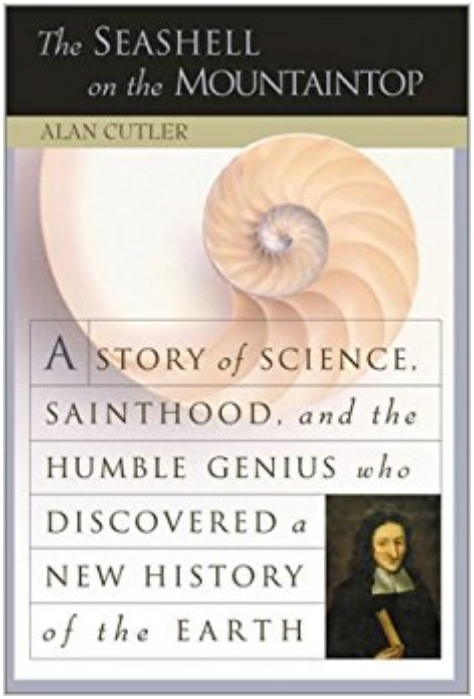
The Seashell On The Mountaintop: A Story Of Science Sainthood And The Humble Genius Who Discovered A New History Of The Earth



Synopsis

In the bestselling tradition of The Map that Changed the World and Longitude comes the tale of a seventeenth-century scientist-turned-priest who forever changed our understanding of the Earth and created a new field of science. It was an ancient puzzle that stymied history's greatest minds: How did the fossils of seashells find their way far inland, sometimes high up into the mountains? Fossils only made sense in a world old enough to form them, and in the seventeenth century, few people could imagine such a thing. Texts no less authoritative than the Old Testament laid out very clearly the timescale of Earth's past; in fact one Anglican archbishop went so far as to calculate the exact date of Creation...October 23, 4004, B.C. A revolution was in the making, however, and it was started by the brilliant and enigmatic Nicholas Steno, the man whom Stephen Jay Gould called "the founder of geology." Steno explored beyond the pages of the Bible, looking directly at the clues left in the layers of the Earth. With his groundbreaking answer to the fossil question, Steno would not only confound the religious and scientific thinking of his own time, he would set the stage for the modern science that came after him. He would open the door to the concept of "deep time," which imagined a world with a history of millions or billions of years. And at the very moment his expansive new ideas began to unravel the Bible's authoritative claim as to the age of the Earth, Steno would enter the priesthood and rise to become a bishop, ultimately becoming venerated as a saint and beatified by the Catholic Church in 1988. Combining a thrilling scientific investigation with world-altering history and the portrait of an extraordinary genius, The Seashell on the Mountaintop gives us new insight into the very old planet on which we live, revealing how we learned to read the story told to us by the Earth itself, written in rock and stone.

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Customer Reviews

Science writer Cutler (a contributing editor to The Forces of Change: A New View of Nature) re-creates a fascinating 17th-century world of political and religious upheaval and the progress achieved by curious scientists like the Danish anatomist and (according to Cutler) founder of geology, Nicolaus Steno (1638-1686). A one-time medical student renowned for "his preternatural skill with a scalpel," Steno discovered the parotid gland, which produces saliva, and tear glands. Steno's genius for anatomy provided him the tools to work on the mystery of fossils and the question of how seashells could be found in the rocks of mountains far from the sea. He hypothesized that layers upon layers of earth formed sediments in a sequence, recording a series of events and telling a story about the age of the earth. According to Steno, the stratum at the bottom is the oldest and that at the top is the youngest. Seashells, he said, found their way to mountaintops not by the great biblical flood, as many of his contemporaries believed, but by constant erosion and the sedimentation of soil. Steno published his discoveries in De Solido, after which he abandoned science, converted to Catholicism and spent the last 20 years of his life as an ascetic priest and eventually a bishop. In 1988, he was beatified. Cutler's animated and energetic prose provides a page-turning thriller of scientific discovery, and this splendid biography captures in intimate detail not only its subject but also the tenor of Steno's times.

