LECTURE

Technological Progress and Sustainability: A Look at the History and Future of Human Societies

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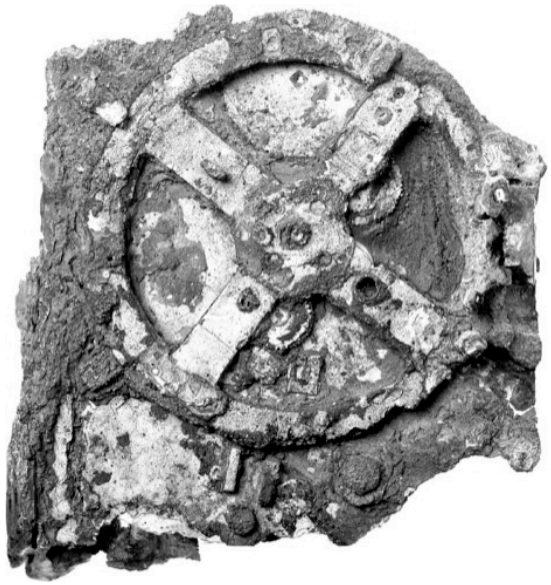


The main fragment of the Antikythera Mechanism", found after two thousand years underwater.

Bamboo bicycle, somewhere in West Africa...

An Overview

- **Background:** I became interested in this topic as a specialist in the history and philosophy of science and technology...

- **Introduction:** A key theme of the BtSM conference this year, "Learning for Sustainable Futures", can be approached from a history of technology perspective, and we will use that approach to address two key questions:

  (a) There has been peculiar asymptotic development of technology from the nineteenth-century to the present — can it be continued? *Should* it be continued?

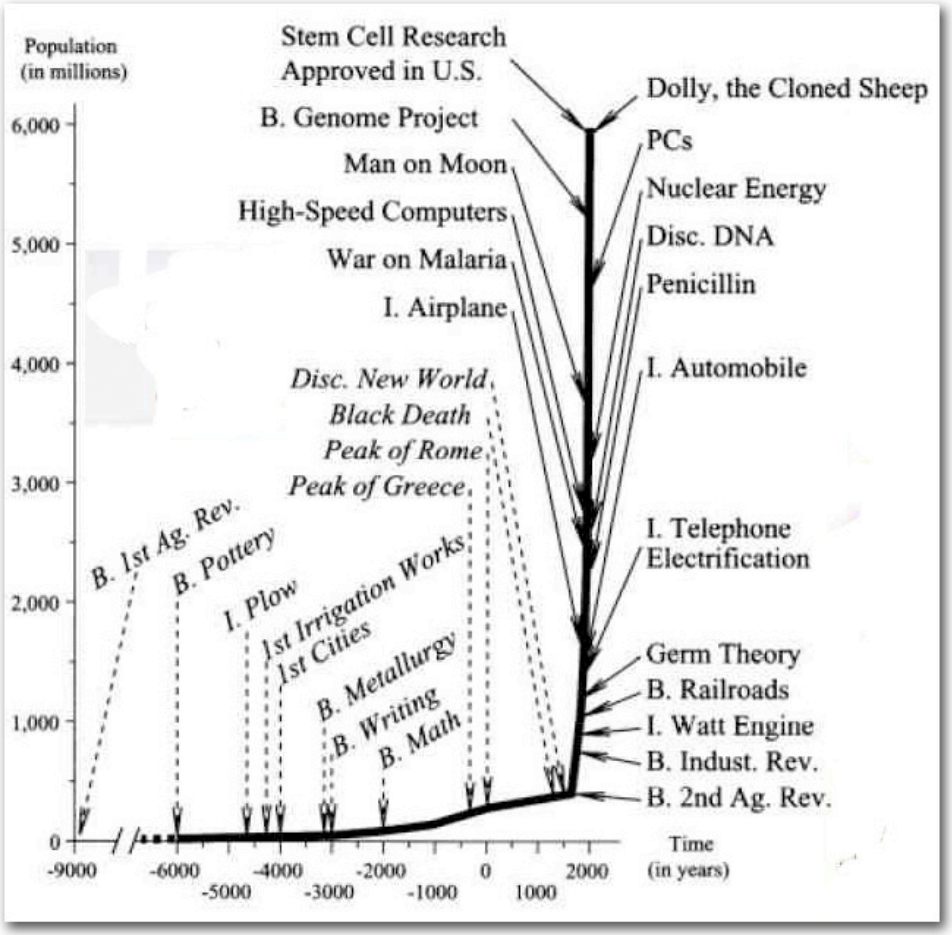
  (b) What other kinds of futures for human society might there be — that is, futures other than ones with more and more technological advances?

