

BuchNotes for February 2010

If you had to identify one connection between the great pyramids of Egypt, Chartres Cathedral, the steam engine, the telegraph, the Apollo space exploration program and the Boeing 777, what would it be? The author, E. E. Lewis, former chair of the Department of Mechanical Engineering at Northwestern University, writes in his book, "Masterworks of Technology", the thread linking these diverse objects is technological innovation. This innovation has always originated in the same way: there existed a need for something new, or a need to do something better, and there was an inventive mind present to create the object or improve an existing one. Lewis uses a diverse and highly illustrative series of examples to depict the nearly continuous stream of technological innovation that has lead from elementary, utilitarian devices of antiquity to the highly sophisticated world we enjoy today. In the process he has compiled an informative history of technology.

Engineers, or more precisely, the problem solving thought process used by engineers, has always been at the heart of technological development. Until Galileo's era, nearly all advances in technology were the result of trial and error, hands-on "tinkering" by artisans, builders, and anonymous engineers. Improvements in design were fragmented and evolutionary.

With the advances in scientific thought starting in the Renaissance, and with Galileo in particular, technology became more grounded in science, mathematics, and the scientific method: detailed observations, direct experimentation, and careful measurements. As a result, technology advanced at an increasingly faster pace to where today its benefits are felt in nearly everything we do. Engineering evolved as the bridge between basic science and technology.

Another important factor in the increased pace of technological development that began in the Renaissance was the transition to a commercial society. The growth in commerce provided funds for technological development which in turn made commerce more productive, and more profitable, resulting in more money available for technological research and development.

Very few drawings existed before the time of Leonardo da Vinci in the 15th century. His drawings and those by other artist/engineers of the era were the first time drawings were used as a visualization tool in the development of technology. Pictorial perspective, codified by Leon Battista Alberti in 1425, was one of the most significant contributions to technology made during the Renaissance. By the 18th century, detailed, scaled engineering drawings were in used routinely and became an absolutely critical element in the development of increasingly complex technology.

The book begins with a presentation on the construction of the pyramids in 2800 BC, and hop scotches through history. Along the way, the book includes a description of the evolution of architectural/structural design from the relatively "heavy and short" churches of the Romanesque era to the "tall and light" Gothic cathedrals exemplified by the cathedral at Chartres. Also included are the 9th century evolution of waterwheels from undershot type, developed by the Romans, to the more efficient overshot design, and the evolution of the 18th Century steam engine from the Newcomen design to the

much more efficient engine developed by the Englishman James Watt. The book concludes with the engineering advances used in the Apollo lunar missions and the development of the Boeing 777.

Lewis pays particular attention to the technological and engineering genius of Galileo Galilei, 1564-1642. Galileo's investigations into the science of motion are better known than his research into the relationship between geometry and strength of materials. The latter forms the basis of structural engineering design we use today. The advances in structural engineering by the Scottish engineer, Thomas Telford in the late 18th century are presented along with other significant engineering developments of the 19th century. Most significant among these were the introduction of Portland Cement concrete, iron, and steel as structural engineering materials.

"Masterworks of Technology" is a short book, only 325 pages, and very accessible to the non-technical reader. It was published in 2004 by Prometheus Books and would be enjoyable for anyone interested in the relationship between technology, engineering, and society as a whole.

Submitted By

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