ENTROPY RUNS DOWNHILL

The Great Fool's Oil Swindle

by Lyndon H. LaRouche, Jr.

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Alan Yue

Republicans (exemplified here by George Shultz, left) and Democrats (by Al Gore) are both lined up at the ethanol trough.

The spreading delusion, that the so-called petroleum-crisis can be conquered by the reduction of living plants, such as corn, to a substitute for petroleum, will go down in history with the John Law Bubble and Ponzi scheme, as one of the sorriest mass-delusions ever to plunge a modern nation into destitution and general ruin. The motive which lures credulous people into condoning such unscientific swindles, is essentially of the form expressed by those who are candid about their motives: "To Hell with society; I—me, me, me!—need the money now!"

The quickest way which modern science offers to clarify that point, is the proof by the great Twentieth-Century scientist, Vladimir Vernadsky, first, of the relative rate of increase of the Biosphere, relative to the non-living processes of our planet, and, second, the relative increase of what Vernadsky defined as the combined living and sedimentary mass of the Noösphere.

In brief: The exemplary basis for the creation of the conditions needed for sustaining human life on this planet, is the action of chlorophyll in transforming low-energy-flux-density solar radiation received near the surface of our planet, into the higher energy-flux-density forms of plant life, on which the satisfactory management of the Earth's climate, and progress of human life depend.

Conserve the environment by increasing reliance on the use of increasing high-energy-flux-density sources of power, such as nuclear-fission and thermonuclear-fusion. . . .

Increasing Energy-Flux-Density

The key to the physical organization of economic conditions of human life, is the increase of what is termed, as a rule-of-thumb, low energy-flux-density of received solar radiation, to successively higher levels of energy-flux-density, as typified by the succession of production by chlorophyll, use of water-power, burning of wood, burning of coal, coke, petroleum, nuclear-fission, and thermonuclear fusion. The relative decrease of the relative scale of the ostensibly abiotic mass of the planet Earth, to the relatively increasing mass of the Biosphere, and the increase of the mass of the Noösphere to the mass of the Biosphere, illustrate the physical principle to be considered.

The ratios of increase of Biosphere to abiotic planetary mass, and of Noösphere to Biosphere, express a fundamental principle of the organization of the known physical universe: a principle fairly identified as anti-entropy. This is also the principle of anti-entropy exhibited by the generation of the organized Solar System, with its characteristic Periodic Table, from the basis in a fast-spinning solitary Sun, with its lower state of organization, to the composition of the Solar System today.

The only basis for sustaining a modern level of human population on this planet, lies in the effects of scientific and related technological and cultural progress. That progress depends, inclusively and characteristically, on mankind's promotion of the density of useful living plant-life per capita and per square kilometer, in which trees represent a higher state of organization and quality of the climate and environment for mankind than the vegetables we grow for the food-cycle: trees absorb more of the Solar radiation!

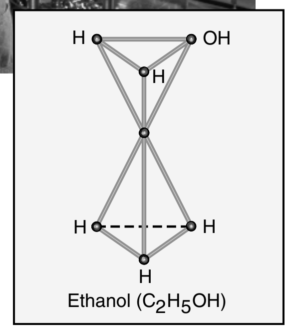
To create a more moderate climate, promote green cover, with an emphasis on trees. At the same time, conserve the environment by increasing reliance on the use of increasing high-energy-flux-density sources of power, such as nuclear-fission and thermonuclear-fusion today. All of these required policies, assume the common physical-economic form of increase of physical, as distinct from merely monetary capital-intensity per capita and per square kilometer. Above half of that investment in physical capital-intensity must be, presently, in the development and maintenance of basic economic infrastructure in, chiefly, the so-called public sector.

In the U.S.A. prior to the rise of the 68ers, the notions which I have just outlined above, represented conventional wisdom. With the coming into maturity of the present upper 20 percent of family-income brackets within the 50-to-65 age-interval, there was a so-called "cultural paradigm-shift" downward, away from a producer society, to a consumer society, from a physical economy, to a low-paid, either non-productive, or marginally productive "services economy."

