeared in Florence and the famous physicians Boerhaave (1668–1738) and von Haller (1708–1777) were deeply interested in Steensen's work. Blondel gave a brief biographical sketch of him, based apparently on notes by Winsløw, in 1722 in his book on saints,¹²² and two biographies of him were written by the Italians Manni in 1775 and Fabronis in 1779. This is hardly a record of immediate obscurity and persistent neglect! During the nineteenth century much of his work was edited and published, and much interest was taken in his conversion, and his medical and particularly his geological contributions, and several biographies were written in Danish and German. Maar collected and edited Steensen's entire scientific writings (1910) and Larsen and Scherz did the same with his theological work (1941, 1947).

There is extensive biographical material on the Bartholin family and most of Thomas Bartholin's writings have been edited and published with the exception of some of his letters in the possession of foreign universities.¹²³ However, both Steensen and Bartholin seem to have been almost entirely ignored in the English literature.

In this introductory essay the aim has been to sketch the life of Thomas Bartholin, the most famous member of the Fincke-Bartholin family, and of Niels Steensen, the most important seventeenth-century Danish anatomist. An attempt has been made to picture their relationship as master and pupil and to rectify the notion that Thomas Bartholin was nothing but a self-seeking opportunist and Steensen but a pawn in the 'powerplay' of a self-centred family and the Catholic church.¹²⁴

BIBLIOGRAPHY AND NOTES

1. The family can be traced back to farmer Jesper Pallesen from Viborg Amt. His son Bertel Jespersen went into the Church. Jesper Bertelsen, his son, latinized his name: Casparus Bartholinus (1585–1629) and his daughter married the mathematician Christian Longomontanus. The present family are descendants of Caspar Bartholin's grandson, Christopher Bartholin (1657–1714).

2. The spelling of the name seems conflicting. He signed his name Nicolaus Stenonis, or in Danish, Niels Steensen. His half-brother signed his name Johann Steensen. Most authors use the form Niels Stensen, except R. E. Christensen, J. Metzler and I. Th. Suhr. The school named after him uses the spelling Niels Steensen and the hospital uses the form Steno Memorial Hospital or Niels Steensen's Hospital. His name was frequently used in the literature in the genitive case, Nicolai Stenonis. The commonly used Steno is probably an incorrect derivation from this. The German authors who started this usage most likely incorrectly thought his name was Steno. It is therefore preferable not to perpetuate this mistake, as one tends to in English, unless it is clearly used as a nickname. The French refer to him as Stenon and the Italians as Stenone.
3. PETERSEN, J. *Bartholinerne og Kredsen om dem. Copenhagen*, 1898. The Gregorys and Monroses of Scotland, Darwins of England and Bernoullis of Switzerland may compare in importance but hardly in numbers. Outside academic circles the Cecils (Salisbury) and Churchills (Marlborough) in affairs of State, the Bachs and Strausses in music show impressive family aggregation of outstanding achievement. Galton (*Hereditary Genius*, New York, 1871) and Russell Brain (*Some Reflections on Genius*, London, 1960) suggested that there might be some unitary factor, allowing for obvious environmental influences, which underlies varied manifestations of 'ability'. For example, relations of artists tend themselves to be artists and so on. Galton pointed out that Mendelssohn and Meyerbeer were the only musicians on his list whose eminent kinsmen achieved success in careers other than as musicians.
4. *Danmarks Adels Aarbog*, 1932, 49, II, p. 115. *Dansk Biografisk Leksikon*, 1935. Vol. VII, p. 31.
5. Caspar Bartholin married Anna Fincke (1594–1677). *Dansk Biografisk Leksikon*, 1933. Vol. II, pp. 193–6.
6. Matriculated from Padua 1608. 1613 elected professor pædagogicus, 1615 professor of Greek, 1621 professor of physics, 1624 professor of medicine. Physician to the royal household. Chancellor of the University 1627, 1636, 1642, 1648, 1654. In charge of the University's botanical gardens. A famous collector of specimens of natural history and archaeology. *Dansk Biografisk Leksikon*. 1944. Vol. XXVI, pp. 279–89.
