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Nicolas Steno

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What do you know about our complicated planet, the Earth? The approach to this question may be assorted into many categories. One way to respond to the question relates to the knowledge of Geology which is the introduction of Earth Science. Geology involves the study of the Earth in physical ways and its process of development. It includes the study of creatures on the planet such as their evolution, extinction, and fossils[1]. Geologists study these historical stories and the occurrence of geologic processes using scientific method. Eventually, they have obtained some valuable knowledge to understand the consequences or foresee what would happen in the future with accuracy. As today, we perceive that behind the extreme natural events, instead of accusing God with his anger, we have come up with reasonable explanations and these have gained awareness of people and helped them to prepare for the future. It is firmly accepted that Geology is significant to our humankind.

As we observe more, Geology was initially introduced by the work of Niels Stensen, widely known as Nicolas Steno. In late of seventeenth century, Steno had investigated the head of the shark and concluded that the object found inside shark's teeth was identical to fossil in rock layer. He had stayed in Tuscany (Italy) and concentrated in Geology for a couple years, eventually according to his curiosity and industriousness, he published De Solido Intra Solidium Naturaliter Contento

[1] Garry Hayes. "Why Geology is Important; Why Education is Important...The Sendai Earthquake in perspective." Geotripper, News and Views from the Geologic Realm. 7 Feb 2012. <http://geotripper.blogspot.com/2011/03/why-geology-is-important-why-education.html>

Dissertationis Prodromus or Prodromus. The book provided three basic principles of geology which are principle of Superposition, principle of original horizontality and principle of lateral continuity[2]. His written work also differentiated the stages of rock formation into six stages which two are fluid stages, another two are solid stages and the rest are discontinuous stages[3]. Steno, about a century later, was considered as a man who gave birth to new-aged geology and stratigraphy which is a branch of geology.

The first fundamental principle is the principle of superposition described that sedimentary has been formed in an order which the depth of the layer determines the age of it. The observation is followed by two suppositions announcing that the formation needs to be in horizontal and it does not turn upside down after being formed[4]. According to this law, today geologists can determine which rock layer was formed first and when it is combined with the study of the origin of fossils called palaeontology, they are able to provide geological time scale which is a standard frame of reference to indicate fossils.[5] Additionally, the time scale is a tool to illustrate evolution of creature over time.

The principle of original horizontality states that sedimentary rocks tend to be formed in horizontally and next upper layer is deposited in unchanged pattern. Hence, any tilted or folded rocks are caused by disfiguration such volcanic eruption or land

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[2] Paul Andersen. "Law of Superposition." Film and Animation. 22 May. 2011. YouTube. 7 Feb 2012

[3] *Tas Walker*."Geological pioneer Nicolaus Steno was a biblical creationist." Creation Ministries International. 7 Feb 2012.< http://creation.com/geological-pioneer-nicolaus-steno-was-a-biblical-creationist>

[4] James S. Aber. "Nicolaus Steno, History of Geology." Go 521 History of Geology. 7 Feb 2012. < http://academic.emporia.edu/aberjame/histgeol/steno/steno.htm>

[5] Doyle, Peter. Understanding fossils. 1996. p.1-4.

sliding, after original deposition[6]. As today geologists, these geological processes are studied in order to discover the presence of these deformations and also to perceive natural series of changes, for example mechanical weathering which is the set of natural operation fragmenting rocks into smaller particles or fault which is the opening between two parts of the Earth's crust with forceful energy underneath[7].

Steno's principle of lateral continuity expresses that sedimentary rocks are deposited and expanded until there are hindrances blocking in the way. Rocks are deposited in every direction on surrounded land nevertheless, if these rock layers have been split away, it happened after the process of formation[8]. This principle leads to the study of landform which is the relationship between Earth's surface and Earth's phenomena. It can be roughly categorized further into three groups which are depositional, erosional, and tectonic landform[9]. Applied landform study is useful for the natural resource discovery.

Even though, these laws are essential fundamental principles devoted to modern Geology, they were never accepted until about two centuries after his death. His work, Prodromus, which includes explanation of the nature of fossil, had not been accepted in England after published in 1671. At that time, Europeans were intensively concerned with religious belief, Christianity. Catholics and Protestants deeply believed in Noah's Flood and Prodromus had illustrated against theirs. The debate about the origin of fossils was set up and Steno's principles were not entirely

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[6] PaleoClones, LLC company. "Rock Layers: Timeline of Life on Earth." Prehistoric Planet. 8 Feb 2012.< http://www.prehistoricplanet.com/news/index.php?id=48>

[7] Andrew Alden. "Mechanical or Physical Weathering." Need Know Accomplish. 9 Feb 2012. < http://geology.about.com/od/geoprocesses/ig/mechweathering/>

[8] Michon Scott. "Nicolaus Steno (1638-1686) From Tuscant to the World." NASA Earth Observatory. 9 Feb 2012.< http://earthobservatory.nasa.gov/Features/Steno/steno5.php/>

[9] Andrew Alden. "Erosional Landforms." Need Know Accomplish. 8 Feb 2012. < http://geology.about.com/od/structureslandforms/ig/erosional/>

adopted. His interest in Geology was now missing and finally, he began to study in theology and dedicated the rest of his life to being a servant to the God[10].

Currently, there are more than 15 branches of Geology for example, Geophysics- study of Earth generally in physical and interpret the data showing Earth's properties, Hydrology- study of water in terms of forms and its effective use, and Mineralogy- study of valuable stone in physical and chemical ways, etc.[11] Environmental risks are now considered as the vital issues facing mankind, geologists are one of the outstanding careers which assist to solve the problem. Specialist in Geology is able to predict the upcoming catastrophe and provide the information to avoid the disastrous consequences. In 2004, the western coast of Thailand was hit by Tsunami. Dr Smith Dharmasaroja, who was the former head of Thailand's National Disaster Defence, previously predicted that the earthquake near Andaman Sea could release massive wave. He alarmed the government. However, he was neglected at and Tsunami attacked on December 26th, about five thousand people died[12]. The natural disaster issues have become more concerned by the public afterwards and as the result, this study case has been added to Thai compulsory educational curriculum.

Nicolas Steno seems to not be well-known by the world; however, his discoveries which are facts of Earth's processes were vitally devoted to today's universal geology education. The principles are the well-stabilized basement for present geologists as if his law of superposition-newer on top of older, and the

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[10] Eoin O'Carroll. "Nicolas Steno: The saint who undermined creationism." The Christian Science Monitor. 9 Feb 2012. <http://www.csmonitor.com/Innovation/Horizons/2012/0111/Nicolas-Steno-The-saint-who-undermined-creationism/(page)/2>

[11] Public Service Organization ITA. "Geologists." O*NET Occupational Information Network. 10 Feb 2012.< http://occupationalinfo.org/onet/24111a.html>

[12] Raffy Tima. "'Mad' Scientist Gets Belated Recognition." SEAPA Southeast Asian Press Aliance. 10 Feb 2012. <http://www.seapabkk.org/seapa-fellowship/fellowship-2005-program/57-mad-scientist-gets-belated-recognition.html>

knowledge have been broadened to many subcategories which are considerably beneficial to human being.

In conclusion, as Earth has evolved gradually, many related topics have been questioned. Some are difficult to answer in reality because there is no availability of the knowledge. However, Geology, initially introduced by Steno, has answered to these particular questions. It has minimized the gap between known and unknown subjects, generated new ideas to mankind about the Earth, complicated planet on which we live, and also broadened our perception of how we view the Earth.