- **Analysis:** Critical factors in (a) and (b) include limitations on the Earth's resources, the arising of a "new Luddism", questions of meaning and identity for us as human beings, and the critical need for a *sustainable future*.

- **Conclusions:** The history of technology can address the nature of technological development, particularly as a way of talking intelligently about the role of technology in the future. There is a vital role for historians of technology not just as historians, but also as prognosticators and policy-makers concerning the making of a sustainable future...

Introduction

- There has been a peculiar asymptotic development of technology from the nineteenth-century to the present...
- But this may be an aberration...
- If we look at history carefully, we see that actual developmental patterns of human civilizations are cyclical or completely unpredictable in terms of technology...



Graph from Robert Fogel, *The Escape from Hunger and Premature Death, 1700-2100: Europe, America, and the Third World* (Cambridge: Cambridge University Press, 2004)

Introduction (continued)

- One way to address the question of a "sustainable future" *is to address the question of the future of technology...*
- We need to move away from current disciplinary boundaries, and the current media mantra that technological progress is "inevitable"...
- Economics, sociology, and history all play a role in the future of technology, and more subtly, we can look at the relation of humanity and human consciousness as a whole to the future of technology...

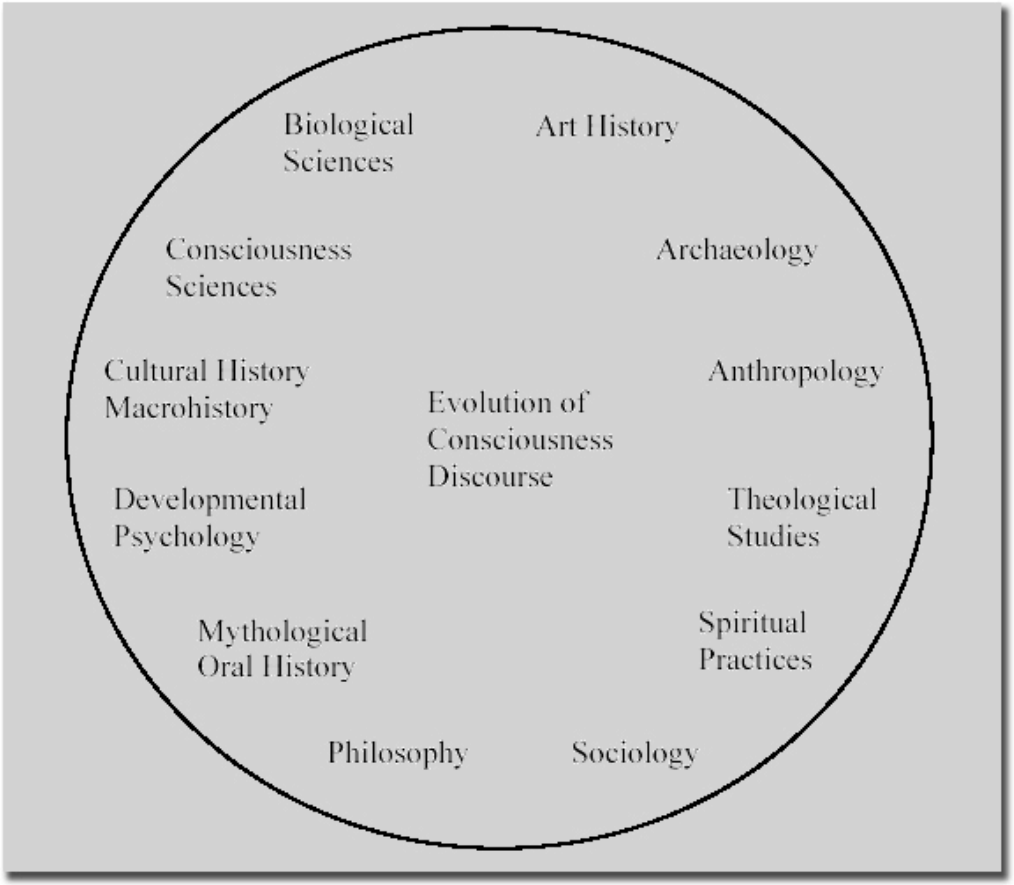
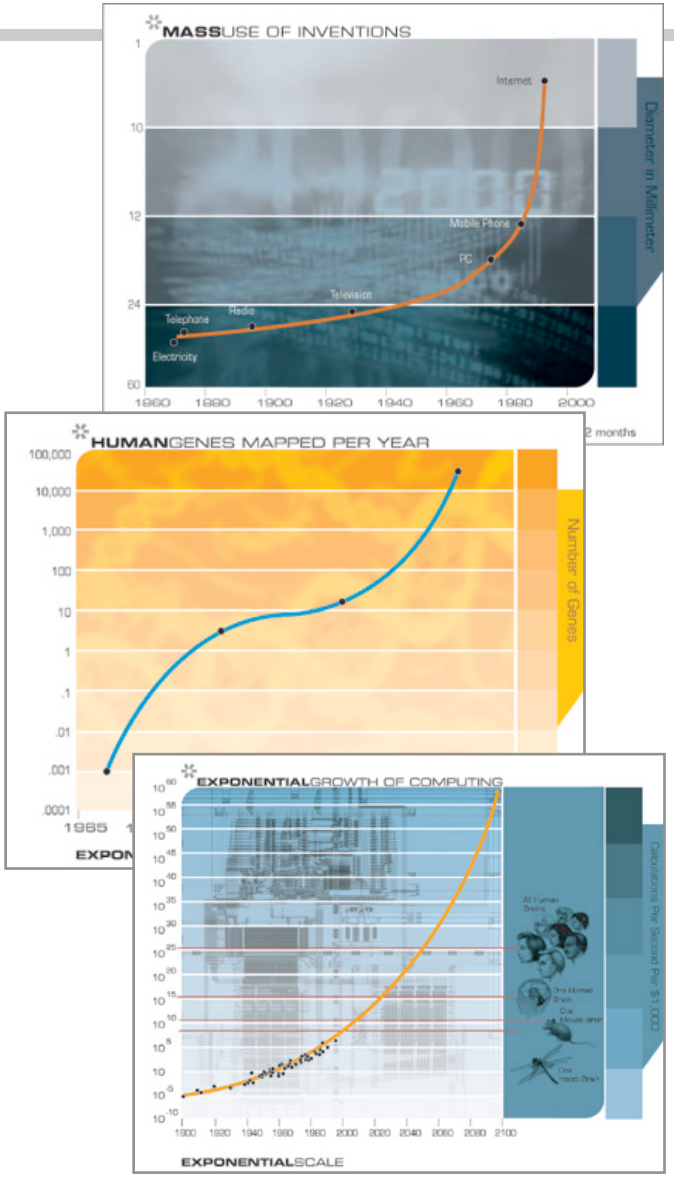


Diagram from Jennifer Gidley, "The Evolution of Consciousness as a Planetary Imperative: An *Integration* of Integral Views", *Integral Review* 5 (2007): 4-226.