7. Biographical information from: ANDRUP, O. Sur les portraits de Thomas Bartholin. *Janus*, 1916, 21, 324–8. GARBOE, A. *Thomas Bartholin*, 2 vols. Copenhagen, 1950. GOSH, C. C. A. *Udsigt over Danmarks zoologiske Literatur*. Copenhagen, 1873. Vol. II, pp. 45–148. INGERSLEV, E. *Ugeskrift for Læger*. 1907. 507–16. INGERSLEV, V. *Danmarks Læger og Lægevesen*. Copenhagen, 1873. Vol. I, pp. 474–82. LILJESTRAND, G., and MEISEN, V. *Nordisk med. Tidsskrift*, 1930, 2, 785–93. MAAR, V. *Thomas Bartholin. Mindeskrift*. Copenhagen, 1916. MEISEN, V. *Prominent Danish Scientists through the Ages*. Copenhagen, 1932, pp. 25–28. STEENBERGER, E. Vor Navnkundige Thomas Bartholin. *Bibliotek for Læger*. Copenhagen, 1955. 147, argang, Hefte 2.
8. HARVEY, W. *Exercitatio anatomica de motu cordis et sanguinis in anamalibus*. 1628.
9. A remark made by Caspar Hofmann (1572–1648) of Altdorf, in response to one of his pupil's efforts to convince him of the significance of Harvey's work. It is a play on the words *circulator*, meaning quack, and *circulatio*, circulation. 'Are you a circulator?' E. Ingerslev suggests in his *Fragmenter af Fødselshjælpens Historie*, 1907, vol. II, p. 110, that Gui Patin of Paris was the originator of this and similar quips.

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10. Gasparo Aselli (1581–1626) demonstrated *venæ lacteæ* in July 1622. His work *De Lactibus sive Lacteis Venis* was published posthumously, in 1627.
11. BARTHOLIN, T. *Opuscula Nova Anatomica de Lacteis Thoracicis*. 1670, p. 726.
12. — *Institutiones Anatomicae, Novis Recentiorum Opinionibus et Observationibus*. Leiden, 1641. Thomas Bartholin watched Jan de Wale (1604–49) dissect in Leiden, 1639, and it was he who taught Bartholin the significance of Harvey's experiments. Ole Worm, *Epistolæ*, 2 vols. Copenhagen, 1751. Vol. II, p. 656.
13. BRUUN, CHR. *Johan Rode*. Copenhagen, 1893. Johan Rode had for many years been interested in Celsus; he hoped Thomas Bartholin might have finished the work, but nothing came of it.
14. For Ole Worm's collection and private museum, see *Dansk Biografisk Leksikon*. 1944. Vol. XXVI, pp. 282–4.
15. BARTHOLIN, T. *Epist. medic. Centuria I et II*. Copenhagen, 1663, p. 235.
16. BARTHOLIN, C. De unicorn eiusque affinitibus et succedaneis. In *Opuscula quatuor singularia*. Copenhagen, 1628.
17. GARBOE, A. Enhjørninger, især i Natur-og Lægevidenskabens Historie. In *Medicinsk-historiske Smaaskrifter*, ed. by V. Maar. Copenhagen, 1915. Ole Worm had shown in 1636 that the unicorn horn was nothing more than a walrus tooth. *Medicinarum Institutionum Libri Primi Sectio Secunda*. Copenhagen, 1638. Chapter XIII.
18. BRUUN, CHR. *Johan Rode*. 1893, p. 46.
19. BARTHOLIN, T. *Hist. Anat. rarior. Cent. III et IV*. The Hague, 1657, p. 138.
20. — *De Pleuritide*. Basle, 1645. Thomas Bartholin's father and grandfather, Thomas Fincke, received their doctorates in Basle, and Ole Worm also studied there. KRARUP, A. Danske studerende i Basel. *Kirkehistoriske Samlinger*. 1903–5. 5 R., 2; 400. Thomas Bartholin referred to this work as a trifle—*nugas*—in a letter from Leiden, 11 April 1646. Ole Worm. *Epistolæ*. Vol. II, p. 734.
