# EIR Special Report

EXECUTIVE INTELLIGENCE REVIEW

# A Conceptual Outline of Modern Economic Science

*By*

**Lyndon H. LaRouche, Jr.**

*Advisory Committee Chairman*
*National Democratic Policy Committee*

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# *About this Author*

Economist, international news service executive, and former contender for the 1980 U.S.A. presidential nomination of his nation's Democratic Party, Lyndon H. LaRouche, Jr., wrote the enclosed pages in "gratitude for the hospitality" he enjoyed during a recent fortnight's trip to India and a somewhat shorter visit to Mexico. "This seemed the best choice," he qualified, "of something in written form which would be useful both to patriotic circles of economists in those nations as well as usefully informative for persons in governmental and managerial positions."

The author's own reputation as an authoritative economic analyst and forecaster has been greatly increased by the success of a computer-assisted quarterly forecast analysis, the "LaRouche-Riemann" analysis, published regularly by his international news service beginning the closing quarter of 1979. That quarterly forecast of short-term and medium-term trends in the U.S. and world economies has enjoyed the advantage of being consistently accurate in forecasting trends and turning-points during a period of more than two years, during which all other published forecasts have suffered the misfortune of having been consistently wrong. He wishes his readers in India, Mexico, and elsewhere similar success. "It is my intent," he qualified the purpose behind this booklet, "to help to foster in these countries nationalist institutions in work of economic science which emerge as, unquestionably, among the leading economic-science centers in the world. On the basis of my discussions recently in both nations, I see no great difficulty in realizing such a result in the very near future."

The author is founder and contributing editor for the international political-intelligence news weekly, the *Executive Intelligence Review*, a director of the scientific association, the Fusion Energy Foundation, and Advisory Committee Chairman for the National Democratic Policy Committee, the latter among the leading organized factions within the Democratic Party. He was born in Rochester, New Hampshire (U.S.A.) on 8 September 1922, and is married to Helga Zepp LaRouche, a political figure of the Federal Republic of Germany.

# *Foreword*

In every case but one, those nations which emerged as industrial powers during the course of the late eighteenth and nineteenth centuries accomplished this under the guidance of policies known during the last century as "the American System of political economy." The United States itself, Germany, the development of northern Italy by Cavour's faction, and the Meiji Restoration "economic miracle" in Japan were premised on the American System by that name. Similar phenomena included the Russian industrial development, into the time of Potemkin, launched through Peter I's adoption of Gottfried Leibniz's program, and the revolutionary transformation of France launched beginning 1793-1794 by the Ecole Polytechnique under Gaspard Monge and Lazare Carnot.

All three successful "models" are unified by the fact that the conceptions of U.S. Treasury Secretary Alexander Hamilton and of Carnot's associates Claude Chaptal and Charles A. Dupin were adopted directly from the founding of modern economic science by Gottfried Leibniz, in his Paris *Society and Economy* of 1671. In no case has any nation industrialized successfully by its own means except through applying those conceptions of Leibniz's embedded in the American System of political economy.

The notable, ostensible exception is the case of Britain. Beginning the takeover of Britain by the Venetian-Genoese rentier-financier interests (and their Swiss and Netherlands branches) in 1603 and again in 1660, Britain and its policies have been ruled by a combination of oligarchical, feudalist interests and a sprawl of rentier-financier interests identified with the eighteenth and nineteenth-century British East India Company. This defines the pivot of distinctions between "British" and both Tudor England and England under the Commonwealth party of Cromwell and Milton. Britain's industrial development, unlike the development of its principal competitors, was based chiefly on the combination of colonial looting and the exaction of usury through continuing hegemony of the City of London and Switzerland and the dominant rentier-financier concentration of power in the world even today.

Yet, despite those facts, only in Japan is the American System relatively general knowledge among policy-influentials today. The dogmas of the British East India Company, the "Oxbridge" and the London School of Economics' Fabian varieties, are the exclusive fare of economics departments of universities throughout North America and Western Europe, and also—sometimes with a bit of quasi-Marxian spicing—in university circles of the so-called developing nations generally.

It is most ironical that influential intellectual circles of developing nations, presumably struggling to free their nations from the crippling aftermath of colonial rule, should espouse political-economic dogmas concocted for no other efficient purpose but to apologize for a perpetuation of colonialism in either overt or disguised forms. It is ironical that nations such as the United States, France, Italy, Germany, and others should reject so sweepingly the policies on which those nations' former rise to economic pwoer were directly premised.

In both kinds of cases, this is ironical, but not wanting of explicable causes.

Beginning in the 1870s, especially with the U.S. Specie Resumption Act of 1876-1879, the trade, currency, credit, and public indebtedness of most nations was subordinated to an arrangement known as the London gold-exchange system. Excepting special circumstances of periods of warfare since, most of the nations of the world have abandoned sovereignty over control of their currency, credit and public debt. They subordinated themselves, in succession, to the London gold-exchange system, the British-Swiss-dominated Versailles monetary order, and, from the close of World War II to the present, to the London-Switzerland-dominated Bretton Woods System—a London-Switzerland domination consolidated by the August 1971 U.S. folly of decoupling the U.S. dollar from a gold-reserve basis.

Since the possibility of economic development is limited by considerations of flows of currencies and credit, and the weight of public indebtedness, to the extent that London and Switzerland have exerted ultimate control over most of international monetary affairs, successful conduct of economic affairs of governments and private entrepreneurship has meant, predominantly, finding pathways to success within the varieties of current "rules of the monetary game" dictated by ruling international monetary authorities.

In this circumstance, if we challenge an hypothetical typical economist today: "Why do you adhere to economic dogmas which have proven themselves disastrously inferior to the Leibniz-American System economic science over centuries?" our hypothetical economist might most aptly retort: "Whether Oxbridge dogmas are rubbish or not is quite irrelevant to me. They represent the rules of the game by which my nation and I must play in the world as its monetary affairs are presently organized."

That hypothetical retort goes to the heart of the problem, of the cited irony. It can be shown, in the case of the United States' universities, for example, that the influence of financier circles allied to London imposed Oxbridge dogmas, displacing willfully American System influences. However, the willingness of students and others to submit to this dictate, which is obviously relevant to the success of the subversive enterprise in this instance, was clearly dictated by the kind of consideration indicated in the hypothetical retort.

The exception proves the rule. Up through 1962-1966, India achieved impressive rates of real economic growth. Yet, it is a matter of record that Harvard economist, Ambassador John Kenneth Galbraith, played a prominent part in conduiting a variety of operations aimed at both the destabilization of India and attempted ruin of its economic development. The United States, already long a virtual tool of British interest in the Western Hemisphere—since President Theodore Roosevelt's days, dictated a codicil to Mexico's Constitution, to the purpose of preventing Mexico's economic development. After the expropriation of Britain's Eagle petroleum interest, under Mexico's President Lazaro Cardenas, the United States intervened ruthlessly into Mexico's internal affairs, to push Mexico's development away from energetic agricultural and basic industries' development, into emphasis upon tourism and shallow forms of "import substitution" investment in consumer goods and urban labor-intensive services. Wherever developing nations manifest vigorous "mercantilist" impulses for effective national economic development, a combination of political interventions and cruel dictates of international monetary institutions reacts with determination to crush such impulses.

Now, during the interval from October 1981 into February 1982, the world has entered into a new "Herbert Hoover" economic depression. Although the depression could still be reversed, by appropriate drastic changes in policies, unless precisely such changes are introduced, at this moment of writing the world is at the verge of a series of financial calamities broadly analogous to those of the period from spring 1931 into autumn 1931. Under these circumstances, as with the case of the Bardi and Peruzzi during the fourteenth century, the creditors' ruin of the debtors becomes the bankruptcy of the creditors.

At this moment, the world is passing through a qualitative transformation of the sort even the undergraduate physicist would recognize, and that most aptly as a "phase change" in world affairs. By "phase change," we mean a transformation in a continuous process akin to the melting of ice or vaporization of water. We have entered a period of crisis, a period of depression pregnant with qualitatively increased risk of thermonuclear warfare. The institutions which smugly persuaded the credulous and awed, "We know how to manage affairs best" are now increasingly self-discredited by the wretched outcome of their own period of unchallenged hegemony over the affairs of the world. Now, either the policies causing this present crisis are overturned, or we must say of the nations and peoples generally that in this time of crisis they demonstrated an incapacity for the kinds of decisions needed to effect their own mere survival.

In the broad sweep of human history to date, analogous periods of profound crisis have

erupted with frightening frequency. Looking back to such crisis-periods of civilizations and nations during the past, the principal generalization which must impress itself upon us is the observation that each such crisis represents a kind of branching-point in history. At such points peoples must choose whether to be swept to ruin by refusing to change radically previous trends in policy-making, or to move humanity into an ascending pathway through appropriate transformations in policies and institutions.

Two transformations in general policy are presently featured. The one, which appears in the ascendancy at this moment, is the unleashing of Hobbesian man, the irrational hedonist, each in war against all. Such cultivation of the basest potentialities of the human individual is leading civilization into lunatic irrationalism and into a state of chaos creating chaos. This is the development impelling civilization to the brink of thermonuclear war. The other, ostensibly more fragile current of policy-alternative is the demand for a return to rationalism of the sort exemplified by the work of Leibniz and his forerunners of Italy's fifteenth-century Golden Renaissance, the current which created the Federal constitutional republic of the United States under President George Washington.

Fragile or not, this latter current is the only hope for civilization in today's crisis. Succeed or fail in this endeavor, unless we at least make the endeavor our individual lives will not have been worth living. We have no acceptable moral choice but to create new institutions, new policies in accord with the best to which rational study of the lessons of our species' historical existence can guide us.

