End of Summer 2014

TRENDEVENTS

Welcome to the end-of-summer issue of TrendEvents, featuring numerous reviews of technology developments and commentary by Ron Miller, and “Mechanisms of Distribution” from the *Technocracy Study Course*.

TECHNOCRACY IN ACTION

TECHNOCRACY WEBSITE RELOADED!

If you haven’t visited the technocracy.org website lately, then you are in for a treat! The site features fresh graphics, a more usable interface and multi-language support. You will also have the opportunity to comment on articles and posts, and read replies from Technocracy leadership. Meanwhile, the site preserves irreplaceable classic content about Technocracy and its design for society.

New home page of Technocracy.org website.

NEWS

ROBOTS

Increasingly powerful computers faced a mammoth obstacle: they could only execute what they were explicitly told. It was a nightmare for computer programmers trying to anticipate every command necessary to get software to operate vehicles or accurately recognize speech. That kept many jobs in the exclusive province of human labor—until recently.

Artificial intelligence has arrived in the American workplace, spawning tools that replicate human judgments that were too complicated and subtle to distill into instructions for a computer. Algorithms that "learn" from past examples relieve engineers of the need to write out every command.

The advances, coupled with mobile robots wired with this intelligence, make it likely that occupations employing almost half of today's workers, ranging from loan officers to cab drivers and real estate agents, will be automated in the next decade or two, according to a study done at the University of Oxford in Britain.

"These transitions have happened before," said Carl Frey, co-author of the study and a research fellow at the Oxford Martin Programme on the Impacts of Future Technology. "What's different this time is that technological change is happening even faster, and it may affect a greater variety of jobs."

The approach has powered leapfrog improvements in making self-driving cars and voice-search a reality in the past few years. To estimate the impact that will have on 702 U.S. occupations, Frey and Michael Osborne applied some of their own machine learning.

They first looked at detailed descriptions of 70 of those jobs and classified them as either possible or impossible to computerize. Frey and Osborne then fed that data to an algorithm that analyzed what kind of jobs lend themselves to automation and predicted probabilities for the remaining 632 professions.

The higher the percentage, the sooner computers and robots will be capable of stepping in for human workers. Occupations that employed about 47 percent of Americans in 2012 scored high enough to rank in the risky category, meaning they could be possible to automate "perhaps the next decade or two," their analysis, released in September, showed.

SOURCE: Aki Ito, "A smart computer might take your job in a decade", *The Oregonian*, March 23, 2014.

COMMENTARY: A great deal of automation in the past has principally just improved the productivity of workers. Fewer workers are then required to produce to same amount. Economically, however, the reduced costs eventually reduced prices so that more people could afford what was being provided thus forcing an increase in output which required more workers. To see the end product one only has to look at agriculture which in the 1840's probably employed directly or indirectly about seventy percent of the population. Today two percent is about enough and that same area now not only feeds the U.S. but also much of the rest of the world. For another end product one need look no further than Detroit. It is the largest city to have filed bankruptcy. Large numbers of homes are abandoned. But they are still building cars.

This analysis doubtlessly takes into consideration only currently available technology. Given that this is a very fast moving field that capacity will only continue growing over time. This time automation is going to be directly replacing workers. Technocracy may have been a bit ahead of its time but that doesn't mean that the analysis or solutions are incorrect.

THORIUM REACTORS

Existing reactors use uranium or plutonium—the stuff of bombs. Uranium reactors need the same fuel-enrichment technology that bomb-makers employ, and can thus give cover for clandestine weapons programs. Plutonium is made from unenriched uranium in reactors whose purpose can easily be switched to bomb making. Thorium, though, is hard to turn into a bomb; not impossible, but sufficiently uninviting a prospect that America axed thorium research in the 1970s. It is also three or four times as abundant as uranium. In a world where nuclear energy was a primary goal of research, rather than a military spin-off, it would certainly look worthy of investigation.

Thorium itself is not fissile. If bombarded by neutrons, though, it turns into an isotope of uranium (u233), which is. Thorium can thus be burned in a conventional reactor along with enriched uranium or plutonium to provide the necessary neutrons. But a better way is to turn the element into its fluoride, mix that with fluorides of beryllium and lithium to bring its melting point down from 1,110 C to a more tractable 360 C, and melt the mixture. The resulting liquid can be pumped into a specially designed reactor core, where fission raises its temperature to 700 C or so. It then moves on to a heat exchanger, to transfer its newly acquired heat to a gas (usually carbon dioxide or helium) which is employed to drive turbines that generate electricity. That done, the now-cooled fluoride mixture returns to the core to be recharged with heat.