This Baby-Boomer-led, ideological downshift in intelligence and in morality, is typified by the campaign against nuclear-fission and thermonuclear fusion as the indicated power sources for reaching into a healthy economic future. This represented the same policy of the satanic Olympian Zeus of Aeschylus' *Prometheus Bound.* The doctrine, from the Apollo Delphi cult's Zeus, to the present day, is known in political history as a characteristic expression of what was known then, as now, as "the oligarchical principle." This takes the form of the doctrine that the upper 3 percent of family-income brackets are to be served, and the lower 80 percent must slip, more and more into penury and servitude of manual, unskilled labor. Not accidentally, this is the oligarchical principle expressed by the George W. Bush Administration, and by Democrats who purse their lips in the contemplation of the buttocks of the upper 3 percent.

The tactic of the pro-oligarchical upper 3 percent and its pursed-lip lackeys, is to fool the credulous into the delusion that "fool's oil" now is a comfort-zone, the future of humanity be damned.

USDA/Photo by Keith Weller



University of Leiden

Making moonshine: A microbiologist and a technician add starter microorganisms to pilot-plant-size bioreactors to ferment ethanol. The molecule can be conceived as two tetrahedra joined at a vertex. A carbon atom sits at the center of each tetrahedron.

Ethanol: Not a Kernel of Science in It

by Laurence Hecht

Ethanol is an excellent substance to tank up on. Just don't drive on it. It slows reaction time, impairs judgment, and it's illegal. In excess, it can make you giddy, stupid, mean, sour, depressed, and violent. It might even make you President.

Here we will inform you what ethanol is, why it is a worse than stupid way to replace our oil dependency, and why development of nuclear power is the only sane way to provide ourselves an economic future.

Ethyl alcohol or ethanol (C_2H_5OH) is the second in what chemists call the homologous series of alcohols, which include methyl, ethyl, propyl, butyl, and amyl alcohol, each one distinguished from the previous by the addition of an atom of carbon and two of hydrogen (CH_2). Man has been making ethyl alcohol since long before the discovery of its chemical and structural formula. Almost any plant substance can serve as the raw material—grapes, apples, corn, grain, and potatoes are traditional ingredients.

To make some yourself, start with some store-bought apple juice which has been bottled without preservatives. Put it in a clean glass container, and let it sit several days. Yeast, naturally present in the air, will act on the fruit sugars—according to a process first deduced by Louis Pasteur—to change them into alcohol. This is called fermentation. Make sure you use a loosely fitting cover, because carbon dioxide gas is released in the process, and could explode a tightly closed container.

If you wait too long, the fermentation will go to the next stage, converting the alcohol to vinegar (acetic acid). If you stop it at the right moment, you will have an apple cider of perhaps 5-10 percent alcohol content. The alcohol will be mixed in with the sugary fruit juice. A simple way to separate the alcohol is to freeze the mixture. The alcohol, which has a lower freezing point than the rest of the mix, will collect in a cylindrical hollow in the center of the frozen substance. One can also separate the alcohol with a still, or what chemists call a distillation apparatus. Ethyl alcohol has a boiling point of 173°F, well below that of water. By heating the mixture, the ethyl alcohol boils off first; its vapor can be collected by condensation on a cool part of the apparatus called a condenser. Both of these methods of separation are types of fractional distillation.

