In defense of Treasury Secretary Alexander Hamilton

by Lyndon H. LaRouche, Jr.

Today, Alexander Hamilton, our republic's first Treasury Secretary and Inspector General of our armed forces, seems to be a giant, and our contemporary political leaders Lilliputians by comparison.

When Hamilton entered the post of Treasury Secretary, our nation's indebtedness and economy were in a terrible condition, similar in many ways to the economic disaster we are suffering today. Under Hamilton's program of recovery, our national credit was restored, our banking system became the soundest in the world, and prosperous growth was unleashed throughout most of our nation.

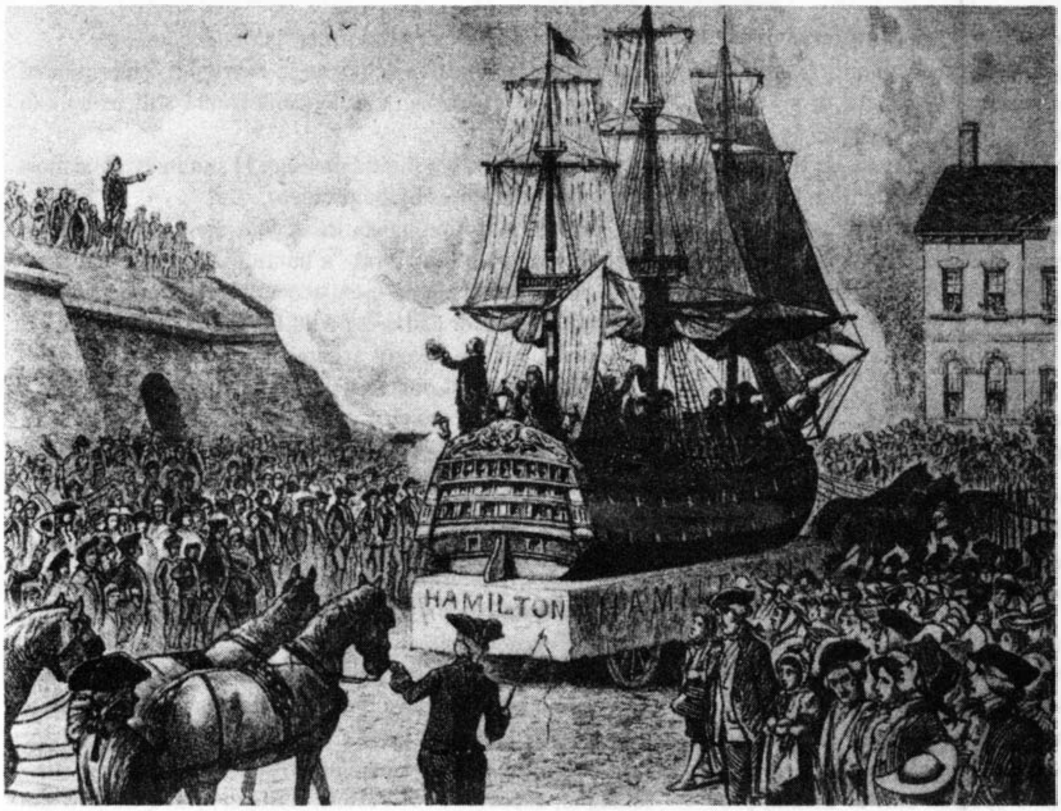
These policies of credit, banking, and economy, which Hamilton outlined in his famous reports to the Congress, became admired and envied worldwide by the name of the "American System of political-economy."

Under the administrations of Thomas Jefferson and James Madison, Treasury Secretary Gallatin scrapped the American System, and introduced Adam Smith's free-trade dogmas instead. The result of this change was a ruinous one. Under Presidents James Monroe and John Quincy Adams, Adam Smith's ruinous ideas were scrapped; Hamilton's American System was restored. National credit, banking, and economy were saved.

Presidents Jackson and van Buren destroyed the American System, and reintroduced the ruinous policies of Adam Smith. The result of Jackson's policies was the terrible Panic of 1837.

I have lived personally through a similar experience in my own lifetime. The Coolidge and Hoover use of Adam Smith's policies, during the 1920s, plunged the world into a Great Depression. Most Americans suffered greatly through 1938, until President Franklin Roosevelt began his first steps toward preparing us for the war with Hitler he already knew then was inevitable.

Many of you are told today, that it was military spending that pulled the United States out of the depression. I was there, and saw, as did many of my generation, exactly how the economic recovery of 1940-42 was organized. It was not the war which caused the economic recovery. President Roosevelt created the economic recovery to bring the production of our farms and industries up to levels needed to



A parade in New York City celebrates the ratification of the U.S. Constitution in July 1788, with a parade featuring the ship Hamilton, *named for the chief author of* The Federalist *papers. Under Hamilton's "American System" of economics, the United States entered an era of prosperous growth.*

support our mobilization for war. It was not the war which caused the economic recovery; it was the economic recovery which made it possible for us and our allies to win the war.

We could have had an even better economic recovery, if we had not been forced to do this under the costly, inflationary conditions of war. Despite the inflationary costs of full-scale war, the U.S. recovery of 1940-43 was one of the greatest successes in the economic history of the world. All of the prosperity we enjoyed during the 20 years after the war, was a result of the high levels of farming and industrial potential we built up by 1943.