This is roughly how America's experimental thorium reactor, at Oak Ridge National Laboratory, worked in the 1960s. Its modern incarnation is known as an LFTR (liquid fluoride thorium reactor).

THE BENEFITS OF FLUORIDATION

One of the cleverest things about LFTRs is that they work at atmospheric pressure. This changes the economics of nuclear power. In a light-water reactor, the type most commonly deployed at the moment, the cooling water is under extremely high pressure. As a consequence, light-water reactors need to be sheathed in steel pressure vessels and housed in fortress-like containment buildings in case their cooling systems fail and radioactive steam is released. An LFTR needs none of these.

Thorium is also easier to prepare than its rivals. Only 0.7% of natural uranium is the fissionable isotope U238, which is heavier because it has three more neutrons, and does not undergo fission because of the stability these neutrons bring. This is why uranium has to be enriched by the complicated process of centrifugation. Plutonium is made by bombarding U238 with neutrons in a manner similar to the conversion of thorium into U233. In its case, however, this requires a separate reactor from the one the plutonium is eventually burned in. By contrast thorium, once extracted from its ore, is reactor-ready.

It does, it is true, need a seed of uranium or plutonium to provide neutrons to start the ball rolling. Once enough of it has been converted into U233, though, the process becomes self-sustaining, with neutrons from the fission of U233 transmuting sufficient thorium to replace the U233 as it is consumed. The seed material then becomes superfluous and can, because the fuel is liquid, be flushed out of the reactor along with the fission products generated when U233 atoms split up. Similarly, more thorium fluoride can be bled in as needed. The consequence is that thorium reactors can run non-stop for years, unlike light-water reactors. These have to be shut down every 18 months to replace batches of fuel rods.

BOMBS AWAY?

Thorium has other advantages, too. Even the waste products of LFTRs are less hazardous than those of a light-water reactor. There is less than a hundredth of the quantity and its radioactivity falls to safe levels within centuries, instead of the tens of millennia for light-water waste.

One or two U233 bombs were tested in the Nevada desert during the 1950s and, perhaps ominously, another was detonated by India in the late 1990s. But if the American experience is anything to go by, such bombs are temperamental and susceptible to premature detonation because the intense gamma radiation U233 produces fries the triggering circuitry and makes handling the weapons hazardous. The American effort was abandoned after the Nevada tests.

The gamma ray problem is created by a quirk of the process that turns the thorium into U233. A small amount takes a different path and ends up as radioactive thallium – which is very radioactive indeed. Its gamma rays are so powerful that they can penetrate concrete a meter thick. Extracting, smelting and machining material containing even trace amounts of it is beyond the scope of all but a handful of national weapons laboratories. Rogue nations interested in an atom bomb are thus likely to leave thorium reactors well alone when there is so much poorly policed plutonium scattered around the world. So a technology abandoned because it could not be turned into weapons may now, in part for that very reason, be about to resurface.

SOURCE: "Asgard's Fire", *The Economist*, April 12, 2014.

COMMENTARY: Plutonium is probably the most toxic substance on Earth. It has been estimated that one pound of plutonium inhaled as plutonium oxide could give cancer to two million people.

THE CANCER GAME

Computer games may be fun to play and are often very addictive, but some researchers now realize that games also provide a perfect platform for tackling real-world problems. Take human health: because the drugs given to children with cancer in remission make them tired and ill, simply explaining that the drugs will help keep the cancer away is not always enough to convince children to stick to the therapy. But a computer game that puts those kids on the front line of a battlefield inside the human body—where cancer cells and chemotherapy drugs are slogging it out for supremacy—just might persuade them that it's important to keep taking the drugs.

It was this idea that led Pam Omidyar, an immunologist and games enthusiast, to HopeLab, a non-profit organization that develops technologies designed to encourage healthy behaviors in teenagers.

Omidyar went about disproving the doubters. Her first big success came in 2006 with the release of Re-Mission, a third-person shooter that puts the gamer inside the human body, fighting cancer at the cellular level. Subsequent research has shown that the game works, too. In a randomized trial, children and young adults who were given Re-Mission to play at home for three months were more likely to take their chemotherapy than a control group who played a similar computer game that had been developed purely for entertainment.

In February, the charity Cancer Research UK chose developers Guerilla Tea to create its Genes in Space game partly because the company immersed itself in the scientific literature on cancer. Prior to the contract with Cancer Research UK, Guerilla Tea's co-founder and CTO Alex Zeitler devoted himself to exploring cancer research, he says, "for an overview of the current situation and (to understand) … what they wanted to achieve with the game."