In piquant contrast to the oft-told tale of Galileo, the acclaimed martyr of astronomy, Cutler recounts the little-known story of Nicolaus Steno, the neglected saint of geology. Living scant years after Galileo, Steno devoutly embraced the church even as he advanced a revolutionary science that tested orthodoxy at least as much as Copernicanism. Despite his conversion to Roman Catholicism, Steno was undeterred from his scientific quest to understand why petrified sharks' teeth--and other remains of sea creatures--frequently appeared in rocks high in the Tuscan mountains. With his publication of the principle of superposition, Steno gave scientists a key to reading the history of the planet in its rock layers, a premise still central to modern geology. His theory discredited many traditional readings of Genesis, but Cutler finds no evidence that church censors disapproved of Steno's work or that Steno himself ever regarded his theory as a threat to his faith. Indeed, Steno concluded his life in holy orders and ultimately qualified for posthumous beatification. A sophisticated portrait of a forgotten pioneer. Bryce Christensen

Readable, well written account of the early, mostly unknown scholar who first published the basic insights that allow interpretation of earth history from study of sedimentary layers in earth structures. Fossil sea creatures had been recognized as oddities, incongruities occurring high above sea level, even on mountain tops, from before the rise of the Roman Empire. But they remained puzzles, with no reasonable explanation. Nicholas Steno recognized them as real remains of sea creature, that grew in the sea and became part of rock layers later raised into mountains by forces within the earth. His ideas were far ahead of his time, his writing ignored for centuries. But he is properly recognized today as among the very earliest of thinkers leading to the science of geology and a rational understanding of the history and actual age of the planet. Fascinating history.

Review of The Seashell on the Mountaintop: How Nicolaus Steno (1638-1686) solved an ancient mystery and created a science of the earth By Alan CutlerA quotation dominated reviewby Walter H. PierceThis text is both historical and biographical, focusing mainly on Steno’s geologic discoveries regarding fossils and fossilization. Cutler views Steno’s chief achievement as simply: "He showed that the earth had a history, revealed in its own rocks." (page 201) The text is also an important contribution to the history of Science and does an excellent job of putting Steno’s contributions into the context of the development of science during the seventeenth century. Also reading is easy and supported by the author including the right proportion of interesting and spicy facts. "This book is aimed at general readers and is not intended to be a scholarly work. For this reason I have not included end notes or compiled an exhaustive reference list. Most of the quotations from Steno’s geological work." (page 208) In spite Cutler’s disclaimer the book contributes mightily to our knowledge of Steno.Below the reviewer has italicized text that is quoted from Cutler’s book. In addition quotations attributed to Steno are emboldened."Steno’s changed our place in time. It removed us from the center of the standard Biblical narrative and gave our world a new history. The time encompassed by this new history expanded from a mere six thousand years to nearly five billion. Vastly older than the human species, the world could no longer be claimed as our exclusive domain." (Page 7)Cutler brings into the context precursor, contemporary, and successive scientists. This book is a real contribution to the history of science during an episode when the word science is just barely beginning to be used in our modern sense. The following partial list gives some idea of the rich biographical context of the book: Bartholin, Descartes, van Gorp, Redi, Kircher, Borelli, Spinoza, Avicenna, Lister, Boyle, Newton, Hooke, Ray, Leibniz, Woodward, Reaumur, Ussher,

Boulanger, Voltaire, Thomas Jefferson, Arduino, and Goethe.What I enjoyed most about this book is that Cutler has attempted to give us from Steno's own words a window on how Steno reasoned and gave birth to this new science of geology. But first we are given a background into how Steno learned science as he understood it."He was, first, an anatomist of spectacular skill at a time when the inner workings of the human body were still very much terra incognita. As a young man, he dazzled the scientific world with a string of anatomical discoveries." (Page 2)"Artists, he said, often observed the body more accurately than did scientists." (Page 93)"No doubt," he added, "hidden among what I myself have discovered,: there were things "simpler and more obvious than what I have seen." (page 93)"What is most evident receives the least attention." (Page 93)To Steno, separating answerable from unanswerable questions was the key to scientific investigation. (page 103)Cartesian Thought"The Scientific Revolution had seemed to offer an antidote to the confusion. It was as much a reaction against the radical skepticism prevailing in some quarters as it was against the dogmatic certainties of the Scholastics. When Descartes proposed his "method of doubts," it was because he believed, like Bacon, that it was the path to certainty. After erroneous ideas were discarded he said, what remained would be certain." page 90"Cartesian anatomy was a product not so much of observation as of reason." (page 87)"The keystone of Cartesian anatomy was the theory of the heart. The dispute had always been whether this heart was a muscular pump, forcing blood into the blood vessels during its contractions, or if it was a furnace, generating the body's heat and causing the blood inside it to violently expand and rush into the vessels." (page 87)"Soon after reading the book, Steno and a friend dissected an ox heart to see how it squared with Descartes's contentions. After boiling the heart to soften it and peeling away its outer membranes, Steno found that its walls were fibrous like a muscle. He saw also that the fibers were arranged in such a way that by shortening they would squeeze the heart precisely as it would normally contract to force blood into the arteries--just like a pump.This was a shock, Steno said, because up to that point he had held Descartes to be "infallible." (Page 87-88)"His Faith in Cartesian science was utterly destroyed. If the "indisputable evidences" of Descartes and his followers were errors "which in an hour or so I can get a ten-year-old to demonstrate," said Steno, "what certainty can I then have about other subtleties of which they boast?" Page 88In Florence a research group, the first of its kind, was being set up by the Medici family. The emphasis was on experimentation and inductive reason rather that deduction and Cartesian science.Accademia del Cimento (Florence)".....Florence, indeed all of Europe, was in a state of transition. The Renaissance had pretty much run it course. The convulsions of the Protestant Reformation had mostly subsided. The Age of the Enlightenment , on the other hand, was barely on the horizon. It