During the past 20 years, under five successive Presidents, our economy has been sliding downhill. Today, for most of our families, local communities, farms, and industries, things are as bad or worse than during the middle of the 1930s. Leading world bankers are warning us that we are near the edge of the biggest financial crash in history.

The time has come, to junk Adam Smith's ruinous policy of free trade, and to return our country to what Secretary Hamilton was first to name "the American System of political-economy." That is what I intend to do as your next elected President of the United States.

Today, more and more political analysts are warning that the AIDS issue will make my presidential candidacy a very strong proposition. When some among these analysts are asked what might be the added effect of a financial crash becoming an issue during the coming months, their eyes roll upward, as if they were about to faint. The response is: "Let us hope that the crash can be postponed until after the 1988 elections."

For technical reasons, the only one who could predict the exact timing of a crash is some powerful government or banking interest, which knew the day on which it intended "to pull the plug." Unless one has that sort of information, it is impossible to predict mathematically the exact timing of a financial crash. However, the international financial bubble is now stretched to the point it is ready to burst. Under these conditions, any significant disturbance could set off a chain-reaction collapse in markets. Anyone who imagines that it could be postponed to beyond President Reagan's January 1989 farewell address to the nation, without the kinds of sweeping changes in emergency policies I would propose, is dreaming wishful dreams.

Therefore, any American who is looking a few months or more ahead, ought to be very concerned with knowing my economics philosophy and plans for emergency action.

My policies are documented at considerable length in a number of published texts, including a special report I presented to the Reagan administration in August 1982, and a follow-up special report submitted a year later. Given the reading habits of most of my fellow-citizens today, it is indispensable that I summarize this topic in a series of shorter articles. In this article, I concentrate on what might be the first question which comes to the mind of the concerned citizen: What is the kernel of my philosophy of economics?

By profession, I am primarily an economist, and, by scientific standards, a very successful one. All of my work in this field lies within the policy-framework of the American System, as defined by such leading economists as Benjamin Franklin, Hamilton, the two Careys, and Friedrich List.

Within that context, I have added an important discovery. My discovery, known around the world today as the LaRouche-Riemann method, does not overturn anything proposed by Hamilton's famous 1791 "Report on the Subject of Manufactures," but only strengthens Hamilton's policies rather significantly.

Within Hamilton's "Report on the Subject of Manufactures," the following passage appears prominently:

> To cherish and stimulate the activity of the human mind, by multiplying the objects of enterprise, is not among the least considerable of the expedients, by which the wealth of a nation may be promoted.

The connection between inventions of the mind, and the increase of the physical productive powers of labor, is the kernel of the American System. What I have accomplished, is to show that it is possible to predict mathematically the rates of increased physical-economic growth which will result from an effective use of a specific sort of mental production of a new technology. On this basis, I have been able to provide a new, stronger scientific proof for the reasons that Hamilton's American System promotes depression-free economic growth, and why Adam Smith's doctrine must always lead a nation to new disasters.

Most of the argument in the following pages belongs within the scope of what most readers will probably call "intelligent common sense." Part is somewhat technical, although I am able to describe this in terms which require no mathematics education beyond the high-school level. I make no apologies for including this technical material. Contrary to the apparent beliefs of President Ronald Reagan, economics is a science, which only bunglers would approach with nothing more than a few handy slogans.

By the end of this article, the reader will recognize the practical importance of the technical matters I introduce in the following section.

The core of my argument

The fault of most modern economists, and our government officials reporting on the economy, is that these fellows simply do not know what it is they ought to be measuring.

Certain things have been growing in our economy; some things have not been growing, such as farming, industry, stability of banks, and the average standard of living of family households. That which pleases the Reagan administration, it measures; that which does not please the administration, it either does not measure at all, or measures in an incompetent way. As a result, while the economy has been collapsing, the administration has been reporting "economic growth."

Hoover promised a "chicken in every pot," but ignored the question: How many Americans would still be able to afford a pot?

What is it that we should measure? I summarize the most fundamental features of the problem.

Modern anthropologists insist that the earliest form of society was what they term "a hunting-and-gathering society," in which mankind's existence depends upon hunting fish and animals or gathering wild fruits and vegetables. Let us assume, for the sake of argument, that these anthropologists were correct. Look at such a society through the eyes of the economist.

An average of approximately 10 square kilometers of the Earth's land-area would be needed to sustain the nutrition of an average individual in such a society. This would mean that the human population, worldwide, could not have exceeded about 10 million individuals. It would be a very miserable existence. The average life-expectancy would be well below 20 years of age, and the cultural level a brutish one.

Over a period longer than the past 2,000 years, we have fairly good knowledge of the population-densities and technologies used in major portions of the world. Our knowledge becomes more precise since the great census taken by Charlemagne, especially in Western Europe, where Church statistics are most helpful, in enabling us to estimate population-densities by area with considerable precision. Since the 15th century, the quality of our data is highly reliable for estimating the rates of change in population-densities.

For our purposes here, it is not necessary for me to go into detail on the kinds of methods we use to estimate populations and to cross-check those estimates. The point I am making is a fairly obvious one: a very crucial difference between the behavior of mankind and beasts, as seen through the eyes of the economist.