21. — *De Angina Puerorum Campaniæ Siciliæque Epidemia Exercitationes. Accidit de Laryngotomia Cl. V. Renati Moreau*. Paris, 1646.
22. WORM, O. *Epistolæ*. Vol. II, pp. 687, 714.
23. The 1644 portrait is the oldest known of Thomas Bartholin; it was originally used in the membership book of the *Accademia dei Signori Incogniti di Venezia*, later in Bartholin's *Institutiones Anatomicae* (1645) as well as in the French translation of this book. The epigram below the portrait was coined by J. Rode. ANDRUP, O. Om Portrætter af Thomas Bartholin, in *Thomas Bartholin, Mindeskraft*, ed. V. Maar. Copenhagen, 1916, p. 56.
24. WORM, O. *Epistolæ*. Vol. II, p. 699.
25. *Ibid.* Vol. II, p. 728.
26. *Ibid.* Vol. II, p. 729.
27. *Ibid.* Vol. II, p. 736.
28. *Ibid.* Vol. II, p. 733.
29. *Ibid.* Vol. II, p. 738.
30. BARTHOLIN, T. *Antiquitatum Veteris Puerperii Synopsis*. Copenhagen, 1646.
31. — *De Armillis Veterum, præsertim Danorum Schedion*. Copenhagen, 1648.
32. — *De Latere Christi Aperto Dissertatio*. Leyden, 1646.
33. — *Epist. medic. Centuria I et II*. Copenhagen, 1663, p. 420. *De Cruce Christi Hypomnemata IV*. Copenhagen, 1651.
34. Simon Paulli was born in Rostock, and was professor of anatomy there from 1630 to 1639. He was called to the chair in Copenhagen in 1639 and was responsible for establishing the *Theatrum Anatomicum* in Copenhagen in 1644.

- His father, Henrik Paulli, was Queen Sophie's physician, and his father-in-law, Jacob Fabricius, was physician to Christian IV and Frederick III. His son, Jacob Henrik Paulli, became professor of medicine in Copenhagen in 1654.
- INGERSLEV, V. *Danmarks Løger og Lægevæsen*. 1873. Vol. I. PANUM, P. L. *Vort medicinske Facultets Oprindelse og Barndom*. Copenhagen, 1879. GARBOE, A. *Thomas Bartholin*. Copenhagen, 1950. Vol. I, pp. 93–96; vol. II, p. 14.
35. Married the fifteen-year-old Else Christoffersdatter (1634–75), daughter of Christoffer Jansen (1598–1679), merchant and mayor of Copenhagen.
36. BARTHOLIN, T. *Epist. medic. Centuria I et II*. Copenhagen, 1663, p. 428.
37. MATZEN, H. *Kjøbenhavns Universitets Retshistorie 1479–1879*. Copenhagen, 1879. NORVIN, W. *Københavns Universitet i Reformationens og Orthodoxiens Tidsalder*. Copenhagen, 1937. Vol. I.
38. It was the grave of the aristocrat, John Vestermænd. BARTHOLIN, T. *Hist. anat. rarior. Centuria I et II*. The Hague, 1654, p. 96.
39. *Ibid.*, p. 293. BARTHOLIN, C. *Acta med. phil. Hafn.* 1673, p. 278. WILLIE, V. A. *Tygger Haren Drøv. Et naturhistorisk Studie*. Copenhagen, 1903. Leviticus, 11.6: 'And the hare, because he cheweth the cud, but divideth not the hoof; he is unclean unto you.' Deuteronomy, 14.7: 'Nevertheless these ye shall not eat of them that chew the cud, or of them that divide the cloven hoof; as the camel, and the hare, and the coney: for they chew the cud, but divide not the hoof; therefore they are unclean unto you.'
40. BARTHOLIN, T. *Historica Paralytici Secundi ex Math. VIII et Luc. VII*. Copenhagen, 1649.
41. — *De Variis Reipublica Christiana Morbis et Placidis eorum Remediis Dissertatio Oratoria*. Copenhagen, 1649. In *Orationum Medicarum Volumen*. Copenhagen, 1668.