was an awkward, in-between age--reborn, reformed, but not yet enlightened." (Page 6)"In setting up their hothouse for the new experimental philosophy the Medici brothers were following an old family tradition. Wielding power off and on for nearly four centuries, the Medici clan had always been patrons t the greatest artists and philosophers in Florence. Medici money paid for the art of Michelangelo and Botticelli, it underwrote Marsilio Ficino's translation of Plato. Niccolo Machiavelli had dedicated the Prince to a Medici patriarch, Lorenzo the Magnificent." (Pages 49-50)"For someone of Steno's interests it was close to paradise. Corpses could be had from the hospital or gallows with a wave of the grand duke's hand. The court menagerie supplied a wonderful variety of exotic animals to dissect. And should one desire a particular kind of beast not already on hand, His Serene Highness would dispatch hunters or have his agents abroad obtain specimens." (page 51)"The Cimento was unique. In their wigs and brocade jacket, Ferdinando and Leopoldo's experimenters dissolved pearls in acid and used plates of solid gold to prove the penetrating force of magnetism, all to the delight of the court." (Page 51)"The Cimento was breaking up. For several years, relations within the group had been deteriorating. Much of the problem could be traced to the brilliant but quarrelsome Giovanni Alfonso Borelli. Borelli had no patience with his intellectual inferiors, and was suspicious of his few equals. Under Leopoldo's protection, Borelli had just published a treatise on the forbidden Galilean astronomy that in some ways anticipated Newton. Some years before, he and Viviani had been the first to measure the speed of sound: now they were barely on speaking terms." Page 81Tongue Stones, Glossopetrae, sharks teeth and Fossils"Today the word (fossils) is generally used for the preserved remains of ancient plant or animal life - bones, teeth, shells, wood, and so on --- found in rock strata, but it formerly included all distinctive stones, crystals, gems, and mineral ores that one might dig up." (page 31)The same year that Steno arrived at the Cimento a strange event happened. "Dragged onto shore and clubbed to death, the shark, a great white, tipped the scales at 3,500 Florentine pounds -- about 2,800 pounds in today's measure. By the grand duke's order it was butchered, the body and entrails cast back into the sea, and the head sent on its way to Florence, where Steno waited." (page 54)" What particularly interested Steno, however, were the teeth. Steno recorded no dimensions, but those of a shark the size of Steno's would likely have blades up to three inches high. Many were missing, having been cut out on the beach during the excitement of its capture, but hundreds remained. Each jaw held thirteen rows of teeth. Steno noted that the inner rows were soft and half-buried in the gums. He did not see what purpose they served. As for the outer rows, there was no question: The sharp, serrated blades were admirably designed for grasping the shark's prey and slicing it to pieces." (page 56)Cutler points out that Steno was not the first to notice the resemblance of these