Today, there are more than 5 billion persons. Even with existing technologies, as the case of Belgium illustrates the general point, we could sustain three or more times the present levels of population, at a standard of living comparable to that in Western Europe and North America during the happier days of the early 1970s. In other words, "since the hunting-and-gathering society," we have increased mankind's potential population by about a thousand times. We have also increased potential life-expectancies by about four times. If we measure all forms of income in kilocalories consumed, we have raised the potential standard of living by much more than a thousand times.

In mathematics, it is conventional to speak of an increase by a factor of 10, as an increase of one order of magnitude. Through technological progress, mankind has increased its potential by about three orders of magnitude. The smartest species of beast could not increase its potential population-density by even a significant fraction of one order of magnitude.

From the standpoint of the economist, the thing about human existence which sets us above the beasts, is that we are able to effect successive advances in what we call scientific and technological knowledge, and are able to transmit that knowledge to one another in such a way as to raise the standard of living of the average person, while also increasing the potential size of the human population sustained at this improved level. No beast's mind can generate or transmit scientific and technological progress.

The most important fact in economic history, is society's power to increase productivity through generating technological progress, and assimilating these technological advances into daily practice of the society generally.

Let us set up a very crude sort of equation, which expresses what we have just said:

$$y = F(x)$$

in which y signifies a rate of increase in productivity, and x signifies a rate of increase of technological progress. $F(x)$ signifies a function expressed in terms of rate of increase of technological progress. Is it possible to construct a mathematical function of the required form? The search for such a mathematical-economics function has been ongoing since the founding of modern economic science, by Gottfried Leibniz, during his work over the period 1672-1716.

What Leibniz did, in this connection, was to establish economic science as a branch of physical science. This economic science was known during the 18th century, into the 19th, as the science of "physical economy." It was sometimes also identified by other terms, including "science of technology," and, in French, "polytechnique." This branch of economics, "physical economy," is the area within which the greatest part of my own professional work lies.

A mathematical-economics function of this sort is possible. My principal contribution to economic science, since my initial such discoveries during 1952, has been to show how such a function must be defined.

This mathematical function can not be solved through use of the methods upon which present-day econometric forecasting is based. Those methods are based on the combined influence of several influential figures of the 1930s and 1940s: Harvard's Professor Wassily Leontief, the principal designer of the present U.S. national income-accounting system, Prof. John von Neumann, and Prof. Norbert Wiener's doctrine of "information theory." These defective methods are known among specialists as methods of solution of "simultaneous linear inequalities." No system of linear inequalities can represent the relationship between rates of advance in technology and rates of increase of physical productivity.

What I did, starting by attacking this fallacy in the arguments of Leontief, von Neumann, and Wiener, was to return to the starting-point of my adolescent studies of Leibniz's work. On that basis, over the course of several years work, I redefined the problem. My next difficulty was to select a choice of mathematics suited for solving problems of the type I had defined. I found the solution in the work of a leading 19th-century physicist, Prof. Bernhard Riemann. For that reason, my discovery is known as the LaRouche-Riemann method.

The first crucial problem we encounter in seeking to construct the desired kind of mathematical function, is the problem of defining what we should mean by human "creativity" in mathematical language. "Creation" is a conception which can not be represented in any system of deductive mathematics. My adolescent wrestling with the famous *Critiques* of Immanuel Kant, enabled me to understand this problem, where Leontief, von Neumann, and Wiener, among others, had failed to do so.

Define the word "creation." Try it in theology. Try it in cosmogony. What do you mean by that word? Most of you mean, that in one moment, something does not exist, but in the next moment it does. The transition from the first to second moment, you will name "creation." What happens in between those two moments, which causes the new thing to be created? No matter how long you attack that question with the methods of formal, Aristotelian logic, or modern deductive mathematics, you will end up no better than at the beginning. To the person who relies only upon deductive logic, it would seem that "creation" is a word we use to identify something the human mind could never grasp.

That was the argument of Immanuel Kant, throughout his *Critiques*. Kant insisted throughout these *Critiques*, but especially in his last, his *Critique of Judgment*, that the mental processes by which human beings create a valid scientific discovery, are not intelligible. This was the same standpoint which von Neumann took, not only in his doctrines on mathematical economics, but his mathematical theory generally. This was Norbert Wiener's standpoint in "information theory."

The solution to this problem of mathematics was first shown to exist by a person who was probably the greatest genius of the past 600 years, Cardinal Nicolaus of Cusa. In addition to being the Papacy's outstanding thinker of the Italian Renaissance period, Cusa was the founder of the methods of modern physical science, and the most direct influence on the work of Leonardo da Vinci and Johannes Kepler, among others, as well as a leading indirect influence on Huyghens and Leibniz, among others. Cusa showed how "creation" could be represented as an intelligible idea, capable of mathematical representation.

Cusa was the founder of one of the two leading branches of all modern physical science. Galileo, Descartes, and Newton are typical of methods of formal deduction, based upon Euclid's *Elements*. Cusa, Leonardo, Kepler, Leibniz, Gauss, and Riemann, are among the leading names in an opposing faction in science, whose method is based on a non-Euclidean geometry. By "non-Euclidean geometry," I mean one based entirely on construction, with no axioms, from which use of deductive reasoning is prohibited.