Genes in Space players don't require a background in science to be helpful either. The game's design means anyone can help advance cancer research. Players plot a path through deep space to collect a precious resource called "element alpha," but the map is really a representation of genetic sequence data collected from women with breast cancer. By identifying the densest regions of element alpha, gamers are highlighting the genetic sequences most likely to interest cancer researchers = potentially slashing months off their standard analysis times.

"Researchers want to use games to address problems that are really relevant," says Arney. "They don't want to do it just because it's cool."

SOURCE: Colin Barras, "Gaming Cancer", *New Scientist*; April 5, 2014.

COMMENT: For the last couple of decades scientists have been using computer models to study their subjects. Extending their computer models to games where tens of thousands of iterations can be tried only makes good sense. Even the most brilliant of individuals can't really think of everything. No matter how strange it might sound, it works.

MICROBE PRODUCTION

Many valuable chemicals found in plants could soon be produced using genetically modified microbes. Here are a few examples:

• SAFFRON: The world's most expensive spice, derived from the flower of the saffron crocus. Swiss company Evolva has developed yeast that can grow each of the three main components. Synbio saffron could be available in a few years.

• NOOTKATONE: A citrus flavor and aroma found in grapefruit that is used in food and fragrances, and as an insect repellant. It is usually extracted from grapefruit peels. Allylix of California and Isobionics in the Netherlands plan to produce it cheaply using modified microbes.

• STEVIA: An increasingly popular zero-calorie, natural sweetener extracted from the stevia plant – but the best-tasting components are present at vanishingly low concentrations. Evolva has developed yeast that can grow these components. In partnership with Minnesota based food processing firm Cargill, Evolva began pilot-scale production in 2013.

• RESVERATROL: A compound found in red grapes and other plants. Animal studies suggesting it might boost lifespan led to much excitement. Resveratrol is now sold as a health supplement despite its effects on people remaining unclear. Yeast-grown resveratrol was introduced to the market by Danish firm Fluxome in 2010, but at an uncompetitive price. Evolva bought the rights to the yeast in 2012 and hopes to produce resveratrol more cheaply.

Engineering the design of microbes to produce useful chemicals or medications is now moving toward industrial scale operations. New medications are being designed that probably could not be produced by any other method. At the same time RNA is being tasked with the delivery of medications as well. RNA is produced by the body in all of its incarnations so it is not seen as a foreign substance. It is even possible that RNA could be used to recognize foreign molecules in the body and simply chop them up so they just become waste. There is still some distance to go on all of this but it is happening fast.

The first working artificial chromosome has been produced consisting of 272,871 base pairs. It was smaller than what exists in the original yeast. The original chromosome has 316,617 base pairs. The size was reduced by removing what were considered to be extraneous parts. The team found that yeast cells carrying the synthetic chromosome grew as well as ones with the natural version under 20 different conditions. The work was carried out by Johns Hopkins University, including a small army of undergraduate students, and colleagues.

SOURCES: Colin Barras, "Anything plants can grow we can grow better", *New Scientist*, April 12, 2014. Christine Gorman and Dina Fine Maron, "The RNA Revolution", *Scientific American*, April 2014. Tina Hesman Saey, "First chromosome made synthetically from yeast" *Science News*; May 3, 2014.

TECHNOCRACY: THE DESIGN

(Continued from Chapter 4 of the *Technocracy Study Course*)

THE MECHANISM OF DISTRIBUTION

The monetary mechanism fails dismally on every count as a satisfactory mechanism of distribution. A mechanism possessing the properties we have enumerated, however, is to be found in the physical cost of production—the energy degraded in the production of goods and services

In earlier lessons we discussed in some detail the properties of energy, together with the thermodynamic laws in accordance with which energy transformations take place. We found that for every movement of matter on the face of the earth, a unidirectional degradation of energy takes place, and that it is this energy loss incurred in the production of goods and services that, in the last analysis, constitutes physical cost of production.

This energy, as we have seen, can be stated in invariable units of measurements—units of work such as the erg or the kilowatt-hour, or units of heat such as the kilogram-calorie or the British thermal unit. It is therefore possible to measure with a high degree of precision the energy cost of any given industrial process, or for that matter, the energy cost of operating a human being. This energy cost is not only a common denominator of all goods and services but a physical measure as well, and it has no value connotations whatsoever.

