American system

Abraham Lincoln imposes science on American agriculture

by Anton Chaitkin

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President Abraham Lincoln, Civil War commander-in-chief, issued his Emancipation Proclamation on Jan. 1, 1863, declaring the freedom of slaves held in the rebellious states. The power of the Union's arms—then substantially aided by 180,000 Black troops—enforced the Proclamation.

With the defeat of Black slavery, the legal remnant of the British Imperial past, it remained for America to construct a positive alternative to Britain's world plantation system.

British imperial apologists Thomas Malthus and David Ricardo posited fictitious "natural resources," whose inevitable depletion by agriculture must deprive land of its natural, original value, making poverty and hunger inevitable. Colonial or other production-depressing regimes are beneficial, by this doctrine, since they delay the using up of nature. Environmentalism is just a 20th-century variant on this old theme.

But a nation mobilized for freedom could not tolerate the blasphemous notion that God's laws consign man to perpetual scarcity and backwardness. Under Lincoln's leadership, using the breakthroughs of science, Americans created a system to render farming so successful, so powerful and productive, that the lie of inevitable poverty was forever dispelled.

Since the triumph of Lincoln's agricultural program, only outright tyranny can enforce hunger and poverty anywhere in today's world.

Millions of new private farms were created, by government direction. Farm families were educated at government expense. Government scientists supplied them with the latest intelligence on fertilizers, soil chemistry, and crop management. New farmlands opened up by government-organized railroads allowed for production economies of scale. Increasingly sophisticated farm machinery, produced by patent-protected inventors using tariff-protected American steel, was bought by farmers with cheap government-supplied credit. Diseases of livestock were conquered and eliminated by the vigorous prosecution of government science and federal law.

The science of government

The Lincoln revolution moved the United States to world leadership in agriculture and industry. Facing the physical, moral, and legal collapse of his country, Lincoln showed his tenacious faith in the optimism of his principal teachers, Sen. Henry Clay of Kentucky and economist Henry Carey of Pennsylvania, exponents of the "American System" of economics. Lincoln and his colleagues crafted a program serving the interest of every segment of American society. But rather than a grab-bag, the principle underlying government action was the change of the various "interest groups" themselves by transforming them with science, such that the improvement of the nation would serve humanity.

Lincoln's advocacy of humanity meant that he could never worship Nature, as do today's pagan environmentalists. A visit to Niagara Falls set off reflections in his mind which led to his patenting of an "improved method of lifting vessel[s] over Shoals," while a fellow visitor to the Falls complained of Lincoln's alleged lack of a sense of wonder.

Neither did he romanticize or otherwise propitiate farmers; no farmer asked him beforehand to create the Agriculture Department or America's farm-centered state college systems.

A year after he won national notoriety by his campaign debates with Illinois Sen. Stephen Douglas, and a year before

his election to the presidency set off the clamor leading to the Civil War, Lincoln addressed the Wisconsin State Agricultural Society at its annual fair in Milwaukee on Sept. 30, 1859:

"I presume I am not expected to employ the time assigned me in the mere flattery of the farmers, as a class. My opinion of them is that, in proportion to numbers, they are neither better nor worse than any other people. In the nature of things they are more numerous than any other class; and I believe there really are more attempts at flattering them than any other; the reason of which I cannot perceive, unless it be that they can cast more votes than any other. . . ."

He praised the fair, rather than the farmers, for "exciting emulation, for premiums, and for the pride and honor of success—of triumph, in some sort—to stimulate . . . discovery and invention into extraordinary activity. In this, these Fairs are kindred to the patent clause in the Constitution of the United States; and to the department, and practical system, based upon that clause."

He warned of the very low grain yields from then-current agricultural practices, 8-18 bushels per acre as opposed to the 50 to 100 bushels possible from the mere application of available methods. "What would be the effect upon the farming interest, to push the soil up to something near its full capacity? . . . Unquestionably, thorough cultivation will require more labor to the *acre*; but will it require more to the *bushel*? . . . It would develop those unknown causes, which of late years have cut down our crops below their former average . . . in the deeper plowing, analysis of the soils, experiments with manures, and varieties of seeds. . . . These cases would be found . . . thorough cultivation would spare half, or more than half the cost of land, simply because the same product would be got from half, or from less than half the quantity of land. . . .