Without going into the detailed history of this scientific issue, it is enough to say the following. Cusa solved the problem left unsolved by Archimedes, the so-called problem of showing why the attempt at a simple squaring of the circle is based upon a mistaken assumption. Cusa discovered a geometrical and physical principle, which he defined as the "Maximum Mininum" principle, which modern mathematicians know in the guise of "the isoperimetric theorem" of geometric topology. The greatest advance beyond Cusa's original formulation, was contributed by Karl Gauss. A number of Gauss's contemporaries and collaborators worked on refining Gauss's discovery. The results of this were summed up in the work of Riemann.

Today, we call the variety of mathematical physics based on Gauss's approach to constructive geometry "the Gauss-Riemann complex domain." Riemannian physics is based, centrally, on the mathematical representation of processes which evolve to higher states. This is the only branch of mathematical physics in which it is possible to account for what occurs during that interval, constituting the act of creation, between the two moments of successive not-being and being.

This is not the place to elaborate this significance of "Riemann Surface functions." Our purpose here, is simply to identify the nature of the problem of representation, and the location in which the required form of mathematical solution is to be found. The following points must, however, be made.

If you imagine that the only self-evident form of action in the universe were circular action, as Cusa showed, then all of the true theorems and constructions in Euclidean geometry can be developed, in a non-deductive, non-Euclidean way, by construction. This is done, first, by imagining the case in which circular action is acting upon circular action, as if the one is at right angles to another, and that this is occurring at every interval of each circular action. This is called doubly-connected circular action. Euclidean space, elaborated by rigorous methods of non-deductive (non-Euclidean) construction, is essentially triply-connected.

With Gauss, we go a step further. We know that simply circular action is not an adequate representation of the real universe. Imagine a special form of circular action, in which the radius of rotation is lengthening as the action occurs: spiral action. Now, imagine that the center of rotation is moving forward, in the direction of time, while this is occurring. Our spiral action now lies on the exterior surface of a cone. This is called a self-similar spiral, for obvious reasons. Now, in place of circular forms of multiply-connected action, substitute multiply-connected self-similar-spiral action.

State what you have done in the language of trigonometry, using elliptic, hyperbolic, and hyperspherical trigonometric functions to accomplish this result. The result is the Gaussian form of the complex domain. It is the Riemannian form of this Gaussian complex domain, which permits us to represent those kinds of processes which are properly called "creative."

Although this Riemannian approach implicitly permits us to map brain functions in a broad way, the LaRouche-Riemann method considers only one aspect of these brain functions, the problem of representing the generation of higher-order technologies. Admittedly, at first glance, what we are able to accomplish in this way is "mind-boggling," but after becoming used to the ideas involved, it all seems quite obvious.

Beginning with a set of three scientific papers which Riemann composed, during 1853, as the dissertations qualifying him for inauguration as professor at Gauss's Göttingen university, the central feature of Riemann's work as a whole is his concentration on the hypothesis, that any physical process in the universe was mathematically representable in the Gaussian complex domain. Riemann supplied only partial proofs for this, but he made substantial advances, and pointed the way in the direction in which more general proofs might be developed. What he did accomplish, is more than sufficient for the needs of the economist.

Referring to the function, $y = F(x)$, our first problem is that of defining the way in which both y, a rate of increase of productivity, and x, a rate of increase of technological progress, must be measured. The problem of defining y, is the simpler part of the task. Defining x is the major challenge. It is that major challenge we are addressing at this point.

If we can represent efficiently any physical process which represents a new technology, part of the problem of defining x is already solved. If we can also define which kinds of physical processes are more advanced, and show that in the same way we represent particular physical processes, we can measure which process is the more advanced technology. We can also measure how much more advanced it is. How do we compare two physical processes, and say that one is measurably superior economically to another?

Go back to the work of Leibniz, where this problem was first defined.

Leibniz's major work in economic science began in Paris during the same years, 1672-76, he solved Kepler's plan for creating a differential calculus. His work in Paris, together with that of Christian Huyghens, was done under the sponsorship of the French minister Jean-Baptiste Colbert. The mission in which Huyghens and Liebniz were involved then, was to design what became known as "the industrial revolution." Leibniz defined this task as study of the principles of the use of heat-powered machinery, by means of which "one man can do the work of a hundred."

This involved the principles of design of heat-powered machinery. Huyghens worked, for example, upon what became known later as the piston-powered internal combustion engine. Leibniz's work led him to collaborate with Denis

Papin in the creation of what became the first steam engine successfully used to power a boat (using external combustion).

The general problem at the center of Leibniz's work in economics, was to define the way in which increasing the amount of coal-burning power supplied to a machine, would increase the productive power of the operator of the machine. It is generally true, that increasing the power used per operative will make possible increases of the productivity of the operative. It is also true, that by raising the operating temperature of processes, we can not only increase the productivity of the operative, but can perform kinds of work which are impossible to accomplish economically at lower temperatures.

Were Alexander Hamilton alive today, he would smile as he accused me of "stealing his program." Then, he would ask, "Show me how you worked out the methods for measuring the connection between rates of technological progress and rates of increase of productive powers of labor." We wouldn't talk about much else, since on everything else we would agree automatically.

However, Leibniz's work took him beyond these problems. I shall describe the deeper problem in the simplest possible terms of illustration. Imagine that two machines use up the same amount of heat per hour, and that both are used to do the same kind of work, but, that the same operative, using one machine, will produce more than with the other machine. Assuming that both machines are well built, according to their design, how should we define the difference between these two machines?