The energy cost of producing a given item can be changed only by changing the process. Thus, the energy cost of propelling an average car a distance of 20 miles is approximately the energy contained in one gallon of gasoline. If the motor is in excellent condition, somewhat less than a gallon of gasoline will suffice; hence, the energy cost is lower. On the other hand, if the valves become worn and the pistons become loose, somewhat more than a gallon of gasoline may be required and the energy cost increases. A gallon of gasoline of the same grade always contains the same amount of energy.

In an exactly similar manner, energy derived from coal or water power is required to drive machinery; hence, the energy cost of the product would be the total amount of energy consumed in a given time divided by the total number of products produced in that time. Energy, likewise, is required to operate the railroads, telephones, telegraphs, television, and radio. It is required to drive agricultural machinery and to produce the food that we consume. Everything that moves does so only with a corresponding transformation of energy.

Now suppose that the Continental Board, after taking into due account the amount of equipment on hand, the amount of new construction of roads, plant, etc. required for the needs of the population, and the availability of energy resources, decides that for the next two years the social mechanism can afford to expend a certain maximum amount of energy (equivalent to that contained in a given number of millions of tons of coal).

This energy can be allocated according to the uses to which it is to be put. The amount required for a new plant, including roads, houses, hospitals, schools, etc., and for local transportation and communication, will be deducted from the total as a sort of overhead and not chargeable to individuals. After all of these deductions are made, including that required for the education and care of children and the maintenance of hospitals and public institutions generally, the remainder will be devoted to the production of goods and services to be consumed by the public-at-large.

Next, suppose that a system of record keeping is instituted whereby a consuming power is granted to the adult public-at-large in an amount exactly equal to this net remainder of energy available for the producing of goods and services to be consumed by this group. This equality can be accomplished only by stating the consuming power itself in denominations of energy. Thus, if there is available the means of producing goods and services at an expenditure of 100,000 kilogram-calories per person per day, each person would be granted an income, or consuming power, at a rate of 100,000 kilogram-calories per day.

INCOME

Further details must be added to satisfy the requirements we have laid down. First, let us remember that this income is usable for the obtaining of consumers' goods and services. That being the case, there is a fairly definite limit to how many goods and services single individuals can consume, bearing in mind the fact that they live only 24 hours a day, one-third of which they sleep, and a considerable part of the remainder of which they work, loaf, play, or indulge in other pursuits, many of which do not involve a great physical consumption of goods.

Let us recall that every individual in the society must be supplied, young and old alike. Since it is possible to set arbitrarily the rate of production at quite a high figure, it is entirely likely that the average potential consuming power per adult can be set higher than the average adult's rate of physical consumption. Since this is so, there is no point in introducing a differentiation in adult incomes in a manner characteristic of economies of scarcity. Moreover, from the point of view of simplicity of record keeping, enormous simplification can be effected by making all adult incomes, male and female alike, equal. Thus, all adults above the age of 25 years would receive a large income, quite probably larger than they would find it convenient to spend. This income would continue without interruption until the death of the recipient. The working period, however, after the period of transition probably would not need to exceed the 20 years from the age of 25 to 45 on the part of each individual.

Still further properties that must be incorporated into this energy income received by individuals are that it must be non-negotiable and non-savable. That is, it must be valid only in the hands of the person to whom issued and in no circumstances transferable to any other individual. Likewise, since it is issued on the basis of a budget expenditure covering two years, it must be valid only for that two-year period and null and void thereafter. Otherwise, it would be saved in part and serve to completely upset the balance in the operating load in future periods. On the other hand, there is no need for saving, because an income and social security are already guaranteed independently to each individual until death.

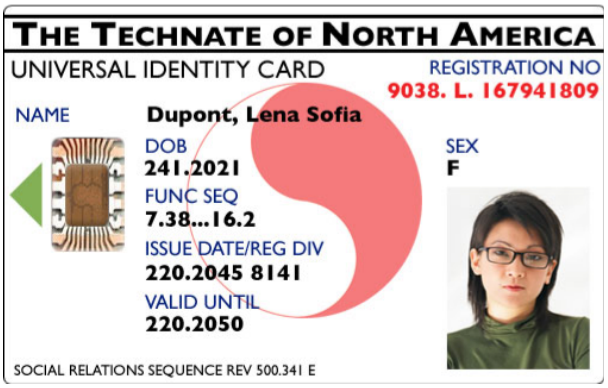
The reason for taking two years as the balanced-load period of operation of the social mechanism is a technological one. The complete industrial cycle for the whole North American Continent, including the growing period of tropical plants, such as Cuban sugar cane, is somewhat more than one year. Hence, a two-year period is taken as the next integral number of years to this industrial cycle. All operating plans and budgets would thus be made on a two-year basis, and at the end of that time the books would be balanced and closed for that period. No debts would be possible, and the current habit of mortgaging the future to pay for present activities would be completely eliminated.