"Again, a great amount of 'locomotion' is spared by thorough cultivation. Take fifty bushels of wheat . . . standing upon a *single* acre, and it can be harvested . . . with less than half the labor which would be required if it were spread over *five* acres. This would be true, if cut by the old hand sicle; true, to a greater extent, if by the scythe and cradle; and to a still greater, if by the machines now in use . . . [which] substitut[e] animal power for the power of men. . . .

"The effect of thorough cultivation upon the farmer's own mind, and, in reaction through his mind, back upon his business, is perhaps quite equal to any other of its effects. Every man is proud of what he does well . . . his heart is in his work; and he will do twice as much of it with less fatigue. . . . The man who produces a good full crop will scarcely ever let any part of it go to waste. He will keep up the enclosure about it, and allow neither man nor beast to trespass upon it. He will gather it in due season and store it in perfect security. . . ."

"The successful application of steam power to farm work, is a desideratum—especially a steam plow. . . . To be successful, it must . . . plow better than can be done with animal power . . . and cheaper; or more rapidly." Lincoln proposed the necessity of self-propelled farm machinery, before any such had been invented. But he then pointed accurately to the impracticality of steam-power for this purpose, compared to the eminently successful railroad and steamship; namely, the weight of fuel and water a steam vehicle must carry over farmland. This problem was solved a generation later by the use of gasoline engines.

Lincoln then proposed the family farm as an available means for upholding the freedom and dignity of labor. He refuted the "mud-sill" concept of labor, a sort of aristocratic corollary of Marxist theory, "that all laborers are naturally either hired laborers or slaves . . . that whoever is once a hired laborer, is fatally fixed in that condition for life; and . . . that his condition is as bad as, or worse, than that of a slave. . . . But another class of reasoners hold the opinion that there is no such relation between labor and capital . . . and . . . no such thing as a freeman being fatally fixed for life, in the condition of a hired laborer. . . . They hold that labor is prior to, and independent of capital; that, in fact, capital is the fruit of labor, and could never have existed if labor had not first existed. . . . Hence they hold that labor is the superior—greatly the superior of capital.

"The prudent, penniless beginner in the world, labors for wages awhile, saves a surplus with which to buy tools or land, for himself; then labors on his own account another while, and at length hires another new beginner to help him. This, say its advocates, is *free* labor—the just and generous, and prosperous system, which opens the way for all—gives hope to all, and energy, and progress, and improvement of condition to all. . . .

"The old general rule was that educated people did not perform manual labor. They managed to eat their bread, leaving the toil of producing it to the uneducated. This was not an insupportable evil to the working bees, so long as the class of drones remained very small. But now, especially in these free states, nearly all are educated. . . . Henceforth educated people must labor. . . . No country can sustain, in idleness, more than a small percentage of its numbers. The great majority must labor at something productive. . . ."

"By the 'mud-sill' theory it is assumed that labor and education are incompatible. . . . In fact, it is . . . deemed a misfortune that laborers should have heads at all. Those same heads are regarded as explosive materials, only to be kept safely in damp places, as far as possible from that peculiar sort of fire which ignites them. A Yankee who could invent a strong-handed man without a head would receive the everlasting gratitude of the 'mud-sill' advocates. . . .

"But free labor says 'no!' . . . free labor insists on universal education.

". . . I know nothing so pleasant to the mind, as the discovery of anything that is at once new and valuable—nothing that so lightens and sweetens toil, as the hopeful pursuit of such discovery. [For the] mind, already trained to thought in the country school, or higher school . . . [every] blade of grass is a study; and to produce two, where there was but one, is both a profit and a pleasure. And not grass

alone; but soils, seed, and seasons—hedges, ditches, and fences, draining, droughts, and irrigation . . . saving crops, pests of crops, diseases of crops, and what will prevent or cure them . . . the thousand things of which these are specimens—each a world of study within itself.

"In all this, book-learning is available. A capacity, and taste, for reading, gives access to whatever has already been discovered by others. It is the key, or one of the keys, to the already solved problems. And not only so. It gives a relish and facility for successfully pursuing the unsolved ones. . . .

"Population must increase rapidly—more rapidly than in former times—and ere long the most valuable of all arts, will be the art of deriving a comfortable subsistance from the smallest area of soil. No community whose every member possesses this art, can ever be the victim of oppression in any of its forms. Such community will be alike independent of crowned-kings, money-kings, and land-kings. . . .