Analysis (I)

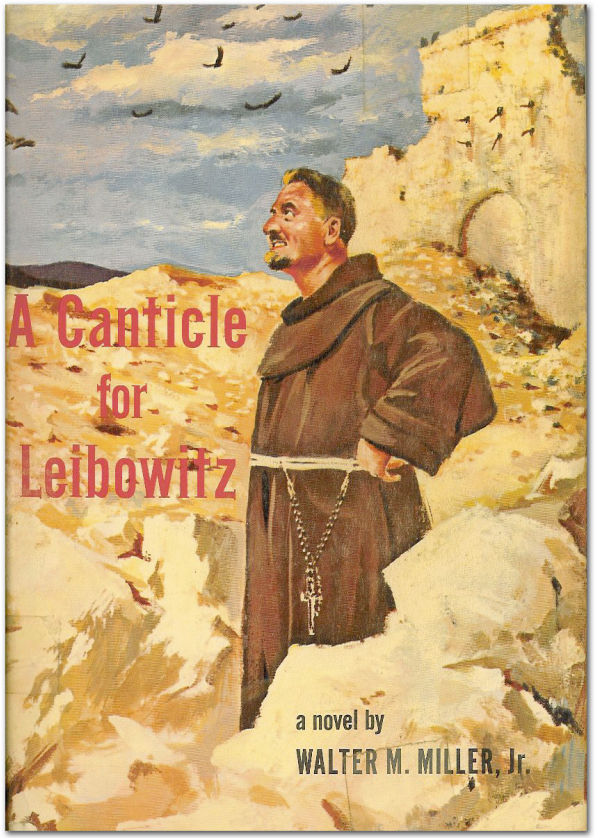
- There is a strong belief that the current asymptotic rise in the development of technology from the nineteenth-century to the present is inevitable…
- The inventor Ray Kurzweil, in his essay "The Law of Accelerating Returns", states: "[We] dramatically underestimate the power of future technology…" In other words, somehow future technology will be so fantastic that it will solve our problems...
- This belief ignores key questions:
  - Will the social cohesion — that has allowed this rapid development — continue to hold together?
  - Do we have the resources to continue in this development without depleting the Earth's resources?
  - **Most importantly, just because we *can*, does that mean we *should* continue this kind of "progress"?**



Charts from Ray Kurzweil, "The Law of Accelerating Returns"

Analysis (2a)

- We must look at historical patterns, e.g., the rise and fall of technological societies (Greek and Roman technologies were lost and had to be rediscovered later; even ancient accounts speak of lost technical knowledge), and long periods of stasis.
- Our current incredible rate of technological development is actually very unusual in historical terms — and not sustainable.
- Despite what Kurzweil says, human beings actually have a poor record of technological prognostication: in the 1950's, many thought we'd be using flying cars and living on the Moon by now! Why did they think this? And why did they turn out to be wrong?

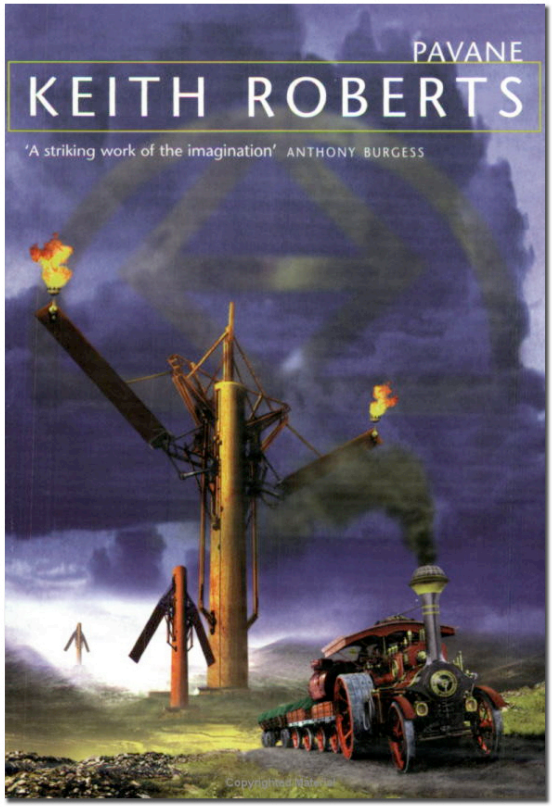


Walter M. Miller, Jr., *A Canticle for Leibowitz* (cover from a 1960 printing)

This novel describes a future where our technologically sophisticated society has disappeared, and humans have started again at an essentially medieval level. Such cataclysmic losses of knowledge are actually quite common in human history.

