Book Review: Finally, all Steno's scientific papers translated from Latin into English

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Received 16 January 2015
Accepted in revised form
13 February 2015
Published online
28 March 2015

Hansen, J.M. 2015. Finally, all Steno's scientific papers transleted from Latin into English. © 2015 by Bulletin of the Geological Society of Denmark, Vol. 63, pp. 13–15. ISSN 2245-7070. (www.2dgf.dk/publikationer/bulletin). https://doi.org/10.37570/bgsd-2015-63-02

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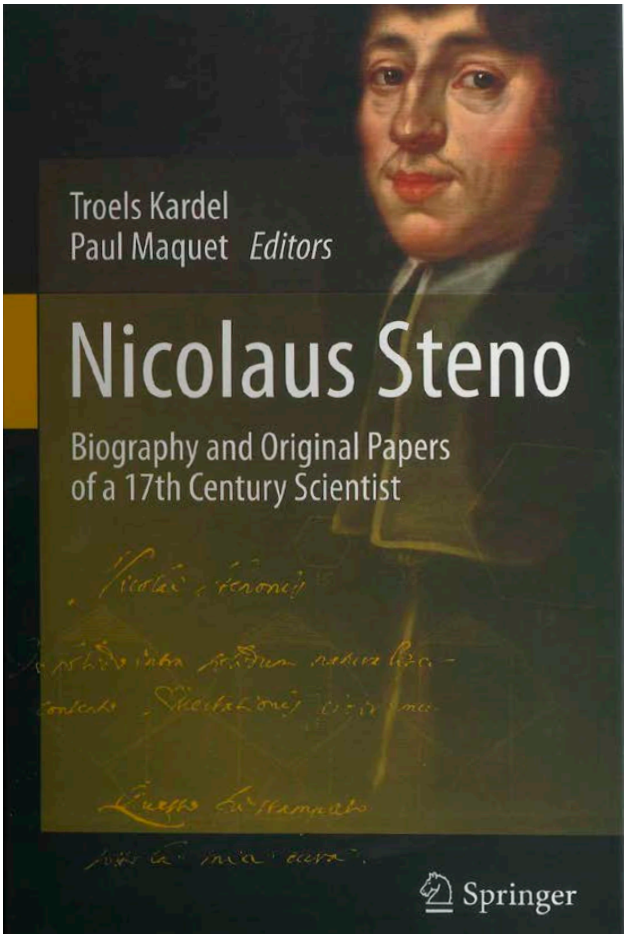
Kardel. T. & Maquet, P. (eds) 2013: Nicolaus Steno. Biography and Original Papers of a 17th Century Scientist. Springer-Verlag, Berlin, Heidelberg, 739 pp.

The Danish-Italian scientist Nicolaus Steno (Niels Stensen, 1638–86) is considered to be the founder of geology, including palaeontology and mineralogy, as a discipline of modern science. He is also considered to be the founder of modern scientific conceptions of the human glands, muscles, heart and brain. Steno also made important novel contributions in fields of anatomy involving, for example, comparative anatomy (humans/animals; animals/fossils), embryology and the diverse roles of body fluids.

The general outset of Steno's science and his philosophy of science constitutes an important step from the medieval and renaissance way of thinking into the appearance of modern science in the 17th century and the Enlightenment of the 18th century (e.g. Kardel 1994; Hansen 2009). The appearance in the 18th century of the contradistinction between the traditional creationistic understanding and Lyell's (1797–1875) and Darwin's (1809–1882) paradigmatically new interpretation of the evolution of the Earth and life on Earth can, to some extent, be traced back to Steno and his methods.

However, Steno's ideas and great influence on geology and the general principles of modern science remain relatively unrecognized. Latin was the common scientific language in Steno's time, but it soon became replaced by modern, national languages. The declining role of Latin in protestantic Europe, and the fact that most of Steno's philosophical statements were not translated from Latin into English until recently, have probably contributed to 19th and 20th century oblivion of Steno in English-speaking countries, whereas Steno's achievements remained known among geologists, anatomists and historians of science in Italy, France, Germany and Russia. In addition, Steno's strong religious faith and his conversion from his native Danish protestantism to roman catholi-



cism when he had become established as a scientist at the Medici's (Ferdinand II and Cosimo III) court in Florence, has puzzled modern scientists. Steno was certainly aware of his strong faith and, perhaps as a consequence, never confused science with religion. On the contrary, in the harsh post-reformation environment of the just-ended counter-reformation wars of Europe, he humbly claimed the freedom of science from religious belief. Moreover, his appointment by the pope as *titular bishop* of the former city of Titiopolis in the East Roman Empire, but stationed in Schwerin with secret duties in protestant and monocratic Denmark (at that time including northern Germany and Norway), has not made it easier to comprehend Steno's extremely stressed situation involving loyalty to science, the roman catholic church and the absolute monarchy of the protestantic Denmark.