42. — *Orationum Medicarum Volumen*. Copenhagen, 1668. JØRGENSEN, A. D. *Peder Schumacher Griffenfeld*. Copenhagen, 1893. Vol. I.
43. HECKSCHEER, W. S. *Rembrandt's Anatomy of Dr. Nicolaas Tulp*. New York University Press, 1958. Chapters III and V.
44. WORM, W. *Oratio in excessum . . . Thomæ Bartholini*. Copenhagen, 1681, p. 48.
45. GARBOE, A. *Thomas Bartholin*. Copenhagen, 1950. Vol. I, pp. 97–100.
46. HECKSCHEER, W. S. *Rembrandt's Anatomy of Dr. Nicolaas Tulp*. New York University Press, 1958, p. 28.
47. BARTHOLIN, T. *Vindiciarum Anatomicarum pro Parente I–V Casp. Hofmanno . . . publice opposita*. Copenhagen, 1648.
48. *Ibid.*, p. 81.
49. RIOLAN, J. *Opuscula Anat. Nova*. 1649, p. 379.
50. BARTHOLIN, T. *Collegii Anat. Disp. Septima*. 1650. Vol. XXI.
51. Svend Olsen, the waiter, was choked to death by a piece of meat which he was eating on his way to the table at which he was serving. TRYDE, G. *Oversættelse af Thomas Bartholins Skrifter om Opdagelsen af Lymfekarrene. Klassisk Dansk Medicin*. Copenhagen, 1940. Vol. III, p. 101.
52. *Ibid.* Chap. 18.
53. GARBOE, A. *Thomas Bartholin*. Copenhagen, 1950. Vol. I, p. 132.
54. BARTHOLIN, T. *Epist. medic. Centuria I et II*. Copenhagen, 1663, p. 505.
55. Martin Bogdan, born Brandenburg 1631, matriculated at Copenhagen in 1653. Received his doctorate at Basle in 1660. Became physician in Bern.
56. RIOLAN, J. *Opuscula Nova Anatomica. Lymphatica Vasa Bartholini Refutata*. Paris, 1653.

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57. *Ibid.*, p. 51.
58. BARTHOLIN, T. *Vasa Lymphatica in Homine Nuper Inventa*. Copenhagen, 1654, p. 9. TRYDE, G. Oversættelse af Thomas Bartholins Skrifter om Opdagelsen af Lymfekarrene. *Klassisk Dansk Medicin*. Copenhagen, 1940. Vol. III, p. 173.
59. — *Epist. medic. Centuria I et II*. Copenhagen, 1663, p. 508.
60. BOGDAN, M. *Apologia pro Vasis Lymphaticis D. Thoma Bartholini*. 1654. GARBOE, A. *Thomas Bartholin*. Copenhagen, 1950. Vol. I, p. 171. GOSH, C. C. A. *Udsigt over Danmarks zoologiske Literatur*. Copenhagen, 1873. Vol. II, p. 108. VON HOFSTEN, N. Upptäckten av bröstgängen och lymfkärlssystemet. *Lärdomshistoriska Samfundets Årsbok*, 1939, p. 262. PETERSEN, J. Thomas Bartholin i hans Forhold til Samtidige nordiske Anatomer. *Nordisk medicinskt Arkiv*. Festband (30 Bd.). Copenhagen, 1897. RUDBECK, O. *Ad Thomam Bartholinum Danum epistola*. 1657. Republished by O. T. Holt, 1930. TIGERSTEDT, R. Om lymfkärlens upptäckt. *Finska Läkaresällskapet*, 1885.
61. WENTZEL, A. *Christian Ostensfeld*. Copenhagen, 1937. *Dansk Biografisk Leksikon*, 1939. Vol. XVII, pp. 502–3.
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63. NORVIN, W. *Københavns Universitet i Reformationens og Orthodoxyens Tidsalder*. Copenhagen, 1937. RØRDAM, H. F. *Københavns Universitets Historie*. Copenhagen, 1873.