Leibniz called this difference "technology." By "technology," we mean, broadly speaking, the quality of organization of the machine's design. One of the simplest examples of this notion of "organization," is the use of a sharper and harder point, or cutting-edge on a tool. The same work can be done with less effort, and usually better. We develop a more general notion of organization, by defining all machine functions in terms of rotary motion.

What we desire to know, is some principle of organization of machine design, which enables us to predict what kinds of changes in internal organization of the machine represent a more effective way of converting heat-power into increased productivity of the machine's operative. This principle permits us to measure the superior organization of one machine over another. This measurement is the measure of quantity called "technology."

To keep the discussion as short as possible, let us define rotary motion in terms of what Leibniz defined as physical least action. Most of the preliminary work on defining principles of technology was undertaken by Lazare Carnot and Gaspard Monge's circles at France's Ecole Polytechnique, with the fundamental work established during the years 1794-1815, before the Ecole began to decay under the post-1815 leadership of LaPlace and Cauchy. Most of the basic principles of technology of design of heat-powered mechanical devices were solved by the Ecole during that period or soon after.

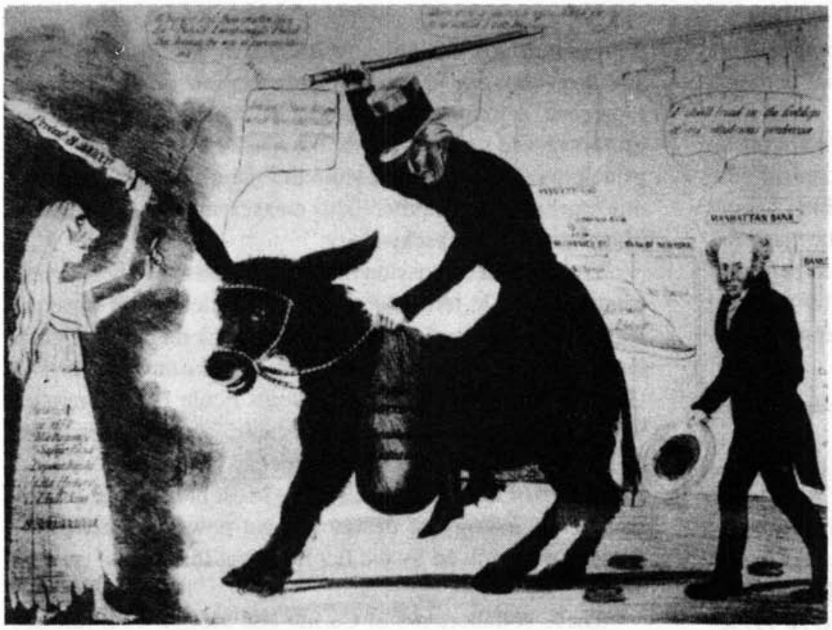
These collaborators of Carnot and Monge went further, to begin to define some of the problems of electrodynamics in particular, as well as thermodynamics in general. The work of Sadi Carnot, Fourier, and Legendre is the most important. However, as French scientists were repressed under the regime of Cauchy, the world's leadership in scientific progress began to shift into Prussia as early as the 1820s, with one center at Berlin, under the leadership of Alexander von Humboldt, and another around Gauss at Göttingen. During the 1820s, Gauss and his collaborator Weber, undertook a comprehensive reworking of electrodynamics. During the 1850s, this work on electrodynamics accelerated, centered in the collaboration between Riemann and Weber.

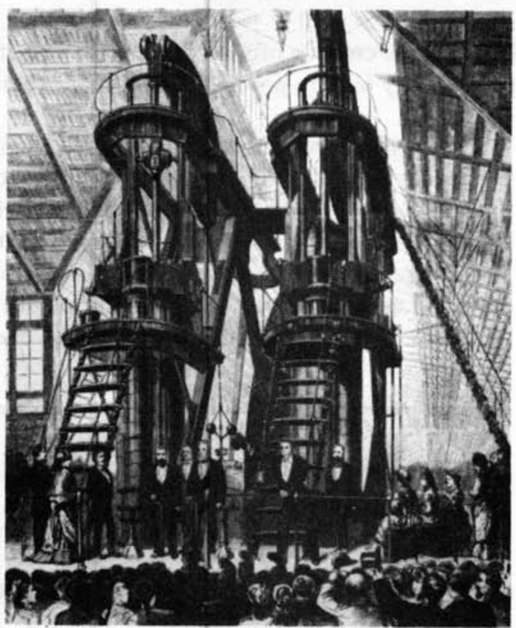
As briefly as possible, now. There is a grave flaw of inadequacy in Fourier Analysis. The combined work of Gauss, Weber, Dirichlet, Riemann, Weierstrass, and Cantor, was focused upon this problem of Fourier Analysis to a large degree. Gauss's complex domain provided a unique basis for correcting this flaw. A more advanced view of hydrodynamics was integrated with electrodynamics. This view permits us to do for the technology of electrodynamics what the Ecole Polytechnique did for the technology of mechanics and simpler thermodynamics.

The key clue is to base a notion of physical least action on multiply-connected self-similar-spiral action, rather than upon multiply-connected circular action. This approach permits us, today, to subsume modern plasma physics and coherent electromagnetic pulses under Leibniz's notion of technology. In the conclusion of this article, I shall indicate the major practical importance of that fact for organizing a long-term U.S. economic recovery today.

