

TWO FUNDAMENTAL YEARS (1667 and 1669)  
IN THE HISTORY OF EXACT GEOLOGY AND MINERALOGY,  
AND THEIR RELATION TO DANISH SCIENTISTS

By

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*Abstract*

In the literature on the history of the geology the year 1669 is generally named as the year of the foundation of the exact scientific geology and mineralogy. In this year the Danish scientist NIELS STENSEN (NICOLAUS STENO) (1638–1686) published his booklet »De solido intra solidum naturaliter contento dissertationis prodromus« (Florence 1669). This »prodromus« (provisional treatise) is the classic work of the beginning exact geology and mineralogy.

Nevertheless, it deserves to be known that already in the year 1667 STENO could give the outlines of a geological Earth-history in a little treatise which is incorporated in his anatomical work »Elementorum myologiæ specimen« (Florence 1667) as a digression. Both treatises are written in latin but are now available in translation both to the Danish and some other languages. The years 1667 and 1669 therefore both deserve to be remembered.

In the history of exact geology and mineralogy the year 1669 has a commonly accepted central position. In this year the Danish anatomist and physiologist NIELS STENSEN (NICOLAUS STENONIS or STENO) (1638–1686) published his book »De solido intra solidum naturaliter contento dissertationis prodromus (Firenze 1669).[1] In this work the title of which can be translated »On solid bodies enclosed by the process of nature within a solid body«, STENO gives the outlines of an exact treatment of geological problems based on observations in the nature and conclusions based thereupon by inductive reasoning. He sets forth as a fact that the fossil sharks teeth and other fossils were of animal origin (organic nature) and not formed in the stony layers by some unknown process. He understood that the fossils in the layers could tell something of the history of the Earth and his geological evolution. Basic principles in palæontology and stratigraphy were set forth. In »De solido« STENO also gives the first exact crystal-morphological study and found the constancy of the interfacial angles (STENOS Law).

It was STENO's aim to publish a greater geological work in continuation of »De solido«, when his personal circumstances permitted it. This work which would be of the greatest scientific interest was never published and the material or preliminary manuscript is until now unknown.[2]

In the same year 1669 another Danish scientist, professor *medicinæ* in Copenhagen ERASMUS BARTHOLINUS (1625–1698) published a treatise which also represents a landmark in the geological-mineralogical science. The treatise »Experimenta crystalli islandici disdiaclastici quibus mira et insolita refractio detegitur« (1669) gives an experimental study of the hitherto unknown double refraction of the light in the islandic calcite which was brought to Copenhagen in great, pure, transparent specimens.[3]

This first crystal-optical study was of eminent importance and opened the way to wide scientific and practical areas.

It is therefore correct to name the year 1669 as a great year in the history of geology and mineralogy.

Nevertheless, it deserves to be said that already two years before the publication of »De solido« NICOLAUS STENO had laid down the fundamental principles of exact geology in a little treatise, inserted as a »digression« in a greater anatomical and physiological investigation.[4]

In the spring 1666 STENO arrived for the first time in Italy. As an eminent anatomist he was generously patronized at the court of the Grand Dukes of Tuscany and in Firenze found the most favorable scientific conditions. In the beginning of STENO's stay in Italy he continued his anatomical investigations. In October 1666 a gigantic shark was caught in the Mediterranean off Livorno (Leghorn). The head of this animal was ordered by the Grand Duke of Tuscany, Ferdinando II, to be sent to Firenze, and set at the disposal of NICOLAUS STENO for anatomical investigation. A closer study of the sharks teeth, their structure and development gave STENO the more and more convincing thought that the »tongue stones« (glossopetræ) were in reality petrified sharks teeth from a former period in the Earth's history. Step by step he came to the conclusion that not only the much discussed »tongue stones« but all other »bodies resembling parts of animals« were of animal origin. He understood that the strata are sediments, deposited in water, and an image of the evolution of the Earth's crust began to take shape. STENO discussed his hitherto gained »geological« results in a series of »historiæ« (observations of facts) and »conjecturæ« (possibilities and conclusions). With stringent logic STENO gives in short sentences a beginning outline of a »geology« without using this terminology. STENO's little fascinating treatise from 1667 was the beginning. In connection with the memory of the important year 1669 which has a place in all histories of geology and mineralogy STENO's little treatise from 1667 deserves to be remembered in the tricentenary of its publication.

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*Some references from the rich Steno literature*

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