64. MAAR, V. *Oluf Borch*. Copenhagen, 1926.
65. RØRDAM, H. F. *De danske og norske Studenters Deltagelse i Kjøbenhavns Forsvar mod Karl Gustav*. Copenhagen, 1855.
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 70. NEUBURGER, M., and PAGEL, J. *Handbuch der Geschichte der Medizin*. Jena, 1903. Vol. II, pp. 247, 262, 338.
 71. BLASIUS, G. *Medicina Generalis*. Amsterdam, 1661.
 72. MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910; *Disputatio de Glandulis Oris*. Vol. I, p. 24; *Apologiae prodromus*. Vol. I, pp. 143–54.
 73. BARTHOLIN, T. *Epistola medic. Centuria III*. Copenhagen, 1667, p. 158. GOSH, C. C. A. *Udsigt over Danmarks Zoologiske Literatur*. Copenhagen, 1873. Vol. II, p. 149.
 74. BARTHOLIN, T. *Epist. medic. Centuria IV*. Copenhagen, 1667, p. 18.
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 76. STENONIS, N. *Observationes Anatomicæ*. Leyden, 1662.
 77. AGGEBØ, A. *Danmarks store Søn, Niels Stensen*. Copenhagen, 1937, p. 28.
 78. BARTHOLIN, T. *Epist. medic. centuria IV*. Copenhagen, 1667, p. 103.
 79. ‘Cor vere musculus est.’ MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910. Vol. I, p. 158.
 80. BASTHOLM, E. *The History of Muscle Physiology*. Copenhagen, 1950, pp. 142–63. HALLER, A. VON. *A Dissertation on the Sensible and Irritable Parts of Animals*. Baltimore, 1936.
 81. Letter dated 2 January 1662 from Leyden.
 82. In 1662 Hoboken published a pamphlet in which he pointed out, among other things, that Stenonis spelt backwards reads *Simon est*. Simon’s treachery led to the defeat of Troya. JØRGENSEN, A. D. Nils Stensen. *Historisk Tidsskrift*. Copenhagen, 1865–6, 3 R., 4, 8.
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 84. AGGEBØ, A. *Niels Stensen*. Copenhagen, 1937, pp. 33–34. JØRGENSEN, A. D. *Nils Stensen*. Copenhagen, 1884, p. 78. METZLER, J. *Niels Steensen*. Copenhagen, 1928, pp. 14–15. PLOVGAARD, K. *Niels Stensen*. Copenhagen, 1953, p. 25. SCHERZ, G. *Niels Stensen paa Rejse i Frankrig. Gads Danske Magasin*. 1942, p. 362. STEENBERGER, E. *Vor Navnkundige Thomas Bartholin. Bibliotek for Læger*. Copenhagen, 1955, p. 78. SUHR, I. TH. *Niels Steensen som Menneske. Medicinskhistorisk Selskab*. Copenhagen, 1942, p. 3.
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 87. MEYER, K. *Erasmus Bartholin. Et Tidssbillede*. Copenhagen, 1933. WENTZEL, A. *Christian Ostenfeld*. Copenhagen, 1937. Jacob Henrik Paulli, Simon Paulli’s son, became professor of history, 1668; he soon gave up his academic duties and

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- went into the diplomatic corps. He was titled as von Rosenschild. *Dansk Biografisk Leksikon*. 1941. Vol. xx, p. 136.
88. KRARUP, A. *Danske Studerende i Basel. Kirkehistoriske Samlinger, 1903–5*, 5 R., 2, 404.
89. GARBOE, A. *Thomas Bartholin*. Copenhagen, 1950. Vol. II, p. 60.
90. VINDING, R. *Regia Academia Havnensis*. Copenhagen, 1665, p. 440.
91. *Sjællandske Tegnelser*, 19 October 1667. Rigsarkivet, quoted from A. Garboe's *Thomas Bartholin*. Copenhagen, 1950. Vol. II, p. 64.
92. BROWN, H. *Scientific Organizations in Seventeenth Century France*. Baltimore, 1934, p. 136. He also attended meetings of Pierre Bourdelot's Academy. *Ibid.*, p. 243.