"It is said an Eastern monarch once charged his wise men to invent him a sentence . . . which should be true and appropriate in all times and situations. They presented him the words, 'And this, too, shall pass away'. . . . And yet, let us hope it is not quite true. Let us hope, rather, that by the best cultivation of the physical world, beneath and around us, and the intellectual and moral world within us, we shall secure an individual, social and political prosperity and happiness, whose course shall be onward and upward, and which, while the earth endures, shall not pass away."

Justus von Liebig

From Liebig to Lincoln

The natural science, which was to revolutionize American agriculture, was itself the deliberate product of opponents of colonial Malthusian doctrines. This is perhaps best exemplified by the brilliant successes of Justus von Liebig (1803-73), a chemist who grew up in Beethoven's Germany. Liebig identified the mineral nutrients required for the growth of plants; he created the analytical and educational methods that made modern biochemistry and such things as artificial fertilizer possible.

Liebig described his own early mental development as "the reading of books without any system . . . just as they stood on the shelves" of the library, and "thousands of essays and treatises." This "developed in me the faculty . . . of thinking in terms of phenomena. . . . Most closely akin is the peculiar power of the musician, who while composing thinks in tones which are as much connected by laws as the logically arranged conceptions in a conclusion or series of conclusions. There is in the chemist a form of thought by which all ideas become visible to the mind as the strains of an imagined piece of music."

At age 17 he went to Paris, and exhibited his brilliance under the tutelege of Joseph Louis Gay-Lussac and Alexander von Humboldt. By 1820 the French Ecole Polytechnic, whose personnel had virtually founded America's early engineering and military science, was already more or less destroyed. So Humboldt used his influence to set up the young Liebig in his own chair of chemistry at a small German college, at Giessen, in May 1824.

Here organic chemistry was born. This was the first time that teaching was done in the context of a chemical laboratory. As Liebig described it, "a kindly fate brought together the most talented young men from all the countries of Europe [and America!]. . . . Actual teaching in the laboratory . . . was only for the beginners; the progress of my special students depended on themselves. I gave the task and supervised the carrying out of it. . . . I received from each individual [a daily report] upon what he had done . . . [and what] he was engaged upon. I approved or made my criticisms . . . by each participating in the work of all, every one learned from the others. . . . We worked from break of day till nightfall. . . . The only complaint . . . was that of the attendant . . . who could not get the workers out of the laboratory in the evening, when he wanted to clean it."

Liebig began in 1832 the lifelong editorship of the *Annals of Chemistry and Pharmacy*. He published his world-famo *Chemistry in Its Application to Agriculture and Physiology* in 1840. He then published several editions of *Familiar Letters on Chemistry*, and *Letters On Agriculture*, which brought the new agricultural and pharmaceutical sciences, which he and his associates were inventing, to the notice of a grateful world.

Liebig wrote of "the present conflict between practical agriculture and scientific Chemistry. . . ." It "might justly claim the attention of enlightened statesmen; for it concerns the weightiest material interests and the fundamental prosperity of the state. The most urgent problem which the present day has to solve, is the discovery of the means of producing more bread and meat on a given surface, to supply the wants of a continually increasing population," a problem "which science is expected to solve."

Liebig attacks the empiricist, who, with mere practical experience and no understanding of the underlying laws of nature, must of necessity fail.

At the heart of Liebig's method is the understanding of the unique dignity of Man, made in his Creator's image, whose creativity, like God's, is potentially limitless. Man at

first "sees everything around him bound in the chains of invariable, immutable, fixed laws. Within himself alone he recognizes a *something* which may govern these effects, a will which has the power to rule over all natural laws, a spirit which, in its manifestations, is independent of these natural powers, and which, when it is in its conceivable perfection, is subject only to its own laws.

"The mere empirical knowledge of nature forces upon us, irresistably, the conviction that this *something* within us is not the limit beyond which there exists nothing similar or more perfect [which] affirms the existence of a higher, indeed of an infinitely exalted Being, to contemplate and to comprehend whom our senses are too feeble, and of whom, in his greatness and sublimity, we can only form some conception by the highest cultivation of every faculty of our minds."