The Cost of Scaling Up

To produce ethanol on a commercial basis, the laboratory process of fermentation and distillation must be scaled up. Remembering that our original intention was to save on the use of petroleum products, we must therefore examine the amount of gasoline and other petroleum fuels that would go into the production of ethanol as a replacement for gasoline. First we have the production of the corn or other vegetable product which is going to provide the sugars for fermentation. Modern agriculture is a highly energy-intensive operation: tractors and farm vehicles require a lot of gasoline or diesel fuel; ammonia fertilizers use natural gas as a feedstock; irrigation requires large amounts of electrical energy; farm work also requires human physical and mental labor, which requires energy for its maintenance. Bulk raw materials must now be transported from the farm to the still, for processing and distillation, another energy-intensive process, frequently using natural gas. In fact, more than the total current national consumption of natural gas would be required to power the stills to produce enough ethanol to replace our petroleum dependence.

When all of these inputs are taken together—studies by Dr. David Pimentel of Cornell University and Tad W. Patzek of the Dept. of Civil and Environmental Engineering at Berkeley have shown—alcohol production consumes more units of fossil fuel energy than it yields when burned as fuel. Corn ethanol, switchgrass ethanol, and wood alcohol (methanol) consume respectively 29 percent, 45 percent, and 57 percent *more* units of fossil-fuel energy than they give back on burning.

If we were so insane as to attempt to replace our petroleum usage with corn ethanol (the least inefficient of the choices), it would require placing 1.8 million square miles, or 51 percent of the land area of the 50 states, under corn cultivation, according to the calculations of retired University of Connecticut physics professor Howard Hayden (*21st Century,* Spring-Summer 2006, pp. 10-11). Need we also mention that a large portion of the human population is suffering from malnutrition? Knowing that, can any moral person justify taking our productive agricultural land out of food production to feed this swindle?

The high cost of the energy inputs required for ethanol production is actually reflected in the price of the product. When all the tax credits and government subsidies are taken into account, the cost of ethanol comes to $7.24 per gallon of "imported gasoline replaced" (see http://zfacts.com for an exhaustive study). Not surprisingly, the largest financial beneficiary of the government subsidies have been the grain cartels—Archer, Daniels, Midland and Cargill—and hedge fund speculators who have recently moved in on the ethanol boondoggle.

Let us now see why nuclear power is an enormously better, and absolutely necessary alternative to the funny fuel.

How Alcohol and Gasoline Burn

Structurally, alcohols are similar to hydrocarbons which are what make up the combustible parts of coal, oil, and gasoline. The hydrocarbons form a simple, homologous series, like the alcohols. Methane, one of the ingredients of natural gas, is the simplest hydrocarbon, consisting of a single carbon atom surrounded by four hydrogens. In the 1870s, two brilliant young chemists, Joseph Achille LeBel and Jacobus Henricus van't Hoff, deduced that carbon bonds with other atoms in a tetrahedral arrangement. Thus, the methane molecule (CH_4) could be pictured as a tetrahedron with a carbon in the center and a hydrogen atom at each of the four vertices. Ethane, the second in the hydrocarbon series, consists of two tetrahedra joined at their vertices (see figure). Knowing this, its formula may be easily deduced by construction, as C_2H_6, and so forth. The alcohol series are much like the hydrocarbons, except that one of the hydrogen atoms is replaced by a molecule consisting of a combination of oxygen and hydrogen (OH).

The connection between one atom and another is called a bond. We understand these bonds today as attractive relationships between the electrons in the outer orbitals of the atoms. Their exact nature, despite much study, is not yet fully understood. However, the branch of physical chemistry known as thermodynamics has been able to create a kind of accounting system, which doesn't worry about what the actual physical geometric process of transformation is. It merely keeps track of the energy relationships, on the assumption that no new energy is created or destroyed in a chemical change.

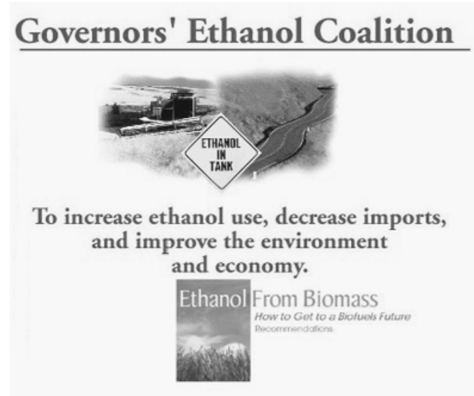
Thus, the attractive bond between the electrons is thought of as containing a certain amount of energy. When a hydrocarbon or an alcohol burns, that is combines with oxygen in the air, these bonds are broken. The energy contained in them is now converted into heat. We don't know exactly how, but we can measure precisely how much.