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95. STENONIS, N. *Discours sur l'anatomie du cerveau*. Paris, 1669. Published by the book dealer Robert de Ninville four years after having been read to the Society. GOTTFREDSSEN, E. *A Dissertation on the Anatomy of the Brain by Nicolaus Steno*. Copenhagen, 1950. MAAR, V. *Nicolaus Stenos Foredrag om Hjernens Anatomi*. Copenhagen, 1903. MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910. Vol. II, p. 335.
96. STENONIS, N. *Elementorum Myologiae Specimen*. Florence, 1667. MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910. Vol. II, pp. 61–111.
97. STENONIS, N. *Canis Carchariae Dissectum Caput*, 1667. MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910. Vol. II, pp. 113–45. Steno's experiment, p. 125. GOSH, C. C. A. *Udsigt over Danmarks Zoologiske Literatur*. Copenhagen, 1873. Vol. II, p. 207. MEISEN, V. Nicolaus Steno: Dissektion af et Hajhoved, in *Stenoniana*, ed. by V. Meisen and K. Larsen. Copenhagen, 1933. Vol. I, pp. 50–59.
98. MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910. Vol. II, p. 152.
99. *Ibid.* Vol. II, pp. 157–66. *Ibid.* Vol. II, pp. 167–79. MAY, M. T. On the passage of yolk into the intestines of the chick. *Nicolaus Steno. J. Hist. Med.*, 1950, 5, 119. NEEDHAM, J. *A History of Embryology*. Cambridge, 1939, p. 137.
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102. SAINT-GERMAIN, B. DE. *Gottfried Wilhelm Leibniz*. Paris, 1859, p. 18.
103. EYLES, V. A. The influence of Nicolaus Steno on the development of geological science in Britain, in *Nicolaus Steno and his Indice*, ed. Gustav Scherz. Copenhagen, 1958, pp. 167–88.
104. *Congrès International . . . Compte Rendu de la 2me Session*. Bologna, 1881, pp. 249–51. GARBOE, A. Nicolaus Steno and Scientific Geology, in *Nicolaus Steno and his Indice*, ed. Gustav Scherz. Copenhagen, 1958, pp. 99–119. GARBOE, A. *Nicolaus Steno (Niels Stensen) and Erasmus Bartholin. Two Seventeenth Century*

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105. GARBOE, A. Nicolaus Steno and scientific geology, in *Nicolaus Steno and his Indice*, ed. Gustav Scherz. Copenhagen, 1958, p. 117.
106. STENONIS, N. *Epistolæ*, ed. Gustav Scherz. Copenhagen, 1952, p. 363. LARSEN, K., and SCHERZ, G. *Opera Theologica*. Copenhagen, 1941. Vol. I, p. 126. MØLLER, J. *Authentiske Efterretninger om Niels Stenos Overgang til den katolske Virke*. *Møllers Theologiske Bibliothek*. Copenhagen, 1821. Vol. xx, pp. 219–75.
107. WICHFELD, J., writes (*Historisk Tidsskrift*, 1865–6, 3 R. 4, 38) that Steensen's departure to Denmark in 1667 was prevented as Prince Leopold told him his ship had left. I have been unable to confirm this. STENONIS, N. *Epistolæ*, ed. Gustav Scherz. Copenhagen, 1952, p. 215.
108. GARBOE, A. *Thomas Bartholin*. Copenhagen, 1960. Vol. II, p. 65.
109. MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910. Vol. II, pp. 249–56. LARSEN, I. N. Stenos Indledningsforelæsning, in *Stenoniana*. Copenhagen, 1933. Vol. I, pp. 100–11.
110. There were three women who played an important role in Steensen's life: (1) Elizabeth Rantzau, who became a nun in Paris following the death of her husband. In 1664 Steensen met her there and again in 1675 in Hildesheim, where she had established a convent (Plovgaard's N.S., p. 41); (2) Maria Flavia del Nero, sister in charge of the dispensary of the convent of St. Vincenz di Annalena in Florence; (3) Sera Lavinia Felice Cenami Arnolfi, wife of an ambassador to the Grand Duke's court. Said to be a woman of great piety and very talented. J. Møller (*Theol. Bibl.*, Vol. xx, p. 230) implies that Steensen was enamoured by her charms. These three aristocratic women kept up a life-long correspondence with Steensen.