Analysis (2b)

- Some prognosticators have been more subtle and sophisticated, especially science fiction writers such as Keith Roberts, Walter M. Miller, and Philip K. Dick. They understood better than many academics and policy-makers that a complex array of economic, cultural, and other factors shape what the future will look like...
- Most of these writers paint pictures of a much more sustainable — if much simpler — human lifestyle in the future.
- They also describe the potential for periodic cataclysms that may *force* us to live in a simpler and more sustainable way...
- So, the current asymptotic rise in technological development may not really mean anything...



Keith Roberts, *Pavane* (cover from a 2000 printing)

This work describes an parallel world where there has been no advanced technological development, and England in the 1960's still functions at essentially a mid 19th-century level, with some older aspects, such as feudal realms, no electricity whatsoever, and primitive steam transportation.

Analysis (3a)

- Some of the key problems in the history of technology which affect our **understanding of the uneven nature of technological development** *and* illustrate the **difficulty of prognostication** are articulated by the scientist Steven Dutch (University of Wisconsin, Green Bay) as follows:

  - **"Tendency to ignore the mundane" + "Elitism and disdain for manual labor"**
    The mundane bits of the history of technology may hold the key to both an accurate picture of the past and a clue to the future. Dutch notes: "[T]here exists a carving of the Persian king Darius on a throne with turned legs, the first indication in history that somebody has invented the lathe, one of the most important tools. We know the name of the king, but not how the lathe was invented, when, or by whom. Until recently, history has been written by the elite, and they have tended to write about the elite. For the most part they gave little attention to technical matters, and in the few cases where they did take an interest, they often did not fully understand what they recorded. The handful of writers who were both socially elite and technically knowledgeable, like the Roman military engineer Vitruvius, are priceless historical sources."

  - **"Secrecy and isolation"**
    Fundamental inventions have probably been invented independently in many places, simply because slow communication prevented people from knowing what had been done elsewhere. ***If an innovation did confer some significant benefit, the inventor was likely to keep the process secret.*** Effective patent laws did not exist until 300 years ago; before then, the only way to keep a competitive advantage was secrecy. In some cases, the mere existence of a new product offers clues to its manufacture. In other cases, ideas would slowly diffuse as assistants and apprentices learned and passed on the techniques. But in countless cases, inventions went to the grave with their inventors.

Analysis (3b)

- The key problems in the history of technology, as articulated by Steven Dutch (University of Wisconsin, Green Bay) (cont.):
  - **"Destruction of Documents + Destruction of Artifacts"**
    Iron rusts, cloth and leather and wood rot, glass breaks… ***[T]he Antikythera Device is the only complex piece of machinery surviving from antiquity***…
  - **"Oversimplification"**
    Oversimplification is the tendency to reduce complex events to too-simple terms. A common example: why didn't the ancient world develop powered technology? Answer: they had slaves to do all the work. So then why did slavery become entrenched in the American South after the cotton gin made it possible to harvest American cotton efficiently? How come slavery inhibited technology in the ancient world but meshed smoothly with technology in America? Clearly there have to be other factors at work.
- CONCLUSION: We actually know very little about the past, about civilization's technological progress, and the significant periods of stasis, decline, regression, and so on...
- CONCLUSION: Technology itself is based on reason, but its development is not rational. So, today's "technological optimism" and belief in unbounded progress is irrational...
- CONCLUSION: The historian of technology needs caution in looking at the past, and perspicacity in considering the future...
- CONCLUSION: But the historian of technology might also advise a move towards sustainability...

Future Directions... Stasis / Regression (1)

- So, instead of an unbounded future of more and more technological development, instead of a world where places like China come to live the extravagant lifestyle of the Western world and copy its wasteful use of resources, what might we have?

- Is technological *stasis* or even *regression* a bad thing? Certainly, there are indications that we are already going in those directions, both because of resource shortages, and a general malaise with our over-engineered society...