All other things being equal, there are three conditions which must be met to generate a generalized advance in productivity of operatives:

1. The amount of usable energy supplied, both per capita and per square kilometer, must increase.





Presidents Andrew Jackson and Martin van Buren destroyed Hamilton's "American System" economics, and reintroduced the ruinous policies of Adam Smith. The result of Jackson's policies was the Panic of 1837, illustrated (left) in a contemporary cartoon. The drawing shows "Old Hickory" beating the bankrupt nation. The drawing on the right shows the Corliss steam engine at the 1876 centennial exposition. With the reintroduction of American System methods after the Civil War, such inventions spurred unprecedented industrial growth.

2. What is sometimes termed the "effective energy-flux density" of the energy supplied and applied, must increase.

3. The level of technology in internal organization of the process of production, must be advanced.

These three conditions are interdependent. If these conditions are not met, productivity of production will tend to stagnate, and ultimately will collapse.

One other point must be added now, before turning to the problem of proper measurement of productivity itself. The fact that we can represent technological progress mathematically, means that we can represent this in terms of the kinds of mental processes which generate these discoveries. This does not explain everything about the human mind, but it describes what mental processes must do to discover a scientific advance beyond existing levels of technology. To this degree, creativity is rendered intelligible.

To choose what to measure as increase of productivity, takes us back to the illustration given at the beginning of this section. What determines whether a change is for the better of society, or not? The answer should be obvious. Most simply: whatever increases the potential population-density of society, whatever increases the number of persons who can be sustained, in an improved standard of living and culture, per square-kilometer of land-area.

We consider the problem of making such measurements at several successive levels of sophistication.

Since our definition of increased productivity must correspond to increase of potential population-density, we should not measure output in either prices or particular products. We measure output in terms of "market-baskets" of consumers' and producers' requirements. The number and qualities of products in market-baskets changes with technological progress. Labor of a higher quality of productivity requires a higher standard of living to maintain its household at that level of cultural potential. So, we must measure how many individual market-baskets' worth of output are produced by the labor of a single operative. We must take into account both consumers' market-basket requirements, and producers' requirements measured in the same way.

The problem of diminishing returns on natural resources comes into play. Here, energy comes directly into play. The more energy per capita, and the greater the effective energy-flux density of that energy, the poorer the quality of natural resources we can use without suffering an increase in cost of production. As we are able to use poorer natural resources economically, the limits of natural resources are widened; whereas, if we do not advance technologically, the limits of natural resources close in upon us.

If we are broadening the limits of natural resources, the result is that an average square kilometer of land will sustain an increasing number of people. If our technological progress is stagnant, the limits of natural resources are closing in upon us. If we slip backward technologically, and have less energy used in production, per capita and per square kilometer, the society is on the road to collapse.

For these reasons, it is not adequate to measure productivity in terms of present-day market-baskets. What we must measure is a rate of increase of productivity, a rate which must be high enough so that we are broadening the limits of natural resources, rather than allowing them to close in upon us.

Political-economy

A modern economy has two interdependent aspects. The first aspect, which we have stressed so far, is the physical economy: the production and physical distribution of goods. This is the aspect of the economic process which falls under the heading of physical science, as we have reviewed what is involved in that. The second part is the political processes governing an economy. These political processes include the issuance of money, the organization of credit and banking, taxation, and tariffs.

Since employment, production, and physical distribution, on the real, or physical side of the economic process, are organized through buying and selling at money-prices, and are fostered or suppressed by the way credit and banking are organized, and are affected by taxation, the two sides, the physical and political, interact in this way. This interaction is what we ought to understand one another to mean when we use the term "political-economy."

Our Founding Fathers' knowledge of physical economy was obtained, from about 1766, in the relatively greater degree from French industry and science, and their theoretical knowledge from Leibniz or Leibniz's indirect influence. The emphasis on "productive powers of labor" in Hamilton's "Report on the Subject of Manufactures" is strictly Leibnizian. Their notions of the political side of the economic process are best traced to the pre-Andros period of the Massachusetts Bay Colony, and the 18th-century influence of Cotton Mather. Benjamin Franklin's 1729 "A Modest Inquiry into the Nature and Necessity of Paper Money," is an affirmation of Cotton Mather's policy, a policy based on the successful use of paper money issue and "state banking" in the pre-Andros Massachusetts Bay Colony.

Our Founding Fathers had none of the illusions about "the magic of money" popular around Washington—and elsewhere—today. They knew that the source of wealth was the production of physical goods and of public improvements such as roads, canals, bridges, ports, and similar works. Paper money, credit, banking, and so forth, were necessary arrangements for efficient commerce, but nothing more than that.

Today, when I outline what I shall do as President, someone always pops up to ask, "Where is the money coming from?" Very simply, under our Constitution, the U.S. Congress shall enact a law, authorizing the issuance of between $500 billion and $1 trillion of U.S. Treasury currency-notes. This money will not be spent by the federal government. It will be lent, through banking-system channels, to farmers, manufacturers, public utilities, and capital accounts of federal, state, and local agencies responsible for building public works. We shall put farms, industries, and people back to work producing new physical wealth. They will produce more wealth than is loaned to get this production into motion. Their wages, and the business income of farms and industries, will put added money into circulation, increase the tax-revenues of the federal government (without raising tax-rates).