111. S.O.R. Vol. 438 to Acta Congr. 1673. 28 February, No. 44, P. A. Rome. Quoted from METZLER, J. *Niels Steensen*. Copenhagen, 1928, p. 38.
112. MAAR, V. *Nicolai Stenonis Opera phil.* Copenhagen, 1910. Vol. II, pp. 49–53. STENONIS, N. *Acta med. phil. Hafn.*, 1671–2, I, 200–3. WARBURG, E. Niels Steensens Beskrivelse af det første publicerede Tilfælde af 'Fallots Tetrade'. *Nordisk Medicin*, 1942, 16, 3550–1.
113. BRUNSMANN, J. *Francesci Spiræ Fortviffelsis Historie*. Copenhagen, 1673. BRUNSMANN, J. *Epistolæ duæ adversariæ Nicolai Stenonii ex medica artis Doctore Episcopi Titiopolitani et Johannis Brunsmanni Ecclesiastæ Hafniensis*. Copenhagen, 1680.
114. JØRGENSEN, A. D. *Nils Stensen*. Copenhagen, 1958, pp. 201–29. STENONIS, N. *Epistola*, ed. Gustav Scherz. Copenhagen, 1952, pp. 301, 768.
115. 25 October 1953, Steensen's coffin was moved from a crypt to a side chapel in the nave of San Lorenzo at a ceremony at which the Danish Bishop, Theodor Suhr, officiated.
116. JØRGENSEN, A. D. *Nils Stensen*. Copenhagen, 1958, pp. 201, 242. SPARCK, R. Nicolaus Steno's contributions to Zoology, in *Nicolaus Steno and his Indice*, ed. Gustav Scherz. Copenhagen, 1958, p. 87.
117. CHRISTENSEN, R. E., HANSEN, A., and LARSEN, I. *Niels Steensens (Stenonis) Værker i Oversættelse*. Copenhagen, 1939, p. 32.
118. He spoke Latin, English, German, French, Dutch and Italian, besides which he had a working knowledge of Hebrew and Greek. He delivered his lecture on the Anatomy of the Brain (1665) in French and it was said that both form and

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- context were in the true French spirit. AGGEBO, A. *Niels Stensen*. Copenhagen, 1937, p. 35.
119. ‘. . . the demonstrations by Mr. Steno ye Dane were neat and clever wherein I much admired ye ingenuitie and great modestie of ye person. . . .’ Letter of Martin Lister. Bodleian MS. 5, folio 224. Quoted from HARCOURT BROWN, *Scientific Organizations in Seventeenth Century France*. Baltimore, 1934, p. 211.
120. e.g. JØRGENSEN, A. D. *Nils Stensen*. Copenhagen, 1958, p. 228. METZLER, J. *Niels Steensen*. Copenhagen, 1928, p. 69. PLOVGAARD, K. *Niels Stensen*. Copenhagen, 1953, p. 157.
121. Quoted from: CHRISTENSEN, R. E., HANSEN, A., and LARSEN, K. *Niels Steensens (Stenonis) Værker i Oversættelse*. Copenhagen, 1939, p. 47.
122. BLONDEL, L. *Les vies des Saints pour chaque jour de l’année*. Paris, 1722, pp. 732–47. Steensen was a cousin of Jacob Benignus Winsløw’s (1669–1760) paternal grandmother.
123. NIELSEN, L. *Registrant over Breve fra og til Danske i udenlandske Biblioteker*. Copenhagen, 1934, p. 18. GARBOE, A. *Thomas Bartholin*. Copenhagen, 1950. Vol. 1, p. 13, ref. 8.
124. SUHR, I. TH. *Niels Steensen som Menneske*. *Medicinskhistorisk Selskab*. Copenhagen, 1942, p. 9.

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