



The Substance of Civilization: Materials and Human History from the Stone Age to the Age of Silicon

By Stephen L. Sass

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Why does glass break and metal bend? A fascinating and fun exploration into why materials do what they do—and how they advanced the world over centuries.

How would history have unfolded without glass, paper, steel, cement, or gunpowder? The story of human civilization can be read most deeply in the materials we have found or created, used or abused. They have dictated how we build, eat, communicate, wage war, create art, travel, and worship. Some, such as stone, iron, and bronze, lent their names to the ages. Others, such as gold, silver, and diamond, contributed to the rise and fall of great empires. The impulse to master the properties of our material world—and to invent new substances—has remained unchanged from the dawn of time; it has guided and shaped the course of history. Yet among vast change, there are constants—the same clay used in the pottery of antiquity has its uses in today’s computer chips.

With “diverse and illuminating examples [and] infectious enthusiasm,” engineering professor Stephen Sass shows how substances and civilizations have evolved together. Moving from the days of prehistoric survival to the cutting edge of nanotechnology, this book—perfect for fans of accessible science reads such as Mark Miodownik’s *Stuff Matters* or Sam Kean’s *The Disappearing Spoon*—connects the worlds of minerals and molecules to the sweep of human history. It shows what materials will dominate the century ahead, and “convey[s] the richness of the material world and the ingenuity of humankind in making use of it” (*Kirkus Reviews*).



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Editorial Review

From Scientific American

Although the author and his publisher committed the unforgivable sin of omitting an index, *The Substance of Civilization* indeed contains much of substance and is a good starting place to develop an appreciation for the history and nature of materials science.

From [Booklist](#)

The word *civilization* brings images of the pyramids of Egypt, Greek temples, or great libraries and museums to mind, monumental structures that not only reflect idealized social order but offer evidence to support Sass' claim that "materials guided the course of history." None of these awe-inspiring constructions or their contents would have been possible without the ingenious manipulation of raw materials. The symbiotic relationship between the shape of culture and the evolution of technology is acknowledged in terms such as the Bronze Age, and Sass, a professor at Cornell University and a writer of both affability and precision, bridges the divide between history and science as he explains the unique properties of such key substances as clay, iron, glass, polymers, and silicon, and how they have affected every aspect of civilization from warfare to religion, politics, education, art, and economics. Noting the direct correlation between the complexity of any given society and the sophistication of the materials it uses, Sass provides diverse and illuminating examples with unflagging and infectious enthusiasm. *Donna Seaman*

From Kirkus Reviews

Remember when you learned about the Stone Age, followed by Bronze and Iron? Well, it didn't exactly stop there, and Sass, a Cornell materials-science professor, is our guide to all the successive wonders of luck, pluck, and technology that have enabled us to move from cave days to today's steel-polyethylene-and-silicon world. Moving chronologically, with some time out to explain what makes metal metal or introduce notions like yield strength, plastic deformation, and dislocations, Sass treats the reader to a materials-science course for the layperson, laced with lots of didja-knows: Did you know that smelting copper often meant releasing toxic arsenic gas, which is probably why Hephaestus in the Iliad is described as lame? That "carat" comes from the Greek *keration*, for locust-pod tree, because the dried pod nearly always weighed 200 milligrams (now the standard)? In short, there are gobs of wonderful trivia as well as accounts of the technological innovations that led to ever hotter furnaces, blown glass, steel from iron, and all the latter-day wonders, from synthetic rubber, celluloid, and rayon to aluminum alloys, Kevlar, plastics, silicon chips, and composites. How each of these material discoveries and inventions affected society is an important subtext but the point of view is largely apolitical. (The reader will infer that building bigger and better arms, however, has clearly been a strong motivating force for material invention.) Sass is not always successful in getting the reader over technological hurdles; there are pages of photos (unseen), but the text could surely use diagrams as well. What he does and does well is convey the richness of the material world and the ingenuity of humankind in making use of it. -- Copyright ©1998, Kirkus Associates, LP. All rights reserved.

Users Review

From reader reviews:

Walter Gagne:

Hey guys, do you desire to find a new book to see? May be the book with the headline The Substance of

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