One need not fear the fact that those among us persuaded to adopt this work appear so relatively few. In the noblest enterprises of human history, it has always been the dedicated few who led humanity out of impending ruin into ascending pathways. The majority among peoples of nations have always been, as they are now, seized by a littleness of comprehension and spirit, a smallness of intellect and purpose flowing from the littleness of their concern for small matters of immediate personal and family life. Little or not, most of those same people wish to live, to find a credible expectation of life for their children, grandchildren and their children after them. In times of crisis, those frightened little people seek new leadership to guide them to safety. It has always been, in the best outcome of crises in history, a relative handful who mustered the kind of dedication to a higher, longer reaching purpose, and so provided for their people more generally the quality of leadership that people required.

A few thousand dedicated such leaders in any nation are probably the margin by which the entire nation might be saved.

If I can assist to strengthen such leadership within developing nations, as I work meanwhile to build such a leadership in my own, all of us, being at once patriots and world-citizens, can collaborate as a community of principle, to aid in uniting our respective nations in common effort. We do that because we have no other moral choice acceptable to us.

The kind of economic policy-making required is at the center of the problem of rescuing humanity from its present peril. This is also a topic in which I find the educated strata of developing nations at a significantly higher level, on the average, than that among comparable social strata in the United States or Western Europe. Increasing the per-hectare yield of agriculture, providing productive employment at rising levels of productivity for urban populations, and the measures these require, are the healthy moral outlook of nations such as India and Mexico, a moral outlook largely destroyed among policy-influentials of the United States and Western Europe. I have found, in discussions with young economists in India and Mexico, a disposition to put aside the dogmas of Oxbridge whenever the discussion is focused upon the problems of physical economy, of conceptions of development of agriculture, industry, and basic economic infrastructure. Whereas the typical economist and student of the United States or Western Europe is babbling whatever nonsense he wishes himself to be overheard regurgitating by prospective employers or superiors, the same strata in India or Mexico are much closer to a nation-building outlook, have retained

their commitment to discovering rational solutions to the problems of developing the physical economy. I am obliged to attempt to educate even such pitiable strata in my own country. I have genuine pleasure in the process of presenting what I have to contribute to you from such nations as India and Mexico.

I have chosen this form, a compact conceptual approach to modern Leibnizian economic science, rather than undertaking a complete textbook in the subject. I have preferred to provide you something you might absorb more or less in a single, uninterrupted reading, because I know from teaching and related experience that such an initial approach yields the greater excellence in the long run.

To those I met during my recent journeys to your countries, I thank you for demonstrating to me that persons of your vitality of intellect and outlook still exist in significant numbers in this world. You have encouraged me in my efforts to bring people of my own nation back to that better moral outlook you have not lost. I hope you will find this booklet partial recompense for the moments of happiness you have given me.

Lyndon H. LaRouche, Jr.
New York City
June 13, 1982

# 1. Leibnizian Economic Science

The instructive irony of economic science is that economic science and thermodynamics, together with the original development of the differential calculus,[1] were all accomplished not only during the same brief time period, 1671-1676, of Gottfried Leibniz's collaboration with Christian Huyghens and the heirs of Blaise Pascal in Paris, but that all three branches of science had a common, interdependent origin.[2]

The pivotal distinction between the economic science of Leibniz and his protoscientific predecessors, the mercantilists and cameralists, emerged from Leibniz's focus upon the implications of the conception of the heat-powered machine, "by which one man may perform the work of a hundred others." Out of this inquiry, Leibniz developed three conceptions thereafter integral to economic science and to thermodynamics: *work, power* and *technology*.

For related reasons, the economic science developed by Leibniz was often termed "physical economy" among his followers in Germany, into the early nineteenth century. This economic science was taught under the topic of *cameralism* in Germany into the early nineteenth century, and radiated in France through circles associated with the Italian and French teaching order, the Oratorians—the latter the institution under whose auspices Gaspard Monge taught geometry to young Lazare Carnot.

*Work* and *power* were notions arising from comparison of the work performed by a man employing a heat-powered machine with the work accomplished either by a man attempting to produce the same kind of result without aid of such a different machine. Machines of increasing relative power implied an ordering of correlated scientific discoveries and inventions, which implied ordering principle was the notion of *technology*, or, in its French translation, *polytechnique*. Although this notion of technology arose in connection with study of heat-powered machines, it is properly extended in two ways. It extends backward, as a principle underlying the ordering of advances in power of productive techniques prior to the advent of the heat-powered machine. It applies also to the introduction of "artificial energy," as by fertilizers and soil treatment, to agricultural development.

Consequently, economic science is properly defined and situated as we situate it proximate to and overlapping what we term physics and chemistry. The problem is that of defining measurement in economic science in ways which permit bringing forth such interconnections with physics.

As we shall show here, money, credit and debt, which are taken as primary in British economics, are properly subsumed by physical-economic considerations in any properly ordered national economy. In a properly ordered economy, the state creates and regulates both money and credit, which a properly informed state must do according to the requirements of a process of development of the physical economy.

This necessary conjunction of economic science and physics is effected by means of two successive steps in defining the fundamental metric for study of economic processes.

The end product of physical economy is the production of human existence, both as to

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1. Leibniz presented the first elaboration of the differential calculus to a Paris printer in 1676, eleven years before Newton's bad plagiarism appeared. See more on this below.
2. Leibniz's development of the calculus was based on the specifications for such a development provided by Kepler. Leibniz's solution to this specific problem depended partly on his own youthful exploration of differential number-series (Cf. Leibniz, "The History and Origin of the Calculus"), but more emphatically upon the work of Pascal. Leibniz used not only Pascal's published works, but Pascal's unpublished papers, made available to him by a relative of the deceased Pascal.

   All of Leibniz's principal lines of work were launched during the Paris period concluding in 1676, and were developed, as search of the Hannover Leibniz archive has shown, as facets of an interconnected effort.

quantity of persons existing and the quality of those persons' existence. The proper definition of quality flows from the proper approach to measure of quantity.

The metric we require is, in first approximation, the *potential relative population-density* of society: given the relative quality of man-improved and man-depleted terrain, how many average persons can be sustained per square mile by means of solely the labor of the population inhabiting all of the land occupied by a definite society?

In a hunting and gathering mode of existence, the human population of the earth could not have exceeded at any time several million persons. Today, there exist an estimated four-and-a-half billion persons. With addition of new energy technologies in reach for completion during the remainder of this century, we have available technologies which, fully deployed, could sustain tens of billions of persons at higher average material conditions of life than prevail in the United States today. If we are not insane, we shall reach the levels of technology such that we shall be colonizing nearby space during the next century, reaching the point that we can sustain an average person in space in the functional equivalent of an earth environment of life-sustenance at a social cost approximately that of maintaining a person on earth today.

This broadly outlines the empirical basis for study of increases of potential relative population-density, increases effected through advances in technology realized in production of material conditions of existence by human productive labor. Increases in potential relative population-density and injections of more advanced technologies to effect advances in the productive powers of labor are two facets of the same action.

This progress is not merely available, it is obligatory.

Equating any productive mode of existence with a range of technology, each range of technology defines certain aspects of man-altered nature as "natural resources." What we mean by "natural resources," in practice, is those aspects of nature which can be exploited at acceptable social costs. The entirety of human existence depends upon end products which are largely, in turn, worked up from raw materials. These raw materials are produced by exploitation of what are called natural resources. If the portion of the total labor force of society required to produce a fixed rate of per-capita raw materials is increased, this diminishes the remaining portion of the labor force available to work up raw materials into end products. So, the amount of human existence which can be sustained through average labor is reduced, reducing the potential relative population-density. If, therefore, a society continues in any fixed mode of range of technology, it must deplete the natural resources available for cheaper exploitation in that mode, and so lower the potential relative population-density of society. As the potential relative population-density reaches the point of decline this potential falls below the existing level of population, the genocidal logic of famine, epidemic disease, pestilences, and homicidal squabbling over crusts of food brings the culture into collapse.

Technological progress is mandatory, not optional.

Technological progress overcomes the apparent limits of natural resources in a twofold manner. Increases in productivity, provided they offset the rising social costs implied by depletion of most cheaply exploited resources, prevent decline in the potential relative population-density, or even cause increases in that potential. What we might wish to term scientific and technological revolutions alter fundamentally what mankind defines as the spectrum of natural resources, liberating society from the apparent limits of a particular form of natural resource spectrum.

What must concern us, therefore, is not merely measuring the static value of potential relative population-density in successive periods. What must concern us is determining what lawful principles govern the respective increases and decreases in potential. It is those processes of transformation which are the appropriately primary datum of economic science. It is the study of the lawful principles ordering such data which is the kernel of economic science.

Next, let us compare this with thermodynamics.

In the general analysis of processes from a thermodynamics vantage point, we assort the

total throughput of energy of a process into two broad categories. First, we distinguish that portion of the energy-throughput which is necessarily consumed to maintain a process in the same state of organization after a transformation as prior to that transformation. This we usually term "the energy of the system." The remaining portion of energy we usually describe as the "free energy," the portion of total energy throughput able either to do work on something outside the process itself or to raise the process itself to a higher state of self-organization. These considerations prompt us to emphasize a ratio, the ratio of this "free energy" associated with work potential of the system to the "energy of the system."

In studying the successive transformations of such a system as a process, if the indicated, characteristic ratio declines in the unfolding of the process, we describe the process in question as *entropic*. If, on the other hand, this characteristic ratio increases in value as the process unfolds, we say that the process is exhibiting "negative entropy," or, for abbreviation, is ***negentropic***.

In general, negentropic systems increase the intensity of energy of the system in correlation with increases of the negentropy of the same process overall. That is, by doing work on itself, raising itself to a higher state of self-organization, the system increases relatively the amount of energy-throughput required to maintain the system in the new, higher state of self-organization. We are interested in realizing those pathways of higher self-organization in which the increase of the energy of the system in this way does not result in decrease or stagnation of the ratio of free energy to energy of the system. We restrict our definition of absolutely negentropic processes to those which satisfy this included requirement.