sharks teeth to Glossopetrae or Tongue Stones. Steno go on to study the more general problem of fossils."Glossopetrae did not actually look much like snake fangs, nor did they look much like woodpecker's tongues, another hypothesis. But before Rondelet examined his French specimens, there were not better alternatives. Probably few people had seen the inside of a shark's mouth and lived to tell the tale." Page 57" It was clear to Steno that the tongue-stone question was really only a special case of the general problem of fossil seashells and other "marine bodies" dug from the earth in places far from the sea. Shells and other marine fossils were often found side-by-side with tongue stones in rocks. The answer to the question lay in understanding how all of these bodies, not just tongue stones, came to be found there. And that meant studying not only the fossils themselves, but the places where they occurred and the materials in which they were embedded." (page 59)"The problem, then, that faced Steno was not that there was no explanation for seashells and tongue stones inside rocks. There were too many explanations." (page 62)Continuing on, Cutler describes how Steno the anatomist proceeds from dissecting a giant shark to recognizing and defining a geologic problem, and in so doing inventing our modern sciences of paleontology and geology.Geologic travel and field workOn his way to Florence, Steno traveled through the south of France, then through the Alps and Apennines over a period of six months with many stops and side trips. If he had never been had the chance to see with his own eyes layers of rock packed with fossilized shells, or strata raised and contorted into mountains, he certainly saw them then." (page 44)"After excursions to the hill-top city of Volterra and the mines on the island of Elba, he wrote enthusiastically to Magalotti, "Everything I saw confirmed my opinion or rather the opinion of the Ancients which I defended in my last treatise" regarding "the origin of mussels, shellfish, and glossopterae found in mountains." (Page 104)"He traveled for twenty months, covering nearly four thousand miles, looping through not only Italy, but the Swiss and Austrian Alps, passing through Vienna, and meandering as far a field as northern Hungary." (page 125)"He had seen the famous Mount Vesuvius in the south of Italy, in the Alps he had seen high peaks and fantastically contorted strata, in the famous mines of Germany and Hungary he seen rich deposits of minerals. He spent almost six months in Germany, in interval of time about which almost nothing is known." (page 125)"The veins came after the rocks, they were not from "the beginning of things." Page 143De Solido Intra Solidum Naturaliter Contento Dissertationis ProdromusProdromus to a Dissertation on Solids Naturally Enclosed in SolidsThe Prodromus was intended as an outline or extended abstract of a larger report which was either lost or never finished. Cutler gives us the following quotation from the introduction to the Prodromus which must give us a sense of his feeling on entry to a new realm of research: "I saw that I was wandering in the kind of labyrinth where the nearer one comes to the

exit, the greater the circles in which one walks." (page 208)"To Steno separating answerable from unanswerable questions was the key to scientific investigation." (page 113)Ultimately, Steno's achievement in De solido was not just that he proposed a new, and correct, theory of fossils. As he himself pointed out, writers more than a thousand years earlier had said essentially the same thing. Nor was it simply that he presented a new and correct interpretation of rock strata. It was that he drew up a blueprint for entirely new scientific approach to nature, one that opened up the dimension of time. As Steno wrote, "from that which is perceived a definite conclusion may be drawn about what is imperceptible." From the present world one can deduce vanished worlds. (page 113-114)"Armed with his new science, Steno was emboldened to delve deep into the past, to explore a new history of the world "not dealt with by historians and writers on things of nature." (Page 114)Out of the Prodromus the following principles remain with us today. Principles that are so simple and lucid that today we think they must have been obvious except that no one before Steno had exposed them. Stratgraphic Principles: Three Principles 1) Superposition 2) Original Horizontality 3) Lateral Continuity,and one Mineralogic Principle: Law of the Constancy of Interfacial Angles.My hope would be that Cutler in a future edition of this work can bolster his treatment of the Law of the Constancy of Interfacial Angles.Live as a Priest and Bishop (1675-1686)Soon afterwards Steno devotes his live to God as a priest. He is sent to Germany to serve the Catholic Church as a Bishop. Starting out in Hanover, Steno was responsible for western Germany, Denmark, and Norway. To the dismay of Leibniz a friend in Germany, Steno had essentially turned his back on science. He began to practice asceticism and this rigorous livestyle may have harmed his health. Upon death at 48 years he had almost no worldly possessions. "According to Johannes Rose's inventory, Steno's clothing and personal furnishings consisted of 'a wretched black garment, an old tunic, his old cloak, two sack cloth shirts, some small warn handkerchiefs which he also wore as cravats, and a night cap.' The funeral was delayed for nearly two weeks for lack of proper clothing to dress the corpse."Post DeathCutler devotes a substantial portion of this book to the history or relevant science between Steno's death and the influence of James Hutton. This is a real contribution on Cutler's part, but difficult to review adequately because it is a veritable who's who of early science. Please read the spicy parts about Woodward, they are worth the price of the book alone.ConclusionsCutler has done an extraordinary service to the geosciences. Steno's contributions are so central to our science, and it is true that he should be considered the Father of the Geosciences. Additionally this book is enjoyable to read. It can be either a tool for education or pleasure. We need to thank Cutler for making so much of this accessible. Of course we always want more, and in a second edition or perhaps in an expanded scholarly work, I would like to see a

schematic time line, and more on the Law of Constancy of Interfacial Angles (perhaps it is not available) .

