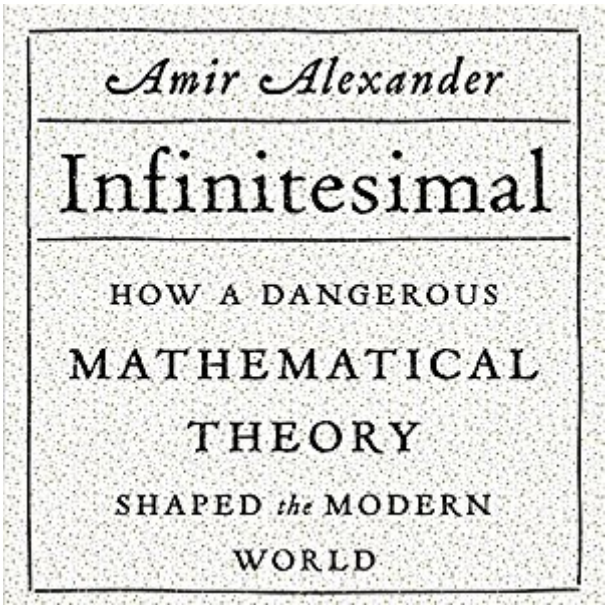
Infinitesimal: How A Dangerous Mathematical Theory Shaped The Modern World



Synopsis

Pulsing with drama and excitement, Infinitesimal celebrates the spirit of discovery, innovation, and intellectual achievement - and it will forever change the way you look at a simple line. On August 10, 1632, five men in flowing black robes convened in a somber Roman palazzo to pass judgment on a deceptively simple proposition: that a continuous line is composed of distinct and infinitely tiny parts. With the stroke of a pen the Jesuit fathers banned the doctrine of infinitesimals, announcing that it could never be taught or even mentioned. The concept was deemed dangerous and subversive, a threat to the belief that the world was an orderly place, governed by a strict and unchanging set of rules. If infinitesimals were ever accepted, the Jesuits feared, the entire world would be plunged into chaos. In Infinitesimal, the award-winning historian Amir Alexander exposes the deep-seated reasons behind the rulings of the Jesuits and shows how the doctrine persisted, becoming the foundation of calculus and much of modern mathematics and technology. Indeed, not everyone agreed with the Jesuits. Philosophers, scientists, and mathematicians across Europe embraced infinitesimals as the key to scientific progress, freedom of thought, and a more tolerant society. As Alexander reveals, it wasn't long before the two camps set off on a war that pitted Europe's forces of hierarchy and order against those of pluralism and change. The story takes us from the bloody battlefields of Europe's religious wars and the English Civil War and into the lives of the greatest mathematicians and philosophers of the day, including Galileo and Isaac Newton, Cardinal Bellarmine and Thomas Hobbes, and Christopher Clavius and John Wallis. In Italy, the defeat of the infinitely small signaled an end to that land's reign as the cultural heart of Europe, and in England, the triumph of infinitesimals helped launch the island nation on a course that would make it the world's first modern state. From the imperial cities of Germany to the green hills of Surrey, from the papal palace in Rome to the halls of the Royal Society of London, Alexander demonstrates how a disagreement over a mathematical concept became a contest over the heavens and the Earth. The legitimacy of popes and kings, as well as our beliefs in human liberty and progressive science, were at stake - the soul of the modern world hinged on the infinitesimal.

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Customer Reviews

As a math teacher, Iâ ™m often on the lookout for books that will help my students make connections between math and its importance, whether that be practical or historical. As I was teaching AP Calculus this year, Prof. Alexanderâ ™s book drew my attention. I was hoping for something that would really make a strong case for the importance of infinitesimal mathematics. Unfortunately, this book turned out to be something other than what I was looking for.Essentially, there was considerably less discussion of math than I expected. Though there are some nice forays into some important basics, the touches on the foundational ideas here are quite brief. Primarily, this is a book of history. And yet, even the focus of the history is not mainly on mathematical ideas. This is a history of conflict where mathematics played a small part.Infinitesimal is divided into two parts, each of which covers a major historical conflict. Part I deals with the Reformation and Counter-reformation. Our primary characters here are the Galileans and the Jesuits. In fact, there is a rather extensive history of the Jesuits and Prof. Alexander does a nice job of showing their developing educational philosophy. He describes how the Jesuits rejected the concept of the infinitesimal in favor of Euclidean geometry more for reasons of philosophy than general mathematics. In describing this conflict, however, Prof. Alexander deserves credit for being less hostile towards the Jesuits than one often finds in these descriptions, even if he overreaches a bit at the end, claiming that this rejection of the new math held back the development of math and science in Italy for centuries whereas the Protestant areas of Europe made the great leaps forward. This is not quite as true or as simple as Prof.

This book is much more than an esoteric history of an area of mathematics. It tracks the ancient rivalry between â ˆrationalistsâ ™ and â ˆempiricistsâ ™. The dominant rationalists have always believed that human minds (at least those possessed by educated intellectuals) are capable of understanding the world purely by thought alone. The empiricists acknowledge that reality is far too

complicated for humans to just guess its detailed structures. This is not simply an esoteric philosophical distinction but the difference in fundamental world-views that have deeply influenced the evolution of western civilization. In fact, rationalist intellectuals have usually looked to the logical perfection of mathematics as a justification for the preservation of religion and hierarchical social structures. In particular, the rationalists have raised the timeless, unchanging mathematical knowledge, represented by Euclidean geometry, as not just the only valid form of symbolic knowledge but as the only valid model of the logic of â œproofâ •.In particular, this book focuses on the battle between the reactionaries (e.g. Jesuits and Hobbes), who needed a model of timeless perfection to preserve their class-based religious and social privileges and reality-driven modernists, like Galileo and Bacon. The core of the disagreement was over the nature of the continuum, which was based on Euclidâ ™s definition of a line as an infinite number of points. This intellectual argument implicitly links back to reality: is matter made of distinct atoms with empty space between them or are there no gaps between continuous matter?