This definition of absolute negentropy is exactly congruent with the required processes of increase of potential relative population-density. For example, the production of an average of about 35,000 kilowatt-hours of electricity per-capita per year is a precondition for achieving the level of productivity per-capita achieved in industrialized nations today.

The reasons for this requirement are most readily illustrated.

In general, reduction of the social cost of exploiting raw materials correlates with improvements in technology which are either directly increases in the thermodynamic reducing-power of the productive processes employed, or express the same change in indirect ways. At the same time, the advancing of the productive power of society in this and other respects makes the productive individual more costly to produce and sustain in respect to the comparison of the "market basket" of combined capital goods and consumer-goods consumption of the less productive and more productive state. (We shall subsequently consider the demographics of this same point.)

In advancing the potential relative population-density of society, we not only produce individuals of greater potential productive power, but those individuals cost more to produce and sustain in terms of comparison of the "market baskets" of combined capital-goods and consumer-goods costs per capita for the society as a whole.

So, the notion of potential relative population-density, defined as a process of transformation to higher states, is negentropic in the same sense we have defined absolute negentropy for thermodynamic processes. On that condition, the two kinds of processes are congruent in leading features.

This connection is emphasized in attempting to define the proper profile of priorities for increasing the productivity of a national economy. In general, we must improve machinery, agriculture, and so forth along a line of advancement corresponding to negentropy for that aspect of production. This local choice must be assessed by considering the effect of that local choice on the economy as a whole: On condition that we choose the proper horizon for measuring the effects of investment and related decisions, we may say that it is the path of negentropy for the economy as a whole which must be the primary criterion, so governing final decisions respecting local investment and related choices.

The important point, more or less neglected in contemporary policy-making of nations and

large concerns, is that the principle of negentropic investment decisions, as we have just summarized the kernel of this matter, is the proper basis for funding of basic scientific research, and priorities and amounts of allocation for research and development, in both the economy as a whole, and in respect to development of the technology of sectors of the economy.[3]

Although these matters focus our attention upon the consumable end products of production, and thus upon agriculture and industry, each broadly defined as the two goods-producing facets of the economic process, too little attention has been given to the role of those improvements in basic economic infrastructure which constitute the indispensable "environment" for such agriculture and industry.

These elements of basic economic infrastructure are broadly divided into social infrastructure, that development of the population's potentials which we shall consider under demographics, and the infrastructure which is immediately environment for agricultural and industrial work places. We concentrate on the latter at this moment.

An estimated 98 percent of the live weight of living organisms is composed of water and carbon as "raw materials," with other elements required for living processes in variously two, three orders of magnitude or greater less than the three primary elements. The possibility of higher forms of animal life, including mankind's biology, depends upon the "chlorophyll revolution," through which less than one tenth of the solar radiation impinging upon the earth's surface—a mere two tenths of a kilowatt per square meter, is converted into biomass. (If "genetic engineering" could lead to an improvement in chlorophyll, the results would be most impressively beneficial.) Any additional energy supplied to the processes of agriculture (broadly defined) must be supplied "artificially," as through fertilizers and soil treatment. The supply of water to agriculture, and the role of vapor transpiration by growing vegetation in moderating climate and generating rainfall systems, complements the role of irrigation and large systems of surface water management. The maintenance of the environment of agriculture, in these and other terms of reference, is the precondition for maintaining and improving the performance of agriculture as such. Direct technological improvements in agriculture depend upon improving the infrastructure for such improvements appropriately.

Also, as the leaders of the young United States understood, efficient transportation is key both to supplying industrial technology to agriculture, the latter a precondition for fostering technological improvements.[4]

In general, water-management systems, communication systems, transportation systems (roads, rails, waterways, ports, ocean transport, air transport today), and energy production and distribution systems, are the basic priorities for development of the economy as a whole, completing the physical elements of urban infrastructure as an additional category.

In a recent computer-assisted study, conducted jointly by the *Executive Intelligence Review* and the Fusion Energy Foundation, it has been demonstrated that the rise and ebb of productivity in the U.S. economy as a whole correlates very tightly with investment in improvements of infrastructure. If one slides the graph of the curve of productivity back in time by between six to twelve months, to overlie the curve of rate of investments in infrastructure, the result is almost exact agreement between the two curves. In the same study, it was demonstrated that this remarkable degree of correlation can be made even tighter by focusing on increases in the number of kilowatt-hours per capita as a leading edge of infrastructural investment.

This result is as it should be. The increase in the raw energy-throughput per capita is important,

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3. See concluding chapter for outline of this specific point.
4. Typical of the issues contributing to the assembly of the 1787 constitutional convention was George Washington's anger at the difficulties of implementing indispensable public works under the Articles of Confederation.

   Compare this with U.S. Treasury Secretary Alexander Hamilton's treatment of the point in his 1791 Report to the Congress "On The Subject of Manufactures."

overall, but the effective increase in the energy-flux-density of heat sources used, overlapping increased efficiency of application of energy from distributive sources, is a rough measure of the effective reducing-power of society's activities, and thus defines broadly the outer limits of increases in productive power per capita. Broadly speaking, industry cannot achieve levels of improved productivity above the limits defined by economic infrastructure generally and quantity and quality (energy-flux-density) of its available energy supplies.

So, the national economy as a whole, combining its end-product-producing agriculture and industry with the development of the quality of economic infrastructure, defines the base line for measurement of negentropic advances in the productivity of the economy.

We define economic science as the study of the task of injecting more advanced technologies into the productive process of the society as a whole. This connection is measured as a process of increasing potential relative population-potential, a process examined as congruent with the notion of a negentropic thermodynamic process, as we have specified our meaning for absolute negentropy.

Although this approach was characteristic of the followers of Leibniz, both the Ecole Polytechnique of Monge and Carnot, and the American System economists associated with the influence of Hamilton, the two Careys, and Friedrich List, the task of explicitly correlating injections of technology, negentropically, to effect economic growth remained unsolved until this writer's work of 1952. Through mastery of the conceptions underlying Georg Cantor's 1871-1883 development of the notion of transfinite orderings, an accurate insight into the significance of Bernhard Riemann's physics (e.g., "The Hypotheses Which Underlie Geometry," 1854) pointed directly to a solution to this remaining problem of the American System. From that discovery emerged what is known today as the LaRouche-Riemann method of economic forecasting analysis. To the implications of this we shall come in due course here.

# 2. The Demographics of Economic Science

Although Karl Marx was broadly correct in his isolation of an intrinsic, cyclical and potential-collapse "internal contradiction" within the British model of economy of his time, he was fundamentally in error in opposing Hamilton, the Careys and List on the point that the British System was not an industrial-capitalist form of economy, but a "mixed economy," in which the industrial form of combined industrial and agricultural production was subordinated to a feudalistic form of rentier-financier order. Marx's principal contribution was not his alleged discovery of "labor power," which had already been discovered in a more advanced form than Marx conceived this, by Leibniz during the seventeenth century, and was already fully developed in the American System of Hamilton[1], the Careys and List. Marx's principal contribution to economic thought was his inadequate but provocative emphasis on the social division of labor in productive relationships.

The best features of Marx's method are presented in their most concentrated form in two writings. The first was the posthumously published "Feuerbach" section of the Marx-Engels *German Ideology* of 1845, most emphatically the opening paragraphs of Marx's contribution to that manuscript. The second is an echo of the same method, in the discussion of "freedom and necessity" in Section 7 of *Capital* III. In general, and not accidentally, Marx is at his relative poorest where the British Marxists identify him as more relatively "mature" and "scientific," by which they signify his actual or imputed submission to the influence of British East India Company-agent David Ricardo and British historiographical frauds generally. He is relatively at his best in those features of method which the British deplore as his "youthful errors."[2]

On condition that we supplant Marx's definition of the social-economic categories with definitions implicit in our preceding outline of rudimentary Leibnizian economic science, Marx's categories of Constant Capital, Variable Capital, Surplus Value and "capitalists' expenses" (for administration, services, etc.) are as good a selection of socioeconomic categories as we might require. The wide use of these same categories, in much "Western" practice as well as Soviet, renders them particularly agreeable for treatment of the kinds of statistical materials generally available today. It need only be remembered that the rigorous definitions of the socioeconomic categories employed here are those definitions congruent with Leibnizian economic science, definitions which conflict with Marx's own often inconsistent definitions on crucial points of application.

For the simplest representation of the social-economic processes of production, we divide the population, illustratively, into only two subcategories, as depicted in the accompanying figure.

