

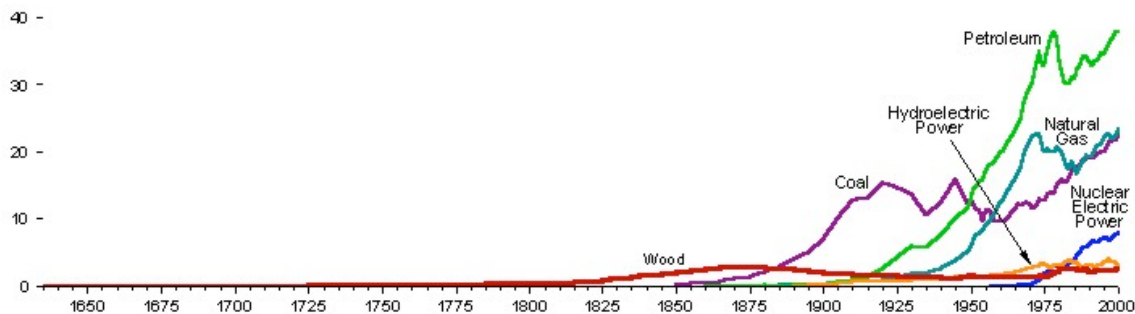
The Way We Will Be 50 Years From Today

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I work primarily on the creation and long-term history of the Universe. 50 years is just a dot on the cosmic scale; however, on a human scale 50 years can initiate significant change. Innovations, successfully introduced, are increasing at a rapid rate. They are cumulative and build upon each other as well as through the entrepreneurial attitudes of the modern world. This makes predicting the way we will be in 50 years difficult; nonetheless, it is instructive and humbling to try.

We can safely estimate that we will weather a change in our primary transportation fuel. Oil will no longer be as dominant and prevalent as it is today. This will clearly result in several shifts of power as well as attitudes. This is not to say that there have not been shifts in energy sources – e.g. wood to coal, then petroleum and natural gas. It has never been on such a scale both in terms of its daily impact on society with increasing energy needs and its global nature.

Figure 1. U.S. Energy Consumption by Source, 1635-2000
(Quadrillion Btu)



We can anticipate that this change over will be stressful and will bring out both good and bad in our institutions and society. Forward-looking groups have now just begun to grapple with what that might mean for them and their place in society. This is mostly an economic view because predicting the full picture of how this will impact civilization and what directions it will take is very difficult. The ultimate path depends upon many factors including technology, societal attitudes, accidents of sources and opportunities. Economic views provide a rationale for making decisions.

One interesting example is the company called BP, formerly known as “British Petroleum”. Since 2004 it has been advertising itself as BP, standing for “Beyond Petroleum”. This is a bold and complicated transition with several nuances. **BP** anticipates investing some \$8 billion in **BP** Alternative Energy over the next decade, reinforcing its determination to grow its businesses “**Beyond Petroleum**”.

Economic stakes, and large sums of money are involved here. Such circumstances lead to careful thought and planning, as well as the marshalling of resources, for the

purpose of inventing and developing innovative technologies that will address complex global energy needs. This is bringing together a generation of scientists deeply knowledgeable in all areas related to bioenergy. This includes the sciences and technology that one would normally expect and especially those that are important for the genetic modifications and viability to develop plants that are efficient and effective bioenergy sources. For this overall investment to be successful, the team must develop the capability to produce, select, and include the genes into plants and then raise them in quantity and quality, turn them into crops, and then into biofuels. This is not an isolated science team working in the lab to simply develop our understanding, but a large coordinated effort to go beyond that and put it into large-scale practice within 50 years. This would readily meet my definition for a successful innovation that will change the way we are.

Why will this change the way we are? Will having something like ethanol in my car's tank change my life that much? Well, yes, indirectly by the shifts in power and the longer implications for global warming. However, this same basic technology can revolutionize many things: food crops, landscape plants, even biological houses. There are already signs that this approach will first impact health and medicine. The technology to be applied here is first being used to develop a low cost cure for malaria via genetically modified bacteria that make the cure. Much more will follow in this area. I anticipate a very significant increase in human life span as a result and hope that I will be one of the many beneficiaries. It is quite possible that nearly every one reading this essay will in 50 years be young (that is less than 150 years old and in relatively good health). This rapid increase in healthy life span will have a major impact on society. There are already huge shocks from a relative few years increase in life expectancy.

These are myriad changes but underneath we will still be the same old humans simply seeking to improve and optimize our lives given the better resources available? I think that at the same time we will begin to see a change in the basic human being. Given that society can routinely re-engineer plants and animals to improve them or utilize them more effectively, what about humans? Clearly, there will be some activity in this area. First, it will come through gene therapy of human genetic diseases. Parents already have some ability to choose whether to have children that have severe genetic defects. It is already partially possible to select not only the sex of one's child (e.g. see the effect of China's one child policy) but also to screen out genetic defects. Even more direct intervention and selection will soon be possible. At the beginning people with family histories of severe genetic diseases will seek this out. Will not some parents chose a stronger selection for good looks and greater intelligence or other traits likely to make their child more successful in general competition? I think that this is likely as there is evidence that people choose their mates (genetic source for their child) based upon these traits. Every time I have talked to groups of high school or college students, at least a few per cent say that, if gene enhancement for their forthcoming children were reasonably affordable and safe they would chose that advantage. It seems to me that on the scale of 50 years we could see something on the order of 5 to 10% of the

children being born being genetically enhanced, mostly likely by selection, but also possibly by direct genetic engineering. Once we reach that level, then such advantages go beyond fashion and status into direct competition in the gene pool much like mate selection. Concerned parents quite often spend large resources (money and time) to ensure that their children have a good education – private schools are a prime example. One could consider simply doubling the human genome (so it would be roughly have the size of the wheat genome) and include all the knowledge up through a great college education directly in the child. No worry about the quality of the teachers, school or whether the child is studying and paying attention. All that knowledge is there and in place in every cell at a tenth the cost and many times the reliability.

We may also see societies or groups that believe that the development of enhanced humans – thinkers, wise leaders, great movie stars, etc. – is the wave of the future toward a more utopian society or toward one with distinct economic and strategic advantages. Any of these motivations leads to push toward genetically modified humans. In 50 years will we likely be at the start of a new rapid evolution of mankind. One of the motivations will be comparison and competition with the rapidly advancing intelligence of machines. Humans will have to advance significantly to keep pace and even be partners in relationship to machines (machines that were once our servants). Presumably one feature that these newer humans will have is a better interface to powerful computing. This is a change that will really accelerate innovations that change society and humans. It is interesting to speculate what will mark the turning point when evolution brings us from humans toward the next level; the way it did apes to humans or even further, from single cells to apes to humans. Maybe we will have intelligent design operating to make a new world and we will be around to see the action.

The Way We Will Be 50 Years From Today is likely to be the last time we will be humans the way we have been for thousands of years.