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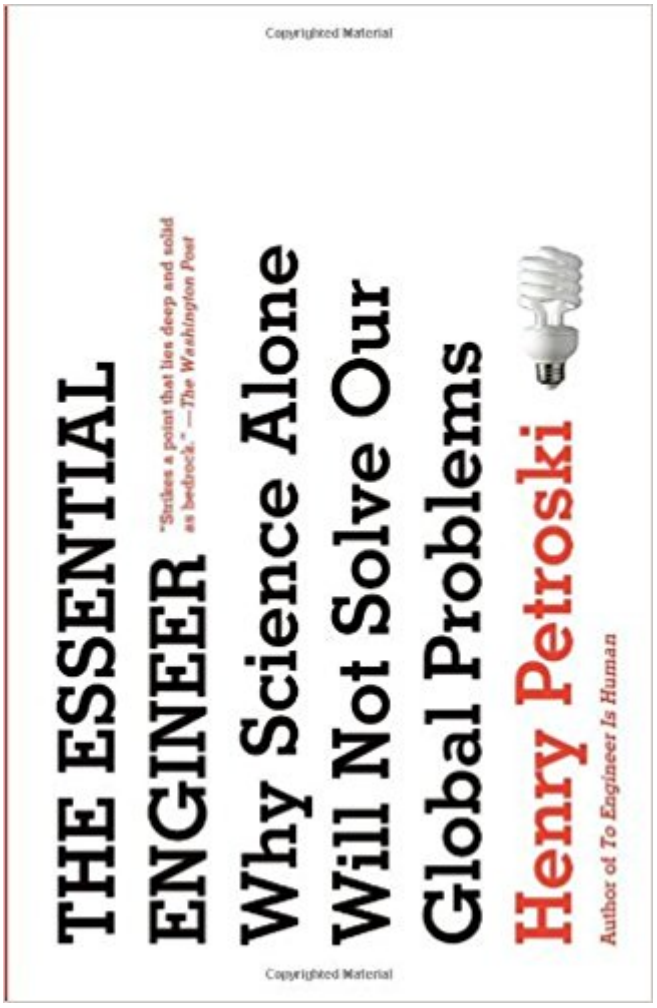
The Essential Engineer: Why Science Alone Will Not Solve Our Global Problems



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Synopsis

From the acclaimed author of The Pencil and To Engineer Is Human, The Essential Engineer is an eye-opening exploration of the ways in which science and engineering must work together to address our worldÃ¢â ¬â„¢s most pressing issues, from dealing with climate change and the prevention of natural disasters to the development of efficient automobiles and the search for renewable energy sources. While the scientist may identify problems, it falls to the engineer to solve them. It is the inherent practicality of engineering, which takes into account structural, economic, environmental, and other factors that science often does not consider, that makes engineering vital to answering our most urgent concerns.Henry Petroski takes us inside the research, development, and debates surrounding the most critical challenges of our time, exploring the feasibility of biofuels, the progress of battery-operated cars, and the question of nuclear power. He gives us an in-depth investigation of the various options for renewable energyÃ¢â ¬â •among them solar, wind, tidal, and ethanolÃ¢â ¬â •explaining the benefits and risks of each. Will windmills soon populate our landscape the way they did in previous centuries? Will synthetic trees, said to be more efficient at absorbing harmful carbon dioxide than real trees, soon dot our prairies? Will we construct a Ã¢â ¬Å“sunshadeÃ¢â ¬Â• in outer space to protect ourselves from dangerous rays? In many cases, the technology already exists. WhatÃ¢â ¬â„¢s needed is not so much invention as engineering.Just as the great achievements of centuries pastÃ¢â ¬â •the steamship, the airplane, the moon landingÃ¢â ¬â •once seemed beyond reach, the solutions to the twenty-first centuryÃ¢â ¬â„¢s problems await only a similar coordination of science and engineering. Eloquently reasoned and written, The Essential Engineer identifies and illuminates these problemsÃ¢â ¬â •and, above all, sets out a course for putting ideas into action.

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Customer Reviews

Exclusive: Henry Petroski on Science, Engineering, and Culture Science is by its very nature global. In fact, it is galactic, even universal. This is because science deals with universal laws, like the law of gravity. No matter where on earth I jump, gravity will pull me down according to the single law of universal gravitation. And no matter where an apple falls, it falls toward the ground. We believe that it has always been so, regardless of culture. But this is not to say that practicing science is independent of culture. It is proper to speak of American science, as distinct from, say, Japanese science. Indeed, at least one Japanese scientist has taken note of the fact that his culture has yielded a paucity of Nobel laureates. This has been attributed to the deference that the Japanese culture expects of the young toward the elderly. Prize-winning scientific breakthroughs often depend on rebellion against the prevailing paradigm, not deference to it. At the same time, the Japanese excel in technological endeavors. Their automobiles and consumer electronics are admired and bought around the world. The disciplined Japanese culture is well suited to the mass manufacturing of excellently engineered and highly reliable products. Those products that are exported fit nicely into the target culture; those that are for home consumption are distinctly Japanese. So there appears to be a significant difference between science and engineering and how they relate to culture. A commonly cited difference between the two endeavors is that science seeks to understand what is, whereas engineering seeks to create what never was. It is wrong to describe engineering as mere applied science. There is some extra-scientific component to engineering, something often referred to as the creative or artistic component. The engineer designing a bridge does not deduce its form from scientific laws and mathematical equations. Rather, like a poem or a painting, the bridge is formed first in the engineerÃ¢â ¬â„¢s mindÃ¢â ¬â„¢s eye. It is only then that the hypothesized structure can be given a scientific or mathematical litmus test. In engineering, analysis follows synthesis--not the other way around. It is essential that the similarities and differences between science and engineering be kept in mind when identifying and attacking global problems. Scientists and engineers come from different technical cultures as surely as Americans and Japanese do from different social ones. --Henry Petroski (Photo Ã Â© Catherine Petroski)
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For a quarter-century now, Duke University's Petroski has replaced Samuel Florman as the