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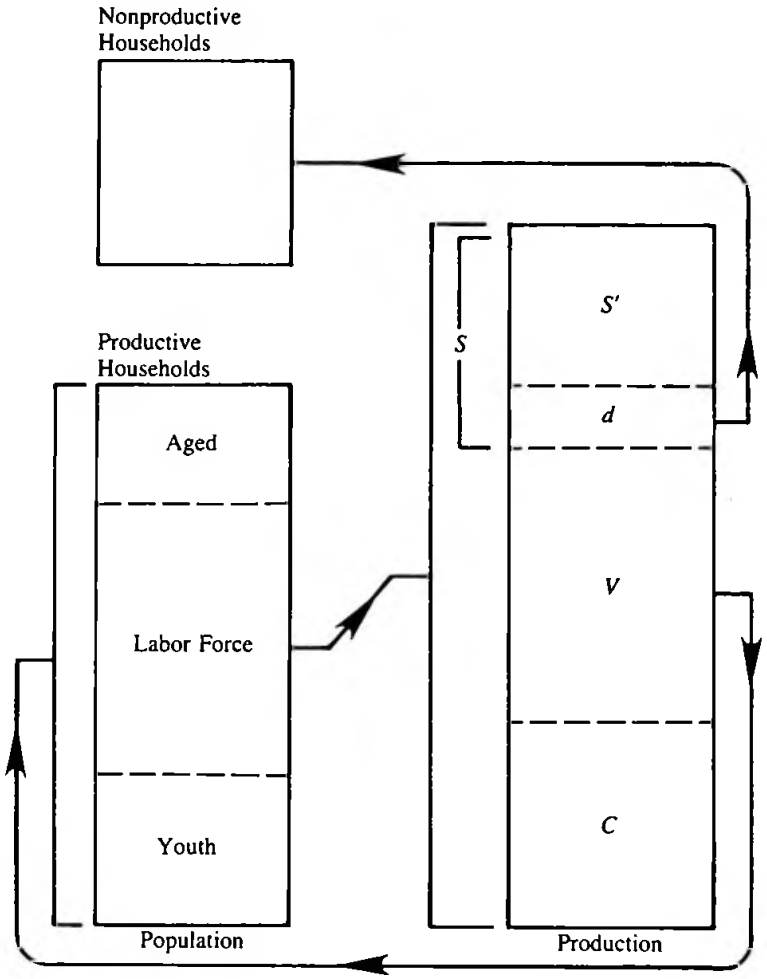
1. The name, "American System," first appeared in the 1791 "On The Subject of Manufactures." Mathew Carey, a former Irish republican leader who had been a close collaborator of Benjamin Franklin and Alexander Hamilton since joining the American cause beginning his political exile, during the middle of the 1776-1783 war against Britain, revived the campaign for the American System by name during 1818-1819. The name of "American System" gained its greatest scope of impact internationally through the work of a German-American protege of Lafayette and Carey, Friedrich List.
2. An examination of Marx's 1835 matriculation essay prepared for a class of his gymnasiums director, Johann Hugo Wyttenbach helps in understanding Marx's methodological ambivalence. Wyttenbach had been a leading spokesman of Franklin's conceptions in Trier of the 1790s, and produced an important, brief study of Groote's teaching-order, the Brothers of the Common Life, during the 1840s. Marx's youthful education was predominantly German republicanism, an influence constantly at odds with his later radical influences.

## Total Economy




We introduce this sort of schematic illustration with some accompanying discussion before turning to the kinds of points to be elaborated with aid of such schematics.

In the first population category, corresponding to the bar in the lower left-hand part of the figure, we take as a unit the total population of households from which a society recruits that portion of its total labor force for direct production of agricultural and industrial goods. (For a more refined analysis, one divides this bar into two bars, one for agricultural production, the second for the industrial labor force's households.) The remainder of the population's households is represented by the bar in the upper left-hand portion of the diagram. This includes the households whose labor force component is engaged in administration, services, police and military occupations, or outright parasitism—excepting the unemployed portion of the labor force attributable to the lower population-bar.

In the bar in the lower left-hand portion of the diagram, we have segmented this bar by dotted lines, designating thus three age groups: (1) below the age level for entering the labor force, (2) in the age range of the labor force, and (3) in the age range above that modal for the labor force. Obviously, a portion of the middle group supplies the entirety of the labor force from these households as a whole.

It may be objected that there is migration from this set of households, as implied by this bar, and the households represented by the bar in the upper left-hand portion of the diagram. This constitutes no proper basis for an objection. As we stressed in the preceding section of this report, what we measure in economic science is not a succession of static, cross-sectional values. What we measure is the process of negentropic (or, entropic) transformation in the process over successive periods subsumed by some actual or implied policy of practice. It is precisely the changes in the ratios of the two bars which concerns us, not their absolute values at some moment. It is merely necessary to adopt some appropriate form of consistent determination of the relative size of the two bars, and no error will be introduced into the analyses made with aid of this schematic approach.

The "output" of the households producing the productive subcategory of the labor force as a whole is that labor force component. This is the input to the production process, as represented by the bar in the right-hand portion of the diagram.

The categorization of production of goods is defined by its application. The primary division is twofold. First, we distinguish that portion of output which corresponds to "energy of the system" from the portion which corresponds to "free energy." The capital goods required to maintain that aspect of the "energy of the system" for production, its capital-goods-factored *equipotential,* is designated by the bar segment labeled $C$. This may be seen as a corrected notion of Marx's category of "Constant Capital." The goods output consumed by the total of households yielding the productive portion of the whole labor force (including its unemployed subcomponent) is designated by $V$. This, with obvious distinctions, corresponds, as replacement for Marx's category of "Variable Capital." This implication is designated by the directed line leading from the output of production to form input to the population bar.

After deducting these two segments, $C$ and $V$, the remainder of the bar represents the Gross Profit of total goods production by the society. We employ the symbol $S$ to designate this Gross Profit. A portion of this Gross Profit of goods production as a whole, designated as segment $d$, is the combined consumption, by goods in the form of both capital goods and consumer goods, of the households and activities of the labor force corresponding to the population bar in the upper left-hand portion of the diagram. This relationship is indicated in the diagram by the appropriate directed line.

The residue, the remaining segment of the production bar, is the Net Operating Profit of goods production, which we have labeled $S$-prime ($S'$). This corresponds to the "free energy" segment of productive output of goods, the combined capital-goods and consumer-goods margins available, as goods or capacity of production, for expanding the scale of production and injecting new technologies into production *on a significant scale*.

Since $d$ includes discretionary expenditures for waste, as well as functionally necessary forms and quantities of administration and services, our first-approximation measurements of the economic process in socioeconomic terms of reference should examine the relationships in a manner which leaves the function of $d$ implicit. So, the first rough measure of an economy's process in socioeconomic terms of reference yields the following principal characteristic ratios and associated constraints

| | |
|---|---|
| Productivity | $S/(C+V)$ |
| Capital Intensity | $C/(V)$ |
| Rate of Profit | $S'/(C+V)$ |
| Expense Ratio | $d/(C+V)$ |

and, these constraints which must be generally satisfied as the result of investments in the economy as a whole:

| | |
|---|---|
| $V$ | rises, per capita, in "market-basket" terms of reference |
| $C/V$ | rises secularly |
| $S/(C+V)$ | rises more rapidly than $d/(C+V)$ |
| $S/(C+V)$ | rises in correlation of some form with $C/V$ |
| $V$ | rises in some correlation with rises in $S/(C+V)$ |
| $S/(C+V+d)$ | rises, and also $S'/(C+V+d)$ |
| $C$ | includes basic economic infrastructure for agricultural and industrial goods production, each broadly defined |

These relationships describe a negentropic process of increase of potential relative population-density. These are the requirements which economic policy of the nation, including policies of development of basic science and technological research and development, must fulfill.

## National Educational and Health Policies

We have studied the Humboldt educational reforms in nineteenth-century Germany, the best educational system ever developed by a modern society, and have criticized this model of reference from the standpoint of our concrete knowledge of the necessary and possible alterations required for the present and threshold levels of technology for the United States today. This provides a model of reference for defining the necessary demographic features of any developing nation which might equal the productivity reached by the United States up into the beginning of the 1970s.

We concentrate upon primary and secondary public education, and merely indicate broadly the additional levels of advanced education.

The proper education of every child and youth, up to ages of between sixteen and eighteen years, must be devoted to a curriculum subsumed under a notion of language as composed of two interacting aspects of language: the language of vision and the language of hearing.

Under the heading of the language of vision we include geometry from the standpoint of the synethetic geometry of Jacob Steiner. This subsumes, under such education in geometry, the transition to physics, by way of the topics of Kepler's founding of modern mathematical physics, and by the same methods of synthetic geometry to a geometrically defined notion of functions of a complex variable, stereographic projections of a Riemannian kind, and general methods of Riemannian topology for physics. This also subsumes composition in painting, as defined by the work of Leonardo da Vinci, the school of Raphael, et al., and coherent approaches to sculpture, architecture, urban planning and the well-tempered system of polyphonic composition from the vantage point of al-Farabi, Bishop Zarlino, and Kepler, and the correction of the tonal values by means of functions of a geometrically defined complex variable.

The language of hearing subsumes the derivation of prose from the principles of poetry, and music as developed lawfully according to geometrically definable principles, from polyphonic singing of poetry. It includes classical literature, history, and language from the standpoint of the classical philological tradition associated with the followers of Wilhelm von Humboldt and Franz Bopp.

Clearly, in its applications for India, such a program would emphasize Sanskrit philology and selected classics, with emphasis on both Indo-European languages and connections to regional dialects of India and Iran as a point of pedagogical reference. In every application, geography is subsumed under both divisions of language.

Such a program has as its combined primary objectives the development of the future citizen, called upon to judge policies as a citizen, and the development of the potentialities of the child and youth to the fullest degree possible, prior to selection of and entry into advanced education.

Such a program would require a span of up to sixteen to eighteen years of age as the point at which the student was prepared either to undertake an advanced education or to enter directly into a modern quality of labor force. Using such a program as a model of reference for our discussion of demographic implications avoids the problems of estimating the school-leaving age in terms of the defective programs now commonplace in the United States and Western Europe.

For our immediate purposes here, the point to be stressed is that these model educational policy requirements specify the prerequisites of an acceptable adult population under conditions of the levels of technological progress definable in respect to combined present and threshold practice in industrialized nations. That means that these are models of reference for the targets to be reached by developing nations during the coming decades. It is from that vantage point that the discussion of demographic implications now proceeds.

A sixteen to eighteeen-year school-leaving age for secondary-school students means a school-leaving age of between twenty-one and twenty-five for most graduates of advanced training. What portion of a nation's population could achieve the ratios of secondary and advanced-training graduates typical of Western Europe or the United States if the life expectancy of preschool children were between forty and fifty years, or even fifty and sixty years? Yet, without such a profile of the school-leaving population as to distribution of age levels, a society at the level of modern technology (and potential relative population-potentials) is impossible.