If, as is quite likely, the public find it inconvenient to consume all their allotted energy for that time period, the unspent portion of their allotment will merely be canceled at the end of the period. The saving will be effected by society rather than by the individual, and the energy thus saved, or the goods and services not consumed, will be carried over into the next balanced-load period. This will not, as will be amplified later, throw the productive system into oscillation, because production will always be geared to the rate of consumption and not the total energy allotment. In other words, if for a given balanced-load period the total energy allotment is equivalent to that contained in, say, four billion tons of coal, this merely means that we are prepared if need be to burn four billion tons of coal and distribute the resultant goods and services during that time period. This merely sets a maximum beyond which consumption for that time period will not be allowed to go. If the public, however, finds it inconvenient to consume that amount of goods and services and actually consumes only an amount requiring three billion tons of coal to produce, production will be curtailed by that amount, and the extra billion tons of coal will not be used but will remain in the ground until needed.

ENERGY ACCOUNTING

There are large numbers of different bookkeeping devices whereby the distribution records and the rate of consumption of the entire population can be kept. In a technological administration, *Energy Accounting* is the only efficient method.

The idea of each person on the continent sharing access to production equally and as a right of citizenship gave rise to the question of how this could be accomplished. Before computers and such, a system had been devised that could handle all the information that a continental distribution system required, the Dewey Decimal System. Applying this system to the need specified by Technocracy resulted in a design whereby the information was to have been inscribed on certificates—with a booklet of such certificates given to each citizen—to be automatically completed at the time of each use. Technocracy Inc., to illustrate how such a distribution system would work, has published a booklet called “The Energy Distribution Card.” Subsequent developments in technology have superseded the Dewey Decimal System, but these developments have made a continental energy accounting system easier to implement.



(Formerly called the Energy Certificate)

The Energy Distribution Card pamphlet describes the various functions of the energy accounting system of Technocracy in greater detail. The illustration of what the card might look like appears here for reference only. Since all pertinent data would be stored either on a magnetic strip or microchip anyway, the appearance of the card is almost purely aesthetic.

By this system all accounts and records pertaining to consumption are kept by the Distribution Sequence of the social mechanism. The income is distributed to the public in some convenient form, a plastic card, voice print, or some other means of personal identification.

The record of one's income and its rate of expenditure is kept by the Distribution Sequence, so that it is a simple matter at any time for the Distribution Sequence to ascertain the state of a given citizen's balance. This is somewhat analogous to a combination bank and department store wherein all the customers of the store also keep bank accounts at the store bank. In such a case the customer's credit at the department store is as good as his or her bank account, and the state of this account is available to the store at all times.

This personal identification card or device has no counterpart in today's Price System, but the convenience of credit cards or travelers checks is well known; however, "spending," as in the Price System of today, does not correspond to the personal identity technique of the future whereby one can withdraw from the continental inventory according to need or desire.

The significance of this, from the point of view of knowledge of what is going on in the social system, and of social control, can best be appreciated when one surveys the whole system in perspective. First, one single organization is manning and operating the whole social mechanism. This same organization not only produces but also distributes all goods and services. Hence, a uniform system of record keeping exists for the entire social operation, and all records of production and distribution clear to one central headquarters. Tabulation of the information contained in the use of the identity device day by day provides a complete record of distribution, or of the public rate of consumption by commodity, by sex, by regional division, by occupation, and by age group.

With this information clearing continuously to a central headquarters, we have a case exactly analogous to the control panel of a power plant, or the bridge of an ocean liner, or the meter panel of a modern airplane. In the case of a steam plant, the meter panel records continuously the steam pressure of the boilers, the fuel record, the voltage and kilowatt output of the generators, and all other similar pertinent data. In the case of operating an entire social mechanism, the data required are more voluminous in detail but not otherwise essentially different from that provided by the instrument panel in the steam plant.

The identity card use gives precise information at all times on the state of consumption of every kind of commodity or service in all parts of the continent. In addition to this there is also corresponding information of materials and rates of operation in every stage of every industrial flow line. There is, likewise, a complete record on all hospitals, on the educational system, amusements, and others of the more purely social services. This information makes it possible to know exactly what to do at all times in order to maintain the operation of the social mechanism at the highest possible load factor and efficiency.

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