Heat is measured in a unit called a calorie, which was developed out of the work of Antoine Lavoisier (1743-1793) in experiments on the specific heats of the elements. It is the amount of heat required to raise the temperature of one gram of water (at a temperature of 14.5°C) by one degree celsius. Because this unit is so small, we often employ the kilocalorie, which is the amount of heat required to raise the temperature of one kilogram (2.2 pounds) of water by one degree celsius. (Heat may also be measured by the unit of work known as the joule—there are 4.18 joules in a calorie—and the British Thermal Unit (Btu) which is equal to 252 calories). Using any of these units, we can determine the amount of heat produced when a certain quantity of alcohol, gasoline, coal, or any other combustible substance is burned.

The burning of one kilogram of gasoline produces about 10,500 kilocalories. Burning one kilogram of ethanol produces about 7,140 kilocalories, about 68 percent that of gasoline. Thus, a car running on pure ethanol will require a fuel tank that is almost half again larger than a gasoline-powered

EERE/DOE

The quick-buck magical lure of the ethanol "boom" has captured the Department of Energy, elected officials, universities, and, of course, the cartels.



Governors' Ethanol Coaltion

vehicle.[1]

The Nuclear Domain

However, these relatively small differences are negligible in comparison to the heat released by nuclear processes. The fissioning of one gram of uranium releases about 2 million times as much heat as is produced by burning an equivalent weight of gasoline or oil, and 3 million times the heat produced in burning that weight of coal.

These enormous energies are not released from the chemical bonds. We are speaking now about a new physical domain. In the breaking apart of the uranium nucleus, we are releasing the much stronger forces which hold the nucleus together. Here, in a space about one-millionth the size of the whole atom, we find 92 charged particles, known as protons, each 1836 times heavier than the extra-nuclear electrons, which are the actors in chemical reactions. The protons are held together by some powerful agent, conventionally known as the strong force. In addition to these 92 protons, a nucleus of fissionable uranium-235 contains another 143 neutral particles about the same mass as the proton. When a uranium nucleus shatters, fragments containing these particles go flying apart at velocities up to one-tenth the speed of light.

Finn Hadansson/EIRNS

A Wall Street event on June 14, 2006 promoting the initial public offering of an ethanol company, VeraSun Energy Corp.

For more than 60 years, since the operation of the first atomic pile on Dec. 2, 1942, we have known how to control this process. For over 50 years, we have harnessed the heat generated by the fission of the nucleus to produce electricity, safely and cheaply. With a complete fuel cycle which includes reprocessing, *there is no nuclear waste.*

Nuclear is a fully renewable energy resource. It is also only the beginning. For in 25 years we will begin to commercialize an even more powerful source of energy from the nucleus, fusion power.

With abundant nuclear power, we can virtually eliminate our dependence on imported oil, without having to cover the whole nation with ethanol cornfields and eliminate our food and animal production. Nuclear will provide the electricity to recharge the batteries for electric-powered transport on the trips of under 30 miles that make up the majority of vehicle use.

Nuclear will also generate the fuel to replace gasoline for use on longer trips. With the temperatures of 700-800 degrees, which can be produced by the new fourth generation of nuclear reactors, we can easily separate hydrogen from water, using electrolysis and even more efficient chemical separation methods. The hydrogen will power fuel cells to run electric motors, or be burned in internal combustion engines. Soon, as a result of advances in fast-pulse laser machining processes, ceramic turbines, capable of operating at temperatures of 3,000 degrees and thus achieving efficiencies three times that of conventional engines, will be available.