foremost American civil engineer explaining to lay audiences the nature of engineering and its crucial role in improving the world. Petroski has long been outraged by the persistent elevation of scientists over engineers in terms of intelligence and creativity. Yet none of Petroski's 14 books on technology has argued so aggressively as his newest that engineers do not merely apply what scientists discover. Instead, engineers seek the most appropriate solution out of several to any engineering problemÃ¢â ¬â •not the supposedly single solution requiring diligence rather than depth. Analyzing both historical and contemporary examples, from climate change to public health, Petroski shows how science often overlooks structural, economic, environmental and aesthetic dimensions that routinely challenge engineers. Moreover, he says, sometimes science trails technology, as when engineers had to design the first moon landing vehicles before scientists learned its surface composition. Far from being hostile toward science, Petroski pleads for continued cooperation between science and engineering. When, as Petroski laments, even President Obama has sometimes omitted engineering in touting science, this book could hardly be more timely. Illus. (Jan.) Copyright Ã Â© Reed Business Information, a division of Reed Elsevier Inc. All rights reserved. --This text refers to an out of print or unavailable edition of this title.

In this highly engrossing book, Petroski eloquently challenges a fundamental and profound bias in our society--the relegation of engineers and engineering to second-class status among professions. He traces to roots of the perceived primacy of science over engineering to the Western Platonic bias that "ideas are superior and prerequisite to things" and to the simplistic linear model of research-before-development promulgated by science administrator Vannevar Bush in the 1940s. Petroski uses examples such as the steam engine, powered flight and rocketry, to demonstrate that engineering often leads science, and also that science is a tool of engineering. He also compellingly describes the optimistic, challenging, rewarding nature of engineering, showing its satisfying creativity. And to demonstrate the richness of engineering, he takes the reader through a tour of technologies as seen through the eyes of an engineer, including speed bumps and humps, dams, climate change, "geoengineering" of the earth to combat climate change, renewable energy, nanotechnology, robotics, structural earthquake engineering, hurricane protection, airline accidents, the electric power grid, evolution of the automobile, and "financial engineering." This book is essential reading, not only for engineers and students, but for all of us who benefit from the vast wealth of technology that makes modern life possible.

Good read, The author explains the difference between science and engineering, and explore the

complex relationship between the two. Thought-provoking.

satisfactory

Not sure what the intent of the book is, other than whining about the lack of recognition for the engineering disciplines.I am an engineer myself but this was not what I was expecting from this book.

Petroski aims to clarify the difference between science and engineering. He professes that, "Engineering and medicine are more like each other than like science." The book’s subtitle, Why Science Alone Will not Solve Our Global Problems, focuses Petroski’s conviction, drawing upon the support of some of the most creative scientific minds of the 20th Century, including Albert Einstein.One of the main problems of technological rescue, Petroski purports, is the high cost of technology. He points out how the Europeans are way ahead of the US in the race for renewable energy. The reason for their success is the high cost of petrol-based fuel. When the cost of petrol-energy exceeds renewable energy, technology will grow in that direction.Petroski explains in clear English how our engineering will garner a new way to harness the vast technology already within our grasp. His ideas bridge the once clear gulf between science and engineering. Engineering has shifted away from mere scientific application. The new technology, he claims, emerges from the amalgamation of different areas. If need is the mother of invention, then technology is the godfather of engineering. The author sees the day when technology will fill niches and support our ingenuity to fabricate a more efficient world.

I picked up this book from the library yesterday and I couldn’t put it down. Having been online since the late 80s (in the form of BBSs’ and such) and evolving personally through the evolution of the Internet, I’ve gotten into many discussions with scientists and people interested in science through the years.But I would always hit the same stumbling blocks. Their obsession over prediction and single answers drove me nuts - couldn’t they see that the world is more complicated than that? That you can’t predict everything - which makes attempting to tackle compexity as it stands all the more important?What I didn’t realize in all of this time, is that I think like an Engineer. I don’t think like a scientist.The subtle distinction of the brainstorming and the "how" and the "do we have enough time, money, resources" and "what will its effects be on the environment, people, the future?" are in the realm of the engineer moreso than the scientist.I’ve always been the "fix it" guy around here and

bold proclamations by scientists about "I know the Universal Truth here", by averaging out reality always felt more religious than 'scentific' in nature.And now I know why. I think like a hacker, like an engineer, like a technician. But when I am thinking about the science, and the whys of things - I know that I'm delving into an arena less of fact than of fiction, of stories not so different than Noah's Ark; explanatory tales of history that teach basic principles - but may or may not be true to reality.Engineering takes a more honest approach and creates something out of nothing. Dreaming drawing, planning, doing.it doesn't predict the future, but tries to anticipate and is always self-conscious that failure is always looming over the shoulder but it makes the pressure to do the best you can with the resources you have at hand a fantastic metaphor for approaching life.Thanks for a great book, one of only 2 on engineering in my whole library - at least the philosophical side.

As an aspiring mechanical engineer and student, I found this book to be highly informative. It's packed with knowledge of interesting technological concepts, which really helped to ponder my options to create positive change in the world.

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