If we follow this line of investigation through adequately, we quickly demonstrate in that way, the monstrous consequences of any of the currently popularized versions of Malthusian policies. We are forewarned what hideous consequences await civilization unless all Malthusian thinking is immediately extirpated from policy-influencing.

The ability to educate the general population of youth up to levels consistent with modern production and related technologies requires that a very high percentile of the school-graduating population remain in the labor force for forty or more years after graduation. To achieve a high rate of survival into a modal retirement age of sixty-five years, for example, requires a population in which the number of years of life expectancy remaining to a person of sixty-five must be between ten and fifteen at least.

Such demographic characteristics are impossible without appropriate policies of practice in nutrition, in health care, and in hygienic and safety policies of practice. Without such factors of per-capita cost, a population capable of sustaining economically a modern economy is not feasible.

During the recent two decades, the United States has converged, with certain other industrialized nations, upon a zero population growth. In some instances, such as the Federal Republic of Germany, an absolute shrinkage is in progress. This contraction is caused, inclusively, by a combination of the rock-drug-sex counterculture and a contraction in the economic potentials for family formation at modern levels of household material existence for that culture. The growth of per-capita income in the U.S.A. during a large part of this indicated period has been merely a consequence of lower birthrates, of decreasing the number of persons per wage earner in the household!

This contraction of the ratio of youth population has caused the U.S. population to age demographically. This adds an element of crisis within the Social Security system of the U.S.A. The lowering of the birthrate causes an increase in the ratio of retired persons to contributing members of the working labor force. Insurance firms and others have responded to this growing cost of the retired segment of the population by medical reforms which propose to accelerate the death rate among both the aged and the severely ill, parallelling the euthanasia policies of practice of the Nazi regime during the 1930s.

This problem demands a twofold reexamination of social policy respecting persons above the retired age. On the one side, there is the point that the United States—like other nations—committed itself to retirement as a right. However, to live a post-retirement life of from ten to twenty years without some function which makes one an unimportant person in one's own judgment, is also a cruel oppression. This forced retirement was imposed by aid of various policies

of practice, on the silly presumption that any person holding gainful employment after sixty years of age was condemning some deserving young person to unemployment. The solution would be to make retirement optional, such that the retired citizen is given the liberty of means of choice to undertake gainful employment or any other activity he prefers as useful at his or her choice.

That policy brings us into confrontation with another problem: diseases of aging which diminish physical capacity. This means, that to implement a morally mandatory sort of change in policy, the United States would be required to accelerate medical programs bearing upon mastery of degenerative disease generally, a policy directly opposite to the acceleration of the death rate proposed in the reforms of Senator Edward Kennedy's and other sponsorship.

Heart disease and cancer are prototypes of this sort of disease. We discuss these from the standpoint of economic science to illustrate this side of the interconnection between economic policies and demographics.

In fact, the incidence of cancer has been dropping secularly in the U.S. population, if we measure the statistics competently. More people have been living long enough to reach the age at which they incur cancer; by age bracket, the incidence of cancer has been decreasing, contrary to much dishonest propaganda by the antitechnology hooligans on this and related subjects.

In the fight to master degenerative disease, there are limits to what can be accomplished by magic pills cooked up for mass sale by pharmaceutical companies. The problem is one of mastering the methods for assisting and mobilizing the whole human body's potentials for isolating, digesting and expelling degenerative tissue. This means that the frontier of competent research here is individual treatment of patients by highly trained physicians, often with aid of costly clinical procedures by highly specialized clinics.

The insurance companies shout loudly, "No! No! No!" According to their cost-benefit analysis, it is shown with aid of charts, graphs, slides and other paraphernalia, that a patient of fifty-five years of age or older, suffering a high-risk, costly illness, will not be able to contribute back to the insurance fund during the remainder of his working life enough to compensate the fund for the kind of care indicated for this illness. The sly propagandist for the insurance companies adds, "Therefore, if we treat this patient with high-cost procedures over time, funds will be diverted from treatment of other patients, or insurance premiums must be astronomically increased."

What is missed even in economics, apart from clear-cut moral issues here, is that every victory in fighting each instance of such an illness, even if the effort does not fully succeed in saving that patient, is an advance in the combat against that and related varieties of disease. Suppose we spend a few additional millions of dollars on a category of such cases, what we learn from a mobilization of medicine's frontier potentials, as opposed to a low-cost amelioration of the process of dying, is of benefit to all humanity for generations yet to come. It is by precisely such high-cost frontier treatment of individual cases that advances against disease are effected.

The economic-policy objectives, as distinct from the obvious moral imperatives, in mobilizing medical forces against each case of degenerative disease (in particular), is to increase the modal age at which an average improved level of function of mental capacities and general self-sufficiency is maintained. Such benefits will automatically increase the social contribution of persons of the over-sixty-five group, as they naturally seek out opportunities to accomplish something of importance. The result must be, whether through direct or "intangible" contributions to society's productivity, that the apparently large amounts expended for challenging cases of degenerative disease will lead to a benefit to society many times the amount expended in medical efforts.

In any case, the existing perception that the costs of maintaining retired-age sections of population are no longer tolerable, is merely a reflection of a foolish policy of lowering population growth. In effect, lowering the rate of growth of the labor force is a reaction to the restrictions on technologically progressive investment in economic infrastructure and goods production and to the relative reduction in real household-income levels, such that per-capita income can be maintained only by constricting family size.

# 3. Economic Development Is Intrinsically a "Nonlinear" Process

Since the introduction of the depression-triggering "Volcker measures" by the U.S.A. Carter Administration and Federal Reserve System, during early October 1979, the only published forecast by any governmental or private agency which has not been consistently absurd as to directions of key trends, and of turning points has been the quarterly *LaRouche-Riemann* forecast analysis published by the international political-intelligence news weekly, the *Executive Intelligence Review*.[1] That latter, computer-assisted quarterly analysis has been, thus far, consistently correct in forecasting short-term and medium-term trends and turning points, and has maintained the highest performance ever recorded by forecasting services at any time in estimating the quantities of upturns and declines within the economy.

Under ordinary circumstances, such as those of the 1950s and early 1960s, the superiority of the LaRouche-Riemann method would appear chiefly only in the medium-term to long-term range of forecasting, rather than the short-term to medium-term. The LaRouche-Riemann forecast would be significantly better than all other kinds of computer-assisted forecasts, but the principal econometric forecasts now in general circulation would have performed tolerably well in projecting short-term to medium-term trends.

From a comparison of these two sets of facts just cited, it might be concluded, and rightly so, that the introduction of the Volcker measures triggered some profound change in both the U.S.A. and world economies. It would be assumed, rightly, that the Volcker measures triggered a kind of profound change in trends which the LaRouche-Riemann method was well suited to reflect, but which the Wharton and other varieties of econometric methods could not credibly survive.

The appropriate image, as emphasized by this writer's immediate collaborators during early 1980,[2] is the following. If one heats a block of supercooled ice at a constant rate, as in terms of constant numbers of calories per hour per kilogram of ice, the gradual heating of ice will go over, at a critical value, to become the melting of the ice; later, the gradual heating of the water will become vaporization; and so on, to thermal ionization of superheated vapor into a plasma, and so forth. A gradual cooling of superheated steam will describe a reversal of this sequence of transformations. The kinds of transformations which define analogous cases are usually named changes in physical state, or phase changes.

The problem of analyzing the U.S.A and world economies since October 1979 has been that the combined impact of the Volcker measures and the 1979 year-ending, new increase in petroleum prices, pushed an already sickened world economy past a "threshold value," a critical phase.[3] The economic process as a whole experienced a phase change, analogous to what occurs as ice melts or as water freezes. Just as tolerably accurate generalizations from experience with ice fail once the ice melts, so the tolerable errors of econometric short-term forecasts earlier became wild errors once the transformation in state of the economic process had been triggered.

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1. A comparison of the LaRouche-Riemann forecasts with those of competing, leading econometric forecasts was first compiled by *EIR* Economics Editor David P. Goldman in summer 1980 (See *Executive Intelligence Review*, Sept. 2, 1980). Editor Goldman presented an updated report on this subject to a Bonn, West Germany *EIR* conference on May 5, 1982. The failure of all competing forecasts, including those of U.S. Federal executive and legislative agencies, relative to *EIR*'s quarterly forecast performance, has been total, consistent, and devastating.
2. See Uwe Parpart and Dr. Steven Bardwell, "Economics: The Thermohydrodynamic View," *Executive Intelligence Review*, May 6, 1980, where this comparison was first published and analyzed.
3. Ibid.

The LaRouche-Riemann method solved the problem of forecasting through and beyond a point of phase change in the economic process, chiefly by borrowing the methodology appropriate to an analogous situation in physics.

The methodological problem posed is, in its general form, the problem of going beyond simple generalizations from the experimental evidence of behavior of a process within the upper and lower boundaries of any single state—such as the state of ice, water, vapor, for example. The problem is to define a function which specifies conditions equally valid for all possible states of the process, and which also subsumes "prediction" of both the behavior of the process in any one state and predicts the phase of the process at which changes in state occur.

Such a new, generalized approach to analysis of the problems of physics was developed to a large degree by the nineteenth-century physicist Bernhard Riemann. Riemann gave a general statement of the required solution in his 1854 habilitation dissertation, "On the Hypotheses Which Underlie Geometry." In 1859, Riemann published a paper defining what is now a classical model for successful experimental physics solving the problem in question.[4]

The first of the two cited papers of Riemann was employed as a key point of reference by this writer, to effect the breakthrough in economic analysis first defined during 1952. The second of the indicated papers of Riemann was proposed by this writer to be the required model of reference most appropriate to employing the LaRouche-Riemann method of forecast analysis as a mode for computer-assisted quarterly forecasts. This latter policy was adopted during a pair of seminars held in New York City during December 1978. Following a series of successful preliminary tests of the procedure and development of a data base, a few applications were made, and then the regular quarterly forecast was begun during the final quarter of 1979.

