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Better than a

## How the

**Vaclav Smil**

The Science of



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### Brief summary


How the World Really Works by Vaclav Smil is a comprehensive guide that explores the complex systems of the world, including energy, food, and transportation. It provides a macro perspective of how societies and nations depend on each other and the challenges they face in maintaining balance.

### Topics

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# How the World Really Works

## Summary of 5 key ideas

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### Key idea 1 of 5

## **The history of life on our planet is a history of energy conversions.**

Let's start at the beginning – the *very* beginning. Some three and a half billion years ago, when much of our planet's surface was little more than primordial soup, a new form of life emerged: simple, single-cell microbes.

These bacteria didn't have consciousness or mobility: they merely drifted aimlessly through Earth's seas. But they did have *metabolism* – the ability to convert one form of energy into another. That was how they accessed the nutrients they needed to survive and reproduce. The first form of energy was solar radiation from the sun. They used that energy to convert carbon dioxide and water into new organic compounds. While doing so, they created a by-product – oxygen.

This process, which is called *photosynthesis*, changed the planet's atmosphere. Before these microbes began photosynthesizing, it was oxygenless; but after hundreds of millions of years, the atmosphere had enough oxygen to support life as we know it. Life, in other words, began with energy conversion. And it continued that way, too. The entire history of our planet is a history of energy conversions.

For example, several hundred thousand years ago, there was another epochal shift. This was the first *extrasomatic* use of energy – that is, the conversion of energy outside the body. Previously, all energy conversion had occurred inside the cells of living things. More metabolism, in short. Cells unlocking nutrients by converting one form of energy into another. That's when a bunch of unusually clever apes – our ancestors – discovered the controlled combustion of plant matter.

Fire converts the chemical energy of plant matter, be it wood or peat or coal, into thermal energy and light. *Homo sapiens* began by using wood, of course – coal came much later. But that was enough to make indigestible foods edible, keep their shelters warm, and scare off dangerous animals. The use of fire was humanity's first step on the long road to reshaping and controlling its environment.

The domestication of animals some 10,000 years ago is another milestone in the history of energy conversions. Before humans learned to put animals like oxen to work, they relied on their own muscles to convert chemical energy into the kinetic and mechanical energy which hauled loads, plowed fields, and drew water from wells. Domestication outsourced that role to beasts of burden. Later innovations, like sails and waterwheels, delegated that work to the wind and flowing rivers.

Then comes the next milestone – the use of fossil fuels – which brings us into the modern age. After around 1600, humans started burning coal, a fuel created over millions of years as heat and pressure fossilized plant matter. Coal gave us the steam engine – the iron workhorse which powered early industrialization. After around 1850, the history of energy conversion picks up tempo, giving us ever more new energy sources: crude oil, electricity-generating water and wind turbines, geothermal electricity, and then nuclear and solar power.

The abundance of useful energy has changed every facet of human existence. It allows us to work less, eat better, travel more, and communicate more efficiently. Put differently, if you want to understand the miracle of modern life, you have to start with how we convert energy.

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## Key ideas in How the World Really Works

Introduction

**1** The history of life on our planet is a history of energy conversions.

**2** Energy is the ability to do work.

**3** Fossil fuels revolutionized agriculture.

**4** The agricultural revolution drove urbanization.

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**5** Electricity makes the modern world go round.

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## What is *How the World Really Works* about?

*How the World Really Works* (2022) tackles a paradox at the heart of the modern world: we've never had so much information at our fingertips and never known so little about how things actually work. Of course, we can't be experts in everything. But, Vaclav Smil argues, it's our duty as citizens to be informed about the basics – the big questions that shape our societies and their futures.

## *How the World Really Works* Review

*How the World Really Works* (2012) by Vaclav Smil is a thought-provoking exploration of the fundamental systems that shape our global society. Here are three reasons why this book is worth reading:

- Smil's **meticulous research** and data-driven analysis provide readers with a comprehensive understanding of the complex mechanisms that drive our world.
- By addressing a wide range of topics, from energy production to economic systems, the

book offers a **holistic perspective** on the interconnectedness of various global systems.

- **Without overwhelming readers with technical jargon**, Smil presents the information in a clear and accessible manner, making it engaging and easy to follow.

## Who should read *How the World Really Works*?

- History and science enthusiasts
- Anyone interested in how their food gets made
- Those wondering what energy actually is

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## About the Author

Vaclav Smil is a Czech-Canadian natural scientist and distinguished professor in the faculty of environment at the University of Manitoba in Winnipeg, Canada. He completed his graduate studies at Carolinum University in Prague and Pennsylvania State University. His research interests include energy, the environment, food, population, and economics.

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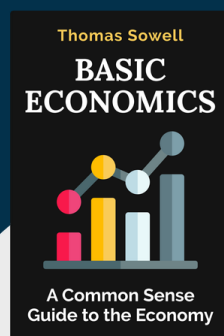


Science

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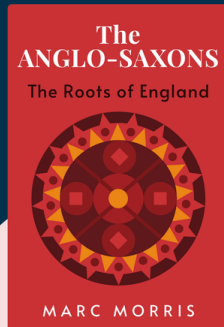
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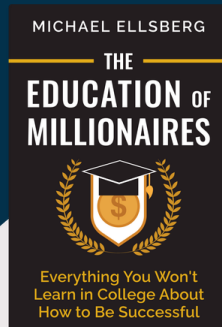


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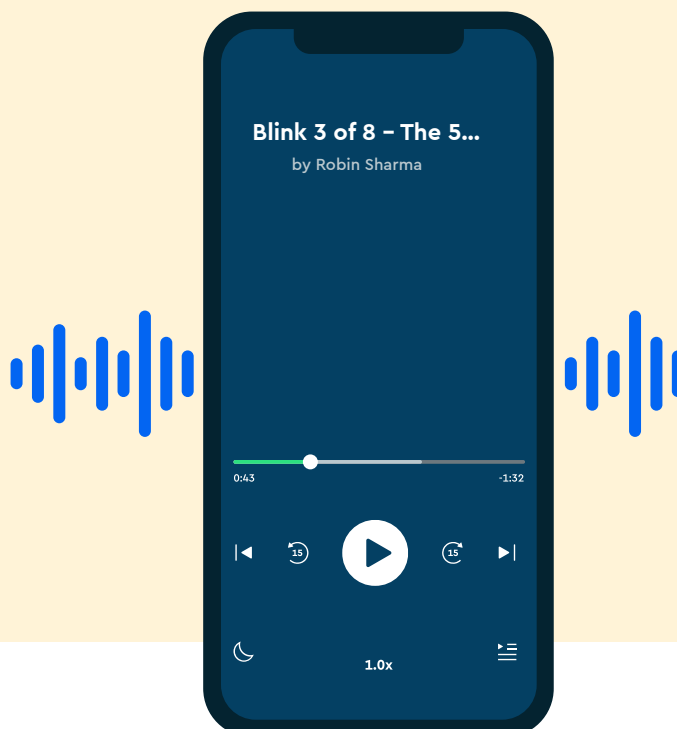
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