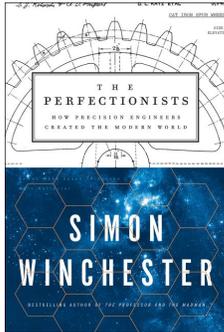


***The Perfectionists: How Precision Engineers Created the Modern World***  
by Simon Winchester, ISBN: 978-0-06-265255-3



Simon Winchester's *The Perfectionists: How Precision Engineers Created the Modern World* is a marvelous work of popular science, tracing the history of high-precision engineering from 1776 to present day. Precision engineering is a subdiscipline of effectively all other engineering disciplines. As the name suggests, precision is tantamount. High tolerances, repeatable results, and stability over time are the tenets of the practice.

The book's prologue starts with a delightful anecdote about a young Winchester and his father—a precision engineer to whom the book is dedicated. When Winchester was a boy, his father brought home some gauge blocks (also known as Jo blocks) from work. These metal blocks, used for measuring things to incredibly high tolerances, are so precisely ground flat that pressing them together makes them virtually impossible to break apart. The only way to separate them is not by pulling, but rather by sliding. The man who invented them was Carl Edvard Johansson, who makes an appearance later in the book.

Winchester then gives his readers a brief but thorough refresher course on the difference between precision and accuracy. Though often used interchangeably, the two terms mean something vastly different. Winchester presents the classic example of hitting a bullseye. If all of the shots are clustered together but are not near the center of the target, they are precise but not accurate. If all of the shots are near the center of the target but not necessarily close to each other, they are accurate but not precise. If all of the shots are clustered directly on the bullseye and even on top of each other, they are both precise and accurate. It is an incredibly important distinction in any field, but especially in engineering.

The prologue's combination of a brief, illustrative anecdote and detailed engineering explanation echoes through the rest of the book. Winchester begins each chapter with a contextualizing tale, either from history or from his personal repertoire. Even if the connection might seem tenuous at the beginning, Winchester deftly pivots back to a milestone of precision engineering in each case. He then offers a concise but significant explanation of exactly how precise that milestone's engineering is.

He dedicates each chapter of *The Perfectionists* to a subject with an increasingly higher tolerance, which not so coincidentally follows a fairly consistent timeline. Tolerance, per Winchester, is “the permissible variation in size from a specified standard allowed for a machined part.” He starts with steam engines (tolerance:  $10^{-1}$ ), then turns to ship-building ( $10^{-3}$ ), guns ( $10^{-5}$ ), screws ( $10^{-7}$ ), cars ( $10^{-10}$ ), planes ( $10^{-12}$ ), lenses for telescopes and cameras ( $10^{-13}$ ), GPS ( $10^{-17}$ ), and finally, computer chips ( $10^{-35}$ ).

In a great moment, Winchester turned to Eli Whitney. Whitney is perhaps best known to schoolchildren across America as the inventor of the cotton gin, but as Winchester so eloquently puts it, he was a “charlatan” of precision engineering. In early 19<sup>th</sup> century America, reliable weaponry was something of a challenge. Handmade by gunsmiths, rifles were prone to misfires. Something as simple as an uneven surface on the inside of a barrel could mean the difference between shooting someone or being shot at first on the battlefield. Gun repairs could take weeks, as each part had to be fixed by hand. Thomas Jefferson, while a US ambassador to France,

became aware of the country's practice of gun-making. The French made interchangeable parts for their weaponry. If something on a rifle failed to perform or broke, it could be easily swapped out for a newer part.

Jefferson pushed for the US to contract someone to make American weaponry following the French system. And Whitney—who knew nothing about the musket-making business—used his connections as an alumnus of Yale to win the government commission. He even went so far as to present his “work” in front of President John Adams and Jefferson, then vice-president, and for lack of a better word, totally bamboozled them.

Winchester's Whitney revelation is one of many such juicy historical tidbits peppered throughout *The Perfectionists*. His prose flows effortlessly, and although it sometimes dips too quickly or too deeply into engineering jargon, the ever-self-aware Winchester includes a “Glossary of Possibly Unfamiliar Terms.” It spans eight pages from “accuracy” to “wabi-sabi.”

All in all, a wonderful read for a fall weekend.

*Review by Jeanette S. Ferrara, MA*