The decision to apply the LaRouche method of forecast analysis to computer applications using Riemann's exemplary method for treating analogous experimental cases was foreshortened for purposes of description, to be named for public reference "The LaRouche-Riemann" method.

The hyphenated attachment of Riemann's name to this writer's had a double function. Broadly, it was a matter of giving credit where credit was due, and so indicating to others the general qualifications of the personnel they must employ if they were to accomplish comparable results. The emphasis upon Riemann's contribution to this result had a second purpose, a very practical purpose in light of the characteristic methodological blunders intrinsic to contemporary econometrical forecasting generally.

Although econometrics is the outgrowth of numerous developments within British and related approaches to economy, dating from Sir William Petty's dicta respecting monetarist statistics, the crucial development was the late John von Neumann's misguided presumption that his 1920s work on the so-called theory of games might competently subsume analyses of economic processes. This culminated in von Neumann's collaboration with Oskar Morgenstern, and the effort to correlate this work with von Neumann's doctrines respecting digital-computer technology.[5] As the writer's collaborator, Uwe von Parpart, stressed at a Bonn seminar, von Neumann's projection of the feasibility of econometrics was based explicitly on the presumption that economic processes were characterized by mechanistic equilibrium (i.e., that they were intrinsically *entropic*). If that could be assumed, then economic forecasting might be competently effected by treating an economic process as a system of simultaneous linear expressions.[6]

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4. Bernhard Riemann, "On The Propagation of Plane Air Waves of Finite Amplitude," (1859), translated by U. Parpart and S. Bardwell. *International Journal of Fusion Energy*, Vol. 2, No. 3, 1980.
5. J. v. Neumann and O. Morgenstern, *The Theory of Games and Economic Behavior*, Princeton, 1944. Exemplary of von Neumann's approach to computer technology is his unfortunate *The Computer and the Brain*, (Yale Stillman Lectures 1956), New Haven, 1958. The latter is selected for reference as among the author's last works, although this not completed, before his death.
6. May 5, 1982.

Professor von Neumann made a second underlying assumption, an assumption presented as axiomatic to the entirety of his and Morgenstern's *Theory of Games and Economic Behavior*. Those authors insisted that all economic processes are defined by Jeremy Bentham's outline of the "hedonistic calculus," by the hedonistic principle which Mill, Jevons, and Marshall made the only determinant of economic value in their own and derived doctrines of marginal utility.[7] Professor Milton Friedman is completely consistent with the principles and stated intent of Bentham's, Mill's, Jevon's, Marshall's, and von Neumann's doctrine of marginal utility, when Friedman argues publicly for the legalization of the international opium-heroin traffic as required by marginal-utilitarian dogma. Marginal-utility dogma generally, and von Neumann's dogma in particular, disallows any value judgments respecting distinctions between productive and non-productive forms of investment.

Hence, although von Neumann was a prominent figure in a team of scientists who helped to bring forth recognition of the importance of Riemann's work on "shock waves" for isentropic thermonuclear ignition,[8] von Neumann's doctrines respecting econometrics violate Riemannian physics in the most fundamental way.[9] The otherwise warranted use of the name of Riemann in identifying the LaRouche-Riemann method contributed the almost indispensable added benefit of identifying the specific incompetence of von Neumann's which is at the root of the intrinsic incompetence of econometric methods generally.

Since a considerable amount of nonsensical, barbarically superstitious metaphysical babbling concerning "nonlinearity" has been promulgated influentially by Ilya Prigogine and others, it is doubly necessary that the real significance of the incompetence of linear economic analysis be correctly understood. The most immediate part of the problem we shall remove now. The more profound implications of the same problem we summarize at an appropriate, later point in this report.

## Input-Output Analysis

The most direct approach to exposing the reasons for intrinsic failure of econometric systems of linear analysis is to examine the most characteristic features of the kinds of input-output analysis employed to construct the kinds of linear models employed in computer-assisted econometrics today.

The methods of input-output analysis in general use today are those traditionally associated with the work of Harvard University's Professor Wassily Leontief. This is the "model" employed for the measurement of Gross and Net National Product and National Income in the United States, and the similar, defective method employed more generally for measurement of Gross Domestic Product.

In this procedure, the principal categories and subcategories of industries are listed twice, once, in terms of their output, in rows, and, a second time, as an analysis of their consumption, in columns. Labor is properly added as a row and household consumption as a column. In this scheme, the cost of the consumed inputs is totalled and that sum subtracted from the actual or actual plus imputed price of product produced, and the remainder is defined as the "value added" to total product (and the national economy) by the activities of that sector of output.

This is the general scheme for "input-output analysis," and the scheme for reducing such

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7. L. H. LaRouche, Jr., and David P. Goldman, *The Ugly Truth About Milton Friedman*, New York, 1980, passim. See also, Carol White, *The New Dark Ages*, New York, 1980, for elaboration of the cult connections shaping Mill's, Jevon's, and Marshall's development of utilitarianism.
8. Ironically, von Neumann contributed a significant part in the work of Hans Bethe and others in calling attention to the applicable significance of aspects of Riemann's work.
9. See development of this in the concluding chapter of this report.

input-output relations to a system of simultaneous linear expressions, constrained by assumed boundary conditions stated in terms of inequalities.

The approach may be extended by aid of adducing the same sort of linear expressions from input-output analysis formulation of the bills of materials and process sheets of production in particular firms, and so forth.

Onto this structure may be grafted such considerations as variations in assorted varieties of inventories, interest rates, estimated supplies of investment funds and credit, and almost anything which might be dragged into the door of the computer room from the latest productions of the economics profession generally. However, for the present, the proof to be submitted is made adequately and conclusively by limiting our attention to those matters of physical economy and demographics already identified in this report thus far.

The most general and most fundamental limitation of such input-output schemas is the fact that any technological change in the economic process, whether negentropic or devolutionary, alters both the total composition of the matrix and the coefficients of the terms associated with the matrix.

For example, the development of the automobile leads to a closing down of buggy-whip manufacturing, but increases the division of labor among vendors to the auto industry and in respect to the required changes in general economic infrastructure associated with the use of the motor vehicle as a passenger and freight-transport device. In general, such technological transformations increase the productivity of the society as a whole, negentropically.

A different, but broadly analogous transformation occurs under conditions of devolution (entropy).

In either variant of change, the assembly of linear expressions and associated constraints undergoes a radical transformation, to the effect of a loss of correspondence between the predicted and actual state of the economy in the period for which projection is made. It is the spectacle of such transformations and the associated, devastating impact of such transformations upon the correspondence of forecast to reality which superstitious fellows such as Prigogine greet with the awe-stricken, husky whisper of alarm "Nonlinear!"

It is such transformations in the "input-output matrix" form of description of the structure of the economic process which underlie those qualitative changes in economic processes we may properly term phase changes.

The general pattern of development of economic processes is dominated by a twofold increase in complexity of the structure of the process as a whole. We examine the broad features of this sort of phase change first, and then consider the kinds of devolutionary phase change set forth by the October 1979 unleashing of the Volcker measures.

In first approximation, the effect of technological progress is to increase the complexity of the division of labor. However, this is accompanied by a partially offsetting tendency to also simplify the division of labor in some degree. It is the latter, subsumed aspect of the process which must be considered briefly before attempting to present a generalization of the combined process.

The simplification of the labor process's division of labor, as a secondary, less-dominant feature of technological progress, is most easily comprehended from Leibniz's view of the heat-powered machine.

In the simplest approach to design of heat-powered machines, the designer transfers motions powered by muscle-power of the human operative into the operation of the machine. By supplying heat-power to this machine, the power now energizing the same kind of "net motion of work" earlier performed by human muscle-power has been manifoldly increased. Hence, Leibniz's observation concerning "one man doing the work of a hundred others."

This simple illustration can obviously be extended to cover the more general case, so we need not elaborate every step of that extension here.

The net result of such considerations is that we are instructed to assign some number $n$ to designate the total division of labor in society, combining thus both the division of human labor and the equivalent compacted into the development of machinery and analogous capital goods. So, we regard a technological advance as correlated with an increase of the number designating order of complexity from $n$ to some larger number $n+m$. For the case of devolution, we could outline the argument we think already implicitly obvious to the reader, that devolution is reflected as a transformation of the process from order $n$ to order $n-m$.

The reader acquainted with Riemannian physics will note immediately the reasons such features of economic process can be comprehended in no other fashion than by emulating Riemann's approach. For others, the general point will be made clearer in due course in the present report.

Two general observations flow immediately from the considerations we have just outlined.

First, it should be clear that to the extent econometrics may appear to forecast developments with reasonable accuracy, this can occur only on condition that no significant technological or related form of change of the input-output matrix occurs during the interval for which the forecast is made. In the language of science generally, econometrics could forecast with reasonable accuracy only under conditions which are completely uninteresting to any scientist, the case in which nothing of significance occurs in the process.[10]

One might think that policy-makers would demand a variety of economic forecast-analysis which is reliable with respect to forseeing with reasonable accuracy precisely what econometrics is intrinsically incapable of forecasting. Sensible policy-makers must be concerned to know whether the introduction of a certain policy, or failure to change a prevailing policy, will lead to a significant benefit or disaster for the economic process generally. Such scientifically interesting issues of economic forecast-analysis include changes in trends, especially those changes in trends associated with transformations in characteristics of the process as described in terms of input-output analysis.