  - *Parts of Detroit are gradually shifting back to wilderness...*

Streets and houses in Detroit, abandoned and overgrown with foliage... "It's the astonishing evidence that an entire neighborhood, and the society that it held, can vanish, with most traces of its presence wiped out in a matter of a few years, returning to the natural state in which it began." Such structures are called "feral houses"...

[from http://www.detroitblog.org/?p=405 and http://www.sweet-juniper.com/2009/07/feral-houses.html]

Future Directions... Stasis / Regression (2)

- Is technological *stasis* or even *regression* a bad thing?...
  - *Old technologies are being revived, both because of their sustainable nature and a certain nostalgia for a less rushed era...*

Bicycles of bamboo, reviving a 19th-century technology

[from http://www.calfeedesign.com/products/bamboo/]

Cargo-carrying airships built by a new company in Germany...

[from http://www.cargolifter.com]

Erika Records, Inc., a California company making vinyl records...

[from http://www.erikarecords.com]

Future Directions... Stasis / Regression (3)

- Is technological *stasis* or even *regression* a bad thing?
  - *There is an increasing understanding that many societies in the past disappeared because of over-expansion and unsustainable development...*

An ancient Detroit? The abandoned Roman city of Ostia Antica...

[from http://www.ostia-antica.org]

The famous "moai" of Easter Island...

"By 800 AD, Polynesian sailors had discovered a subtropical forest here. They settled in... [and] called this rich and abundant land, *Rapa Nui*. As they used slash and burn methods to clear the land and as they consumed wood, the trees thinned. Monument building became competitive... an expression of personal power in the face of diminishing resources... The high culture of Easter Island peaked around 1400... Easter Islanders began eating rats, snails, lizards, and finally, one another. When [the Dutch explorer] Roggeveen arrived in 1722, the people were living in caves, at war with each other. It's a harrowing story for us as we use up our resources, build monuments, and wage war. Is the fate of Easter Island to be our own fate? These people didn't bring *extinction* upon themselves. Nature doesn't always exact such a clear price when we're unwise. Their punishment for folly was instead to live, thereafter, eking out a life on the mere fringe of survival."

[from http://www.uh.edu/engines/epi1053.htm]

Conclusions (1)

- We have approached a key theme of the BtSM conference this year, "Learning for Sustainable Futures" through a history of technology perspective, and brought up two important issues:

  (a) There has been peculiar asymptotic development of technology from the nineteenth-century to the present — can it be continued? *Should* it be continued?

  (b) What other kinds of futures for human society might there be — that is, futures other than ones with more and more technological advances?

- What are our conclusions?

  (a) It is logical to conclude that resources are limited, and that this may limit progress. But also, we must be wary of the idea that there will be "technological fixes" that will allow us to keep progressing technologically, finding new energy sources, etc.

  (a) More importantly, *should* this rapid technological development be continued? If stopped, or at least paused, wouldn't this allow us time to develop in other ways, e.g., ethically, morally, philosophically, culturally?

  (c) What would a future state of stasis look like? Might we settle into a world that is technologically "fixed" at a, say, 1940's-1970's level, with steam trains, black-and-white television, etc.? Or perhaps a 19th-century level, or even a medieval level?

Conclusions (2)

- It is worth considering a perhaps more sustainable model for the future...
  - It is a useful exercise to examine how such a decision, in terms of technology, might be made. Aren't there certain technologies which are, in fact, "good enough"? In automobiles, the manual device for lowering and raising the door windows worked perfectly well. It was simple and repairable by the users, recyclable in terms of its parts, and rugged...
- So, a historian of technology might advise that for a sustainable future, we stick with technologies that follow a "3-R" rule!

  ***r**epairable, **r**ecyclable, and **r**ugged*

- "Sustainability" is about much more than simply trying to maintain our current advanced level of Western-style living, more than simply throwing our bottles into the recycling bin. Sustainability is about a profound reflection on our past as a civilization, and about a serious consideration as to where we might *stop* the current frenzy of constant growth...

DISCUSSION SESSION