If this money is loaned at low borrowing-costs, at prime rates less than 2%, and if federal tax schedules provide generous investment tax-credits to those who invest in creating high-technology work-places in production, we shall do quite well without having to borrow money from anyone but ourselves.

The problem today, and over the past 20 years, has been, that the political side of the economy has been mismanaged, very badly. The percentage of the total labor force employed in producing physical wealth has been collapsing, while the combined total of unemployment, and employment in administration and superfluous services has piled up. Tremendous fortunes have been made in pure financial speculation, with no increase of physical production to show for it. We have been going deeper and deeper into debt, to produce less and less per capita. It's a terrible way to run a railroad.

The only major risks in the government's creating very large issues of money for lending are that the lending and tax policies might move money in the wrong direction—into more financial speculation, and more and more employment in administration and marginal qualities of services. The trick is to lessen the tax burden on investments in high-technology, goods-producing work-places, and to steer most of the newly created credit into those kinds of investments.

My immediate goal is to add 5 million new industrial work-places, emphasizing improved technologies, during the first two to three years of my administration, and steer the nation in the direction of employing about half of the total national labor force into occupations as farmers, industrial operatives, and operatives employed in constructing and maintaining utilities and public works.

There is no magic in it. It is simply a matter of government reaching a consensus with entrepreneurial farmers and industrialists, and government's delivering on promises to promote technological progress in and expansion of production and employment in manufacturing industries and similar forms of employment. Set the investment tax-incentives high, keep low-cost credit flowing through the private banks, and ensure that there is a sufficient rate of scientific progress being generated.

This program will not be inflationary. It will be deflationary. The higher the percentile of the labor force employed in producing wealth, and the lower the percentile employed in administration and marginal services, the lower the cost of every article produced—the fewer the number of overhead salaries tacked onto the price of what the farmer or industrial operative produces. Keep financial speculation down, too. That will be indispensable under conditions of financial crisis; it is a good practice generally, since every dollar of income from financial speculation becomes an added dollar of overhead tacked onto prices of commodities.

Let us suppose that I were President for two terms. In that case, before I left office, the percentage of our national labor force employed as manufacturing operatives would have doubled, while the number of working farmers would remain about the percentage existing today. This would nearly halve the real cost of every manufactured item produced, simply through large cuts in the overhead burden tacked onto the price of things produced.

Balance the budget? Easily! The trick of balancing the budget, is, essentially, keep tax-rates low and tax-revenues high. How? Simply: Increase national income. Low tax-rates mean, among other things, a more rapid investment in new work-places. By expanding production, the government gains more from expansion of the revenue base, than it loses by not raising tax-rates. Government must strike a reasonable balance between the two, subject to imperative national needs.

The political side of the economy is the easiest part of the problem. We need nothing more than a government with the knowledge, political will, and political support to do what must be done. The real mental challenges come in the area of physical economy.

My 'science-driver' program

My first concern, as President, apart from preventing the financial system from blowing wide open, will be to get rates of productive employment up. Those among you old enough to remember 1940-43, will understand this the quickest. We must begin with the plant facilities and work-places which we can reopen for production. A few years down the line, after new capital investments in plant and machinery take hold, the high rates in technological progress will be seen. That's the way it worked during 1940-43; that is approximately the way it will work during most of my first administration.

It will be during the last two years of my first administration, that the impact of technological progress will begin to be felt by the population more generally.

My duty, is to ensure that long after I am out of office, the United States is absorbing improved technologies at rates sufficient to increase our per capita output tenfold approximately each generation. This is not pie in the sky; we already have, or have in sight, new technologies adequate to trigger the greatest boom in the history of mankind.

I start with scientific and related manpower. To achieve what I have set as my goal, we must build up the percentile of combined scientists, engineers, and research-and-development operatives to about 10% of the total labor force.

My next problem, is to rebuild the U.S. machine-tool industry to a scale and rate of turnover sufficient to transfer the new technologies generated in research and development into production in general. If investment tax-credit incentives are high enough, and if large flows of low-cost credit are flowing into industry, industry's appetite for improved products of the U.S. machine-tool sector will be enormous. Government must ensure that the machine-tool sector is being fed with large doses of the kinds of technological progress which our industries will gobble up under such circumstances.

The President, with cooperation of the Congress, has three major economic weapons for fostering high rates of technological progress: 1) U.S. military expenditures; 2) nonmilitary research and development programs wholly or partially backed by government; and 3) public works, both governmental and by public utilities. If the federal government plans its budgets in these three areas properly, the government can shape the net impact of this expenditure to foster high rates of technological progress spilling over into private investment.

The practical problem on which I have been working for about a decade, most emphatically, is to devise the best way in which either I, or some other President could do this.

It happens that all technological progress likely to occur on Earth during the coming 50 years will be concentrated in four areas:

1. Organized plasma processes at very high energy-flux densities. Controlled thermonuclear fusion as a primary energy source for man on Earth, and in space-exploration, is a leading part of this. However, with these "temperatures," and with associated techniques for handling hot plasmas, every branch of metallurgy will be revolutionized, breaking the limits of every presently imaginable limit to natural resources on Earth.

2. Controlled pulses of coherent electromagnetic radiation, and compound pulses of this sort. This is already emerging as a revolution in machine-tool design, and will be the machine-tool industry of the future.