Hydrogen Fuel

With a heat of combustion of 34,200 kilocalories per kilogram, hydrogen carries more than three times the energy content by weight of gasoline, and nearly five times that of ethanol. That is why it is used as rocket fuel. The leading problem in using hydrogen to power vehicles has been the cost of compressing it to a usable size. However, a variety of options are available and in the works to solve this problem.

The by-product of the burning of hydrogen is water. The byproduct of the production of hydrogen from water is oxygen. Releasing oxygen to the atmosphere by the industrial production of hydrogen, will avert what may be the most serious atmospheric environmental threat we face. That threat is not the release of carbon dioxide from combustion of carbonaceous fuels—for carbon dioxide enhances plant life, helps produce cloud cover, and has never been proven to increase the Earth's temperature. A real danger to be feared from the greatly expanded use of carbon-based fuels over centuries to come, is the depletion of atmospheric oxygen. Nuclear power and the hydrogen cycle will assure the children of the next century the air they need to breathe.

As a growing fraction of intelligent young people are coming to recognize, the often sexually tinged anti-nuclear obsessions of their parents' generation have contributed in large part to the new generation's lack of access to the levels of educational, health care, and employment opportunities which Americans had come to expect. It is time for those still embracing such fantasies to grow up and admit their past errors, or get out of the way. Woodstock, Earth Day, and the rest of those youthful hijinks are a thing of the far-distant past. The nation's future is at stake.

Notes

1. Ethanol is able to deliver about the same amount of power as gasoline, because it requires less air to burn, and thus a greater portion of the gaseous mixture found in the cylinder on each stroke is made up of ethanol. Because of its air requirement, only about one third as much gasoline vapor as ethanol can fit into a cylinder of a given size.

'Satanic Sugar' in Brazil

Brazil is the world's largest sugar producer and exporter. With 13 million acres under cultivation, it is expected to produce 30 million tons for the 2005/2006 harvest, one-half of which will go into ethanol production. It is also the world's leading ethanol producer and exporter, having distilled close to 4 billion gallons in 2004, 37 percent of the world total.

Many ill-informed people have pointed to the example of Brazilian ethanol as a model for the rest of the world. But the dirty secret of Brazilian ethanol is the cheap, almost slave, labor employed in the sugar cane industry.

United Nations/Jerry Frank

In Brazil, ethanol depends on sugar cane harvesting by virtual slave labor.

The state of Pernambuco in the impoverished Northeast, and São Paulo state in the south, have historically been the sites of large-scale sugar cane production, although more recently it has expanded into the states of Rio de Janeiro, Minas Gerais, Espiritu Santo, and Paraná. São Paulo produces 60 percent of the nation's sugar cane.

In the state of São Paulo, the cost of sugar production is $165 a ton, compared to $700 per ton in European Union nations. According to a February 2006 study published by Brazil's Social Justice and Human Rights Network, workers in São Paulo state are paid 2.60 reais (about one U.S. dollar) per ton of cut cane. Silvio Donizetti Palvequeres, president of the farmworkers union in the important cane-cutting region of Ribeirão Preto, told the *New York Times* that "you used to have to cut four tons a day, but now they want eight or ten, and if you can't make the quota, you'll be fired."

Small- and medium-sized farms produce the majority of the food for Brazil's domestic consumption; yet foreign-run agribusiness is driving them out of farming. Over the past 15-20 years, according to one study, sugar cane expansion in the poorer areas of Pernambuco and the Northeast has driven 40,000 people out of small-scale agriculture, and into urban slums.

Workers who do the backbreaking work necessary to cut 10, or even 12, tons of cane per day can earn up to R$800 a month, but then have to deduct R$400 for food and usually miserable accommodations. Malnutrition and illiteracy plague most cane-cutting areas. Workers migrate from one region to another in search of work, leaving their families behind, as there is more than one harvest season.

