

This is an extract from the proposal for the book I'm current revising. Although many of the stories changed – that happens with proposals – the basic theme stayed the same. As of yet the book does not have a title: a title is always among the very last things.

This book shares with a popular audience, for the first time, the details of the powerful, revolutionary and, oddly, unknown engineering method that has influenced readers lives intimately, deeply, and lastingly. The book features human stories, perception-changing histories of invention, and accessible explanations of technology. These readable, bite-sized stories reveal a panorama of human creativity across millennia and continents, which readers can consume in a single sitting of fifteen or thirty minutes. They hear of technologies invisible to them, yet which profoundly affect their lives.

The public naïvely assumes the engineering method used to create our material and digital world is a simple outgrowth or variant of the scientific method that began with the early seventeenth-century work of Francis Bacon as summarized in his masterly *Novum Organum*, yet the engineering method precedes the scientific method by millenia. How engineers create their masterworks is unknown to the public. An astonishing statement in the face of one billion cars on the road, two billion personal computers, five billion cell phones, and the trillion requests processed yearly by Google's search algorithm. Most picture these achievements as coming from the stereotype of an engineer as a precise, pedantic applier of established scientific thought, yet this image is belied by the engineering method.

Instead of this stereotype readers will delight in the novel machine designed to move, at Catherine the Great's request, a four-million pound rock from a marsh in Finland to St. Petersburg, which forms the base of a statue that commemorates Peter the Great. Join Chester Carlson in a small apartment in Astoria, Queens, filled with noxious odors from his experiments, where, in 1938 he created the world's first photocopy. Walk the streets of Berlin in 1890 as Rudolf Diesel ponders a new engine for the masses to rebel against what he called the “false on economic, political, humanitarian, and hygienic grounds” of nineteenth-century industry — his engine, he hoped, would help power tools

for watchmakers, sewing machines for seamstresses, vegetable choppers for cooks, and wheelchairs, although instead it powers, today, container ships and concentrates manufacturing in China. Readers will puzzle with Constance Tipper, as she solves the mystery of why German U-boats rapidly sunk British ships in World War II and uncovers why the keels of Liberty Ships cracked open while ferrying critical supplies across the North Atlantic on the icy Archangel. And struggle with engineer Francis Arnold, the fifth woman to win the Nobel Prize in Chemistry, as she pioneers a novel way to engineer enzymes.

Through these stories and many others, this book reveals engineering methods and documents that it is composed *solely* of provisional experience-derived rules of thumb, and, yet, although provisional, when woven together these rules create works of stunning utility and reliability. This book illustrates how these imprecise, provisional, and often bizarre rules create technological marvels through stories of invention, innovation, and failure, connected by brief expository passages on the method. It follows the lead of the philosopher Bertrand Russell who said “Nothing of any value can be said on method except through example.”

This book opens with a simple definition of the engineering method — and a clear demonstration of what the method is and does — then enlarges and nuances this definition throughout the book. The chapters that follow start with a bold, big-idea title that springboards the reader into a story that illustrates the key theme announced in the title. The stories in the book mirror the story of humankind: the book sweeps from the flint tools of our cave-dwelling past, to the magnificent cathedrals of the Middle Ages, to today’s digital world. Readers see that in every era from prehistory to today, the engineering method has reflected the greatest aspirations, hopes, dreams, and struggles of humankind. The stories shared also document the *universality* of the method because the book uses examples from ancient history to today, from all cultures and across the globe (so, not exclusively the West). Readers see the ubiquity of the engineering method with stories about the stonehenge-like

construction built in 12,000 BC in Turkey, the cleverly engineered boats used in 1500 BC in Mesopotamia, and the manufacture of glass in 1000 AD in Islamic North Africa.