Moreover, it may have contributed to the lack of recognition of Steno's achievements that several of his ideas were simply not understood. This relates in particular to his modern understanding of muscles about which professor of anatomy and biographer of Steno, Harald Moe, as late as in 1988 wrote that Steno's work on muscles is "among his weakest". In his 1994-edition of the biography from 1988, after Kardel's studies and comparisons of Steno's descriptions of muscles with computer animations of the human motion apparatus, Moe completely changed his opinion, considering Steno's muscle theory to be amongst his most brilliant achievements.

Kardel and Maquet's new monograph on Steno's science

The present book on Steno, edited and translated by Troels Kardel and Paul Maquet, is the most important monograph for studies of Steno's scientific discoveries and life yet written. Besides translations into modern English of all of Steno's known scientific publications, the book includes the comprehensive biography by the German (Danish citizen from 1938), anti-Hitlerian Steno-scholar and catholic priest, Gustav Scherz, shorter biographies, the editors' comments, many illustrations and footnotes, a comprehensive bibliography and indexes to all the people and places mentioned. Kardel and Maquet's translation (1994) from Latin into English of Steno's general view on scientific recovery and levels of knowledge ('Prooemium') is also included, making it available to a broader public. Steno's first scientific thesis ('De Thermis'), which was rediscovered as late as 1960 in Philadelphia (USA), is also included.

With this wonderful book a complete edition of Steno's 34 known scientific works is available in English for the first time. A previous almost complete edition by Vilhelm Maar (1910) was in Latin (apart from one paper originally written in French). Many of Steno's scientific papers have been translated one by one into English, German, French, Danish, Italian, Russian and Japanese over the years, but the absence of collected translations of both geological and anatomical papers has made it difficult to fully comprehend his more encompassing, general understanding of fundamental scientific principles. Thus, only Steno's second geological paper (1669, 'De Solido'), which was translated into English already in 1671 by Henry Oldenburg, secretary of The Royal Society of London, can be considered to be generally known by historians of science. Accordingly to *Encyclopaedia Britannica,* 'De Solido' is among the 100 most important works of modern science.

Some other sources and recent papers on Steno's science

Another important and comprehensive publication on Steno's scientific thoughts, a complete translation of and commentary on Steno's large student manuscript 'Chaos', was published by August Ziggelaar in 1997. Because this manuscript is already available in English and would require many more pages it is not included in the new monograph. The name of the manuscript is derived from Steno's exclamation written on the manuscript: "In nomine Jesu, Chaos", expressing his opinion on the state of science at the time. 'Chaos' (now 520 printed pages) constitutes a basis for understanding what inspired him at an early stage of his academic life.

Likewise, Steno's correspondence with his Dutch friend, the great philosopher Baruch Spinoza (1632–1677), as well as his correspondence with his German friend and admirer, G.W. Leibniz (1646–1716), are not included, although they give important clues to Steno's understanding of the role of science in contrast to theology. The two editors have wisely chosen a form of monograph that exclusively includes what Steno himself decided to publish.

Introductions to the study of Steno's scientific papers

Direct reading of Steno's scientific papers without introduction to his time and the state of renaissance science would not make it easy to understand his genius, achievements and role in posterity. Such introductions may be found in a relatively new, popular description in English of Steno's life, science

and sainthood by Alan Cutler (2003), in my own book (2000) on perspectives of Stenonian geology, and in my review (2009) of Steno's philosophy of science. Other modern interpretations of Steno's scientific work can be found in e.g. Stephen Jay Gould's introduction (1981) to Steno's first geological paper (comparison of modern shark teeth which he showed were identical with fossil shark teeth, so-called *Glossopetrae*).

Such introductions to Steno may make it easier to understand that Steno's way of study and reasoning differs fundamentally from that of his contemporaries, e.g. Athanasius Kircher (1602–80), by seeking causes and not explaining nature by causes already given in the Bible or other authoritative theological sources. In Steno's thinking the role of science is not to explain effects by means of *a priori* given causes. That is the role of religion, and in our time, I may venture to say, the role of forecasting and mathematical modelling. In Steno's thinking the role of science is to study the things visible in nature and the human body and thereafter, e.g. by assuming that the forces active today were also active in the past, to 'back-strip' and reconstruct, and thereby understand, the causes of the observed effects.

Especially for students of geology, I consider that it will be an eye-opener to read Steno's own introduction in 'De Solido' in order to learn that most of the basic principles applied in modern geology originate from Steno and his breathtaking study of northern Italy, and that these principles have been practiced ever since.

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