3. Optical biophysics. A major advance beyond molecular biology is currently in progress, the study of all living processes as characteristically tuned electromagnetic processes of special characteristics. This direction in biology was implicit in the work of Luca Pacioli and Leonardo da Vinci, and was accelerated for a while by the work of Louis Pasteur and others on "optical activity" of living processes. Modern techniques enable us, increasingly, to get at these processes in the very small. A revolution in biology is now in progress as a result.

4. New dimensions in computer technology. We now need urgently what are called "parallel processing" modes of computer design, capable of processing billions or even trillions of "flops" per second. Progress in this direction is under way. Under way, but more distant, is the development of new kinds of optical-analog/digital hybrid computers, capable of performing explicit solutions to nonlinear problems stated in terms of the Gaussian complex domain. We need such instruments for many branches of laboratory and other research. We need such instruments to aid us in remote control of the new, energy-dense productive processes, and in space-exploration applications.

For the next 10 to 15 years, there are three very urgent programs of government, each of which requires intensive investment in some or all of these four areas. 1) Military. Moscow's rapid development of its own version of "SDI," of which the first generation is supposed to be deployed by 1992; and Moscow's rapid progress in developing radio-frequency and other strategic and tactical assault weapons. 2) Biology. It is very unlikely that we shall master a cure for AIDS without a leading contributing role by optical biophysics research. Progress in this direction will also be important in our continuing efforts to conquer cancer, and to deal with various problems of diseases of aging of tissue. 3) A Moon-Mars colonization project, with the objective of establishing the first permanently manned colony on Mars by about 2027 A.D.

I intend to steer as much of the military procurement budget as possible into advanced systems. This will be indispensable to maintain effective national defense, and will have the side-benefit of building up our machine-tool sector, to the great advantage of the civilian sector.

We should probably be spending about $3 billion a year on biological research into a cure for AIDS. A very large fraction of this should go into optical biophysics, including more efficient instruments for detecting various forms of AIDS-like and other viruses in samples. Much of this expenditure will go for laboratory instruments of advanced design, indispensable for this research. This will generate a valuable new branch of industry within the machine-tool sector.

The Moon-Mars program is not an optional "prestige" project. The primary mission of the program is the establishment of astrophysical laboratories at a required distance from the Sun. The principal duty of these installations near the orbit of Mars is to focus upon very unusual phenomena in our own and distant galaxies. The immediate benefit of this, is uncovering new physical principles of the universe, principles which will become indispensable for life on Earth during the second half of the coming century.

Since a sound Mars colonization program will require about 40 or more years to develop, we must begin now, or we may be starting too late for our great-grandchildren's needs.

The only foreseeable way in which we could colonize Mars economically, would be to build much of the spacecraft and equipment we shall use on Mars on the Moon. So, the industrialization of the Moon (largely with automated or semi-automated industries) is a necessary stepping-stone to Mars colonization.

This Moon-Mars program, to be completed step by step, over about 40 years, I project as the main science-driver program of my own and later administrations. In manpower, the project will be approximately the scale the Kennedy administration adopted for the NASA program. The NASA program repaid the U.S. civilian economy with more than 10¢ of benefits for each penny spent on NASA. The Moon-Mars program will have the same kind of effect.

For example, the first step is to develop a cheaper and better way to get into Earth's orbit from Earth's surface. We are at the limit of efficiency and cost for rocket-power. We are now ready to proceed with a better approach. This new approach will be a two-part airplane-rocketship. The aircraft will go high into the stratosphere at speeds between eight and sixteen times the speed of sound. There, the aircraft will launch the rocketcraft, and return to an airport on Earth. I have two designs for such a system on my desk, one developed in West Germany, and a modification of the German program developed in Italy. We are speaking of something which could be developed to fly within about seven years, allowing for all reasonable bottlenecks.

Such a hypersonic aircraft would have other uses. At eight times the speed of sound, we could fly to the most distant airport on Earth in not more than three-and-a-half hours. At double that, we could reach Tokyo in about an hour, and Western Europe in about a half-hour flying time, probably about an hour from terminal to terminal. Developing such aircraft would mean a giant leap in the retooling of our aircraft industry, and in retooling of the firms which are vendors to that industry. The same technologies would have many other uses besides those in aircraft design as such.

The way the Moon-Mars program would pay us back would be in five-year-long half-cycles. We would have to ante up the advance money to cover the entire investment in each five years of the program's phases, but, during the second five years, our economy would be paid back in improved productivity gained from the technologies developed over the preceding five years, and so on. By the time the first permanent colony was established on Mars, the entire project would not have cost us a net cent; we would have made a substantial profit on the entire investment.

These various research and development programs would be the government's contribution to generating the new technologies needed to push the development of the machine-tool sector, and thus ensure that the private sector had the highest possible rate of technological progress, and increases in productivity.

To ensure the best result, the Departments of Treasury, Commerce, and Energy would make use of the LaRouche-Riemann method. That method of analysis would be used to monitor bottlenecks in the flow of advanced technologies into the economy, to detect the problem, and work to correct it long before any significant slowing of the rate of national economic growth occurred.

Were Alexander Hamilton alive today, he would smile as he accused me of "stealing his program." Then, he would ask, "Show me how you worked out the methods for measuring the connection between rates of technological progress and rates of increase of productive powers of labor." We wouldn't talk about much else, since on everything else we would agree automatically.