

History of Technology: An Energy Perspective

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Technological change is a cumulative process. Today's technological systems are based on evolutionary changes that were invoked at the dawn of human civilization with harnessing of fire and development of tools. The lecture will give a brief overview of technological change that increased human populations from dozens of millions of the hunter-gatherer societies to one billion at the onset of the industrial revolution.

The primeval hunter-gatherer tribes and communities were fundamentally transformed by the so-called Neolithic revolution that established agriculture, bronze and later iron tools and thereby led to the emergence of early civilizations. These societies relied on solar energy for agriculture and food processing. Later they harnessed wind power and sailing ships became the main form of transport. However, most of the mechanical work was provided by human and animal muscle power. Slavery was common. Water wheels and wind mills were known since antiquity but they did not become important before the medieval times.

The second fundamental change in technological base started with the industrial revolution. In the broadest sense, technological advance has liberated the humanity from the constraints of natural environment. It has replaced human and animal work by inanimate energy sources, primarily fossil energy, first coal followed by crude oil and natural gas. For millennia, societies were organized to harness the work of animals and slaves. Technological innovation and diffusion allowed for liberation from physical toil of about half of the humanity now living in affluence, most of them in urbanized areas. It has led to almost universal abolishment of slavery and in general a great advance of humanity. This opened new frontiers increasing global populations by a factor of more than six in two centuries. This explosive development is still ongoing.