This, in a German scientist, corresponds to that combination of faith in God and in man's natural powers of Reason, which was most identified with the American Revolution, and its last great exponent, Abraham Lincoln.

On May 15, 1862, President Lincoln signed into law a bill creating the Depar ment of Agriculture, "to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture . . . to procure, propagate and distribute . . . new and valuable seeds and plants . . . to acquire . . . all information . . . by means of books and correspondence and by practical and scientific experiments . . . employees [to include] chemists, botanists, entomologists, and other persons skilled in the natural sciences pertaining to Agriculture."

The first scientist appointed by the Department, in 1862, was Justus von Liebig's student, Charles M. Wetherill.

On May 20, 1862, Lincoln signed into law the Homestead Act, giving to any head of a family or to anyone 21 years of age, one-fourth square mile of free land for farming. For the remainder of the century, the Act transferred millions of acres of the public domain to private ownership. With the Lincoln-organized Pacific Railroad completed in 1869, settlers poured into newly opened western lands. Between 1870 and 1880, some 128 million acres were added to U.S. farmland, 49 million acres between the Mississippi River and the Rocky Mountains. The total amount of actually improved farmland increased from 189 million to 285 million acres.

On July 2, 1862, Lincoln signed into law the Land Grant College Act; it had first been introduced by Vermont's Sen. Justin Morrill in 1859, but had been vetoed by "free enterprise" radical President James Buchanan of Pennsylvania. The Act donated federal land which the states would sell, establishing a perpetual endowment for public colleges in each state. The curriculum, besides military tactics, and "other scientific and classical studies," was to "promote the liberal and practical education of the industrial classes," in areas relating to agriculture and the mechanic arts.

The Land Grant schools, such as Iowa State, Ohio State, and Pennsylvania State colleges, and the older universities which shared in the federal largess, such as Yale and Harvard, became in the late 19th century the center of potent agriculture-related research.

Evan Pugh, the founder of Penn State, was a student of Liebig. Liebig's student Eben Horsford returned to America to open a pioneering laboratory at Harvard for the teaching of analytical chemistry; his innovations spanned the field from condensed milk to fermentation of bread and alcohol. Horsford's successor at Harvard's Lawrence Scientific School was Professor Oliver Wolcott Gibbs, another Liebig pupil.

Liebig student John A. Porter, the first dean of the Sheffield Scientific School of Yale, helped develop its courses in agriculture and nutrition. Another pupil of Liebig, William H. Brewer, was professor of agriculture in the Sheffield Scientific School from 1864 to 1903.

Brewer's colleague, S. W. Johnson, returned from Europe and his studies with Liebig in 1856. He then began t aching at Sheffield and translating the latest European works on chemical analysis for American chemists. In 1869, with Johnson's urging, Connecticut passed its Fertilizer Law requiring accurate labeling of contents, to be determined by state chemists. This was soon copied by the other states, realizing in America Liebig's proposal for exactly such government regulation of a field that had been entirely unknown to the previous generation. In 1877, Johnson became director of the new Connecticut Experimental Station, emulating the 100 such stations which Liebig's influence had already established in Germany, Italy, and Austria. With Johnson's lobbying, the U.S. Congress passed the Hatch Act in 1887, creating a national network of experimental stations.

The universal mission of American agriculture

For about 35 years after the end of the Civil War in 1865, government-sponsored science and government-protected industry guided an immense increase in American agricultural productivity.

When President Theodore Roosevelt handed the economy over to J. P. Morgan and other British-allied bankers, he simultaneously closed the west to settlement, calling this "conservation." TR's foreign policy imposed the old enemy agricultural form, the plantation system, on certain areas of Latin America. U.S. agriculture went flat.

After World War II's immense economic mobilization, in another generation's war for freedom, America used the agricultural insitutions founded by Lincoln to take another quantum leap in farm productivity. Science in fertilizer, breeding, soil analysis, and heavy mechanization caused record crops, and gave promise for the end of world hunger.

In recent years, however, the policies of Lincoln's enemies—the slavocracy of international banking—have dictated a severe reduction in the machine and scientific power available to U.S. farmers. To regain our power to produce; to regain our vanishing family farms; to feed and to teach agriculture to the starving millions in the Third World; we must regain our independence from "crowned-kings, money-kings, and land-kings."