Where mechanization has been introduced, fewer workers are needed, as occurred during the 2001/2002 harvest in Pernambuco where 150,000 cutters lost their jobs. But because they have no alternative employment, workers are left to wander to other areas in search of work, or end up residing in urban slums or *favelas.* Job security is nonexistent, and unionization becomes impossible, given the large number of transient or temporary workers. With good reason, sugar cane in Brazil's Northeast is called "Satanic sugar."

In place of this policy of slave labor and primitive accumulation, Science and Technology Minister Sergio Resende announced in March 2006 Brazil's ambitious plan to build seven nuclear plants over the next 15 years, two of them in the impoverished Northeast. On the subject of green energy hoaxes in general, Resende wrote in a May 5, 2006 opinion piece in the daily *O Globo:*

"[T]he technological wager on renewable energies, such as wind and solar, to substitute fossil fuels, has not been found to be viable on a large scale. In every study, nuclear energy is confirmed as an alternative capable of meeting demand in the larger domain, cleanly and safely."

—Cynthia R. Rush

C_4 vs. C_3 Photosyhthesis

Continued from page 5

as far as boosting rice productivity to keep pace with population growth and land loss to non-agricultural uses.

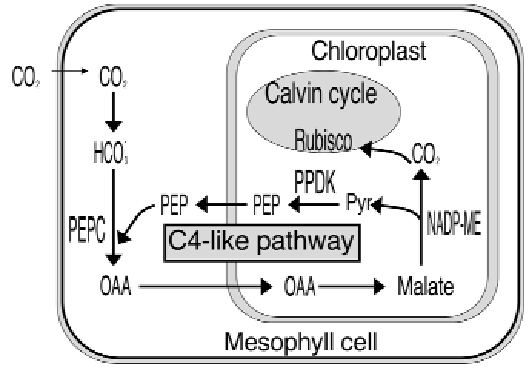
One of the most promising approaches to give a large boost to productivity of rice, would be the successful incorporation of CO_2-concentrating C4 photosynthetic pathways into the rice plants by genetic engineering techniques.

Many scientists are looking at ways to do this, and some progress has occurred with the overexpression of C4 enzymes in C3 plants, but the ultimate goal—significantly boosting photosynthetic efficiency—has not yet been reached. The main problem lies in the anatomical arrangement of C4 plants.

As mentioned earlier, almost all C4 plants break up photosynthetic activity into two cell types, with CO_2 concentration occurring in a different cell than CO_2 uptake. A few C4 plants with just one cell type have elongated cells with one end facing outward and the other to the center of the plant, allowing another sort of separation in space. C3 plants as a rule do not have those qualities of structural complexity.

Whether C4 genes in C3 rice will successfully boost productivity remains to be seen. Perhaps the easier route would be to tinker with the Rubisco protein to shift its affinity for CO_2 vs. O_2 so the CO_2 assimilation reaction drives forward more efficiently under present levels of CO_2, but that also has proved hard to achieve so far.

A MODEL FOR INCREASING THE CO_2 AVAILABLE FOR C3 RICE



Scientists at the National Institute of Agrobiological Sciences (NIAS) of Japan are inserting genes that code for C4 photosynthetic enzymes (PEPC, PPDK, and NADP-ME) into rice, in an attempt to create a functional C4-like pathway to move CO_2 into the mesophyll cell, and incorporate it into the three-carbon molecule phosphoenolpyruvate (PEP) to make the four-carbon oxaloacetate. That would then be shuttled into the chloroplast, where it would be transformed and ultimately cleaved back into PEP by way of pyruvate, releasing CO_2 to be utilized by Rubisco in the C3 photosynthetic cycle, the Calvin cycle. This diagram is adapted from a NIAS schematic.

Notes

1. Mitsue Miyao, 2003. *Journal of Experimental Botany*, Vol. 54, No. 381, pp. 179-189.