This is a lively book, an account of the scientific career of Danish biologist Niels Stensen, and also very informative about how learned folk conceived of the sciences and practiced them, in an age which saw so many things so differently. It is fascinating to read Cutler's depiction of the transition from a more authority-based to a more reason-based era (to put it in simple terms), and also of the complexity of the personality of his individual subject. Cutler does not discuss Stensen's Catholic conversion or work as a cleric as extensively as some might hope, but he admits that he does not consider himself able to address these topics, and writes engagingly and with depth about other aspects of Stensen.

This book details the life and times of a brilliant Danish anatomist, turned geologist, turned priest, bishop, then saint. His contemporaries were the likes of Sir Isaac Newton, Robert Hooke, the philosophers Leibniz, Spinoza and Voltaire. But this book is more than a biography of Nicholaus Steno: it is a magnificent tapestry depicting the interplay of faith (or atheism) with the scientific data known at the time and the personalities of those with competing theories to explain a simple phenomenon. Why are seashells found on the tops of mountains? It is difficult to imagine today why and how this simple fact generated a debate spanning some 150 years and how Steno's simple but elegant explanation was all but lost for many of them. Alan Cutler has done an admirable job bringing to life the debates, questions, and controversies that faced the scientists of the seventeenth century.This incredibly readable book is indeed the story of the birth of a science. We now know it as geology. If you are at all interested in this topic you will love this book!

I am a professor of geology who teaches History of Geology at a major US university. I used this book for the first time this year and it was very well received by the students. Cutler is an outstanding writer. He knows how to get the facts straight and at the same time tell an interesting story. I am a little perplexed at the claims made in another review of this book, namely that Seashell on the Mountaintop is "full of errors". Notably, the claimant doesn't list a single one of these supposed factual errors. I know a little bit about the History of Geology, and I have not yet found a single error in Cutler's manuscript. With regard to the reviewer's wish that Seashell on the Mountaintop "be burnt", I quote John Milton: "Who kills a man kills a reasonable creature, God's image; but he who destroys a good book, kills reason itself, kills the image of God, as it were in the

eye. Many a man lives a burden to the earth; but a good book is the precious life-blood of a master spirit, embalmed and treasured up on purpose to a life beyond life."Seashell on the Mountaintop is a very good book indeed.

The Seashell on the Mountaintop: A Story of Science Sainthood and the Humble Genius Who Discovered a New History of the Earth Humble Heart: A Book of Virtues (Humble Bumbles) Carl Linnaeus: Genius of Classification (Genius Scientists and Their Genius Ideas) Visions of Sainthood in Medieval Rome: The Lives of Margherita Colonna by Giovanni Colonna and Stefania Kingdom of the Seashell: The Colorful Story of Shell Collecting Marching to the Mountaintop: How Poverty, Labor Fights and Civil Rights Set the Stage for Martin Luther King Jr's Final Hours (History (US)) Combating Mountaintop Removal: New Directions in the Fight against Big Coal The Equation That Couldn't Be Solved: How Mathematical Genius Discovered the Language of Symmetry Seashell Patterns Coloring Book (Dover Nature Coloring Book) The Seashell Anthology of Great Poetry by unknown unknown Edition [Paperback(2011)] A SandyÃ¢â ¬â„¢s Seashell Shop Christmas: An Outer Banks E-short Mountaintop Mining in Appalachia: Understanding Stakeholders and Change in Environmental Conflict (Stud in Conflict, Justice, & Soc Change) The Mountaintop (Modern Classics) Something's Rising: Appalachians Fighting Mountaintop Removal The Griffin and the Dinosaur: How Adrienne Mayor Discovered a Fascinating Link Between Myth and Science (Science & Nature) World History, Ancient History, Asian History, United States History, European History, Russian History, Indian History, African History. (world history) Freezing Colloids: Observations, Principles, Control, and Use: Applications in Materials Science, Life Science, Earth Science, Food Science, and Engineering (Engineering Materials and Processes) Humble before the Void: A Western Astronomer, His Journey East, and a Remarkable Encounter between Western Science and Tibetan Buddhism History: World History in 50 Events: From the Beginning of Time to the Present (World History, History Books, Earth History) (History in 50 Events Series Book 3) Radio Shangri-La: What I Discovered on my Accidental Journey to the Happiest Kingdom on Earth