All such interesting changes in the process have the form on "nonlinear transformations." Hence, only a mode of forecast analysis designed to deal primarily with such "nonlinear" transformations has much usefulness for policy-makers. For this reason, as we shall show more clearly at a later point in this report, only a Riemannian interpretation of an economic process as what must be caused to be a negentropic process, has any practical value as a policy-formulating aid.

## The Determination of Economic Value

The transformations of an economic process from order $n$ to $n+m$, on condition that these changes increase the negentropy of the process, are the measure of the net work accomplished by the productive and related activities of the society as a whole: the work accomplished, as measured in terms of increases in potential relative population-density.

Consequently, the immediate measure of *economic value* must be an absurdity unless the measurement employed either directly or implicitly measures increases in potential relative population-density. What the buyer or seller experiences as relative pleasure or pain in the acts of production and exchange has no necessary relevance to such a measure of economic value, and, in fact, is often directly contrary in effect to those choices of production and exchange which would represent increases in economic value for the society as a whole.

The doctrine of marginal utility, which determines notions of economic value for all extant econometric analysis, is premised explicitly on the doctrine of Bentham's hedonistic calculus,[11]

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**10.** This is the point delivered by Parpart at the cited Bonn *EIR* conference.
**11.** See note 7.

asserting that the money-value assigned implicitly to experienced pleasure and pain in exchanges is the only proper determinant of the price upon which many exchanges in a perfect-competition model of economy must tend to converge. The perception of pleasure and pain by the laborer, in giving up the painful experience of labor in return for gratifications purchasable with money, and so forth, are the criteria employed. "Freedom" of the individual to choose among purchases and sales according to his or her subjective perception of relative degrees of pleasure and pain, is thus argued to foster the convergence of prices upon the optimal rates and to apportion allocations of society's efforts to production of products and services accordingly. This is the kernel of von Neumann's and Morgenstern's elaboration of *The Theory of Games and Economic Behavior*.

In this scheme, Bentham's plainspoken "hedonism" is translated into Victorian "utility," and the variations in price determined by the operation of the hedonistic principle under conditions of "perfect anarchism" are determinants of marginal deviations from a central tendency in price. Quantity theories of money supply and related matters much occupying the discussions and published papers of academics are merely outgrowths of the essential hedonistic doctrine of marginal-utilitarian dogma as a whole.

The imposition of this absurd, marginal-utility doctrine of economic value upon the intrinsically defective attempt at a linear, econometric forecasting of economic processes, is the aggravating feature which causes prevailing monetarist dogma to be not merely an incompetent forecasting tool, but a source of national economic suicide for any government which has suffered the misfortune of shaping its policies of economic and related practice according to the counsel of Oxbridge and kindred economists.

The broader implications of monetarist dogma can be considered only after we have turned our attention to the design of currency and credit systems coherent with the principles of the American System. We turn to that after next considering a leading aspect of nonlinear development, the crucial implications of the development of agriculture.

# 4. The Development of Agriculture

The best quick measure of both the degree of economic development of a nation and its potential relative population-density, is given by the combined measurement of its per-hectare agricultural produce and the smallness of the percentile of its labor force required to meet the nation's requirement for agricultural produce representing a modern standard of nutrition.

The most appropriate model of reference is the case of the United States at the beginning of the 1970s—before the 1973-1974 petroleum-price crisis. The process by which the U.S. agricultural labor force declined from more than 90 percent of the whole labor force, in 1790, to less than four percent during the early 1970s, is the case study of reference for designing development policies of developing nations.

Since this present report is a conceptual outline of economic science, rather than a fully elaborated textbook, we limit ourselves here to matters bearing most directly upon basic principles. However, before we complete this section of our report, we are obliged to make clear that the policies which the United States and complicit monetary institutions have jointly imposed upon Mexico during the recent four decades have nothing in common with those principles of the American System upon which the United States and its greatest internal achievements were premised.

No nation can achieve an approximately modern level of general economic existence or potential relative population-density unless it can achieve a general level of good nutrition for all its people with less than 20 percent of its total labor force employed in agriculture. Without measures of development which make such objectives the keystone of long-range economic policies of investment, all efforts at development must necessarily fail.

We proceed now to an unavoidable background discussion of the British theory of rent. Next, we focus upon the nature of the impact of agricultural development policies upon the entire economic development policy of a developing nation. Finally, under this heading, we indicate the disastrous consequences of the kinds of policies of "import substitution" and tourism which the United States has promoted upon victim-nations of the Caribbean region.

## The Theory of "Absolute Rent"

Throughout the more than 2,500 years history of European civilization, European culture has been continuously the battlefield between two, and only two opposing political currents. The first, Judeo-Christian republicanism, the Augustinian republican tradition reflected in the constitutional ordering of the young United States, has been perpetually in mortal combat with the opposing tendency, exemplified by the British oligarchy, a political faction known as the oligarchical current. In economic policy, the issues at conflict between the two factions are aptly reflected in the republican's hostility to the doctrine of rent for which the British East India Company's David Ricardo made apology.

In matters of science and theories of statecraft, Judeo-Christian republicanism is obliged to the classical Greek republican tradition, from Solon and the Ionian city-state republics, through the dialogues of Plato. However this classical Greek heritage has been subordinated to fundamental principles of the Judeo-Christian heritage, principles which are efficiently reduced to two interdependent, most fundamental conceptions. The first of these two principled conceptions is the famous injunction to all mankind in the Book of Genesis: "Be fruitful and multiply and fill the earth and subdue it."[1] The second conception, although implicit in and coherent with the writings

1. The translation of the Biblical passage selected is that of the Papal Encyclical *Laborem Exercens*, in which the relationship of this injunction to technology is thoroughly examined from a theological vantage point.

of Philo of Alexandria, is best known to us as the principle of the *consubstantial Trinity* set forth in the opening of the Gospel of St. John. These two, interconnected principles define the purposes to which classical Greek heritages as to scientific method and statecraft are employed by Judeo-Christian republicanism. We shall consider the implications of these principles from an appropriate standpoint in a later section of this report dealing with the roots of Riemannian method; it is adequate merely to cite them here.

These principles enjoin man to effect increase in his potential relative population-density through technological progress, and to accomplish this by bringing his will into improved knowledge of and submission to the lawful ordering of the universe, employing those creative powers of rational discovery which reflect the divine potentials humanity enjoys in imitation of Christ. St. Augustine's writings are adequate reference for discovering how the Judeo-Christian heritage situates the scientific method and approach to statecraft of Plato's dialogues as the instruments appropriate to fulfill the principled injunctions.

The oligarchical system, as echoed by the pseudo-Christian "Gnostic Bible," rejects both the fundamental injunctions of the Judeo-Christian heritage, and counterposes to classical-Greek scientific rationalism the monophysite irrationalism of the ancient pagan cults of Ayatollah Khomeini's theology. As to social policy as such, the modern forms of oligarchism base themselves on the model of reference provided by the Malthusian world-federalism of the Roman Empire and the earlier, fourth century B.C. design for a "Western Division of the Persian Empire."[2] Out of this background emerges the British doctrine of rent defended by Ricardo.

The oligarchy proposes, today, to destroy the institution of the sovereign nation-state, and to replace that with a Malthusian form of world-federalist order, more or less on lines of the proposals which the evil Count Richard Coudenhove-Kalergi embedded in Otto von Hapsburg's Pan-European Union. This feudalistic world-order is to be ruled by an oligarchical class, a collection of powerful families composed of a mixture of titled aristocrats and wealthy rentier-financier parasites.

To make such a world-order durable, they are working (presently) through such fascist front-organizations as the societies for protection of threatened peoples, to promote separatist movements throughout the world, to carve existing nations into pathetically weak particularities easily subjugated by a network of both regional and global supranational institutions of the oligarchy itself. Those institutions, such as the promotion of rationality through technological progress, which have been proven to mobilize peoples against oligarchical rule in the past, are to be virtually outlawed and the population generally subjected to labor-intensive forms of labor, and manipulated through irrationalist cults modeled upon the system of pagan cults of the pre-Christian era in the Mediterranean region.

Since such a Malthusian world-order does not develop, it does not increase the potential relative population-density of society. Therefore, there is no "free energy" component in society's production generally, no profit in the sense of profit under industrial-capitalist society.

The forms of income available to sustain the oligarchical ruling families is therefore limited to two forms of exploitation of the stupefied labor-intensive toil of the general population: ground-rent and usury.

With the emergence of the modern nation-state out of the fifteenth-century Italian Renaissance, and the emergence of technological progress and investment of produced profit as the characteristic feature of such states, the feudalistic oligarchy struggling to regain its power within this new form of society, has concentrated, on the economic front, on subordinating industrial-capitalist

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2. The surviving versions of the Greek documents from the fourth century B.C. have been worked through by Criton Zoakos, including documents of the conspirators behind Philip of Macedon's assignment and Aristotle's role in this oligarchical plot.

forms of profit to rent and usury. Hence, although oligarchical family-interest has moved into areas of industrial investments, as well as communications and entertainment, it has concentrated its monetary power chiefly in real estate and usury, using control of real estate holdings and rentier-financial power to extract ground-rent and usury at relatively increasing rates from both industrial income and household incomes.

In pursuit of these policy objectives, the oligarchy has fostered propaganda of the sort leading into modern monetarist theory (e.g., marginal-utility dogmas), and has complemented this with promulgation of various physiocratic cult-dogmas, of which the Ricardian doctrine of rent is one outgrowth.

The general argument, broadly in agreement with the more extreme versions of the French eighteenth-century feudalist physiocrats, is the argument that all society's wealth comes ultimately from the land, from the "bounty of nature." It is argued that all potential wealth was established with a "Big Bang" sort of act of creation of the earth, and that mankind has been drawing down this stock of wealth ever since, much in the fashion of a clock's mainspring winding down with no one to rewind it.[3]

The argument continues, that man cannot add any wealth to society as a whole by his labor, but can merely draw down the previously created "bounty of nature." They argue that the appearance of production of profit is a deception, that what appears to be, relatively speaking, profit in the local situation, is actually offset by greater losses in the total stock of wealth in the whole process of which the local situation is only a part.

The argument is then extended into an explicitly feudalist apologetic. Only the owner of land (natural resources) has a right to the bounty of nature from that domain. This rental income must not be contingent upon the variable amount of product produced upon the land, but is imposed arbitrarily according to the relative richness of the bounty of nature of that domain. Rent must not be determined as a share of profits, but solely as income taken arbitrarily on grounds of rights of possession of property.

This feudalistic argument became the kind of doctrines of absolute and relative rents in the apologetics of Ricardo and others. It was argued that the natural fertility of land determined the relative amount of rent which might be extracted. On such premises, plus the rentier-financier features of the British System, Henry C. Carey and others rightly defined the British System as essentially feudalist, a feudalist political-economic order superimposed upon incorporated elements of industrial-capitalist development.

This feature of the British System was the central underlying issue of the American Revolution, and the featured issue of Hamilton's thorough refutation of Smith in the 1791 "On The Subject of Manufactures."

The experience of the American colonists in conquering the wilderness proved repeatedly that the "natural fertility of land" was a hoax. The fertility of agricultural land was a function of the improvements of the land, in which the improvements in land were analogous to investment in improved capital goods by manufacturers. To further the process of improvement of agriculture, Hamilton argued, society must provide the farmer an increasing flow of industrially produced materials of agricultural production, supplementing this and facilitating such commerce by Federal government leadership in development of waterways and highways. The integrated development of capital-intensive agriculture, capital-intensive industry, and essential infrastructure became, together with educational policy, the policy for promoting a technology-driven development of the productive powers of labor of the entire nation.

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3. This characterization of Newton's physics was made first by Newton himself. Leibniz, in his literary debate with Newton and Clarke (the so-called Leibniz-Clarke correspondence), refers to this admission by Newton, notes its accuracy as a characterization of Newton's physics as a whole, and then employs that fact to argue that Newton's world and the real universe have no fundamental agreement.

A half century later, Henry C. Carey, the son of a close collaborator of both Franklin and Hamilton, reviewed the evidence of the intervening period of development and proved afresh the validity of Hamilton's analysis.

The suppression of both ground-rent and of rentier-financier usury is the first line of defense of a nation and its development against the evil encroachments of oligarchism. Only profit, chiefly produced profit used for reinvestment in development of the productive powers of labor of the nation as a whole have any privileged status as owner's income under a well-ordered republic's law, relative to rent and usury.

This becomes clearer in the next section of this report, where we outline the simple principles properly governing the currency and credit policies of a republic.

Insofar as the United States applied these principles of the American System together with the complementary policies of currency, credit, and regulated banking, the United States prospered to the general benefit of its people. To the extent the influence of the oligarchical, British System shaped policies of practice, the United States has been ruined.

## Development Priorities

The means to increase significantly even the most labor-intensive modes of agriculture are obvious and well-known. Water management, soil treatment, fertilization, control of pests and diseases, adequate supplies of energy, and development of transportation and food-preserving functions, will effect significant early improvements in agriculture even at the poorest level of illiterate practice. Convincing the farmers to use such assistance may present political and related educational problems, but the course of action is generally clear.

This basic work must be complemented by emphasis on bringing more improved agricultural land into production and reserve, and increasing the number of hectares worked by the average farmer.

The growing bill of materials of industrial products consumed per hectare and per farmer, combined with the bill of materials for creating and maintaining the infrastructure required for agricultural development, already represent a significant portion of the available combined capital and credit at the disposal of a developing nation. The emphasis within industrial investment generally must be upon developing those kinds of capital-goods industries which have the greatest significance for production of products to fill the two lists of bills of materials. Consumer-goods-industries investments must tag along, helping to meet the most urgent requirements of the population generally, but without efforts to match the full spectrum of such classes of commodities offered within industrialized nations. In general, decisions to allot investment resources to consumer goods industries must emphasize those consumer-goods industries emphasizing as vendors the better use of capacities already required for agricultural and infrastructural development.

## Demographic Tragedies of Import Substitution

During recent decades, the United States has exerted various kinds of pressure upon its neighbor, Mexico, to dissuade Mexico from doing anything which might develop Mexico as a "new Japan south of the U.S. border."[4]

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4. This formulation is best known for its public utterance against Mexico by then-National Security Advisor Zbigniew Brzezinski. However, it was by no means original with Brzezinski. Cf. L. H. LaRouche, Jr., *Will The Soviets Rule During the 1980s?*, New York, 1980, for a relevant criticism of the argument of the New York Council on Foreign Relations's "Project 1980s" series of policy-papers (McGraw-Hill), in which Cyrus Vance, Brzezinski, et al. delineate their (1975-1976) determination to crush "neomercantilist" impulses of Japan, West Germany, and the developing-sector nations generally.

Mexico was encouraged to concentrate more than three quarters of its real capital investment in agricultural and industrial investment in petrochemical development, but dissuaded from using petrochemical income to change the nation's profile from remaining a petroleum-monoculture semicolony. To further this attempted sabotage of Mexico's development, Mexico, together with other Western Hemisphere nations, was encouraged to embrace the follies of promoting earning of foreign currencies through tourism, and to concentrate on a line of development associated with the name "import substitution," the latter meaning emphasis on consumer-goods industries which were more or less merely final assembly-stations for U.S. manufacturers of consumer goods.

The political-demographic consequences of such an imposed direction in policy-making are a monstrous problem confronting Mexico today.

The emphasis on replicating a U.S. consumer-goods market through leverage of import-substitution investments promoted a retailing and labor-intensive-service complex in urban centers. The result was inadequate development of the rural areas, lack of industrial absorption of burgeoning urban-poor populations, and a potent political lobby in the form of the burgeoning "middle class," which saw its immediate self-interest located in the growth of the retail goods and services markets.

The marginal farm places a premium on agricultural child labor. If such child labor is intensively employed in combined field and household tasks, on condition that little is invested in the child's development, this child labor is cheap enough so that high birthrates are a boon to the rural household in this way. This underdeveloped youthful rural population, lacking the training or opportunities for industrial employment, produces what is apparently a surplus, poor rural population. It cannot be assimilated in agriculture, except as a fraction, since lack of development of existing land, plus want of bringing into production newly improved land, prevents this recourse.

The burgeoning of "surplus rural poor" feeds urban-poor populations' burgeoning, fostering growth in marginal employment of "abundant, very cheap" labor, in forms of labor-intensive services whose net contribution to the national ecomomy is actually or potentially negative.

Thus, a growing discrepancy erupts between the ostensibly rich middle-class strata and the very poor layers of burgeoning rural and urban-poor strata.

Examining such results by aid of reference to our schematic in Chapter 2 of this report, the growth of the combined urban middle class and poor populations represents a mushrooming of the portions of the total population in economic-demographic category $d$. Since $S$ is generated in an economy by the production associated with $C+V$, if $d$ grows more rapidly than $V$, and if the combined investment in productive employment of urban and rural goods-producing labor is small relative to the portion of the labor-force households corresponding to $V$, the result of rapid growth of the social-economic category $d$ relative to investment in goods production becomes viciously inflationary.

As for tourism, one need but imagine that the wealth wasted in Acapulco alone had been invested instead in a Pacific peripheral fresh-water canal and pumping system, to the end of transforming more of Sonora into a "new Imperial Valley," and a deep, well-grounded hatred against tourist-development programs begins to well up within one.

During the 1920s and 1930s, leaders of Mexico's revolutionary process were engineering-oriented in their essentially sound perspectives for Mexico's development. Yet it is reported that Mexico's educational institutions graduate a mere twelve Ph.D.'s in physics per year, against the folly of thousands studying such useless things as some branch of sociology at Mexico City's UNAM university, students whose proliferation in these specialities condemns them to become virtually parasites in the development of the nation's economy. The New York financiers, like Zbigniew Brzezinski, insist that no "new Japan" emerge below the United States's southern borders.

In this connection, it is to be stressed that sending students to study sciences abroad is no

real substitute for advanced scientific-educational institutions in the home country. Advanced educational institutions of this sort are not merely school places. A center of scientific education is properly developed as an advanced research and consulting capability situated amid the productive and related institutions which represent the elements of the national community it ought to immediately service with aid of research and related consulting activities.

No matter how poor or underdeveloped a nation is, how restricted its resources, it must concentrate on being a peer of the most advanced nations in some selected aspects of modern science and technology. Although the least-developed nations must deploy available resources almost totally for investments related to the process of development of agriculture, some selected investment must be made which brings the nation as a whole into participation in aspects of the most advanced technologies and scientific research. Although such choices must be made partly for political-psychological reasons, so that the general citizenry of a nation may not sense themselves intrinsically inferior to peoples of other nations, sooner or later every developing nation must attempt to leapfrog the most developed nations in some selected feature of modern science and technology.

The problems of development cannot be solved unless developing nations, sooner or later, escape from the position of copying hand-me-down technology from other nations. As soon as feasible, each nation must become a world-leader in export of one or several technologies.

# 5. Currency and Credit

The variously evil and nonsensical quality of Oxbridge economic (actually monetarist) dogmas becomes quickly evident after one has considered how a well-ordered republic regulates its currency and credit.

The money placed into circulation by production and circulation of goods produced is the sum of the paid-out costs associated with $C+V+d$. No money has been placed into circulation corresponding to the margin in $S'$. This is what foolish people have sometimes called the "buy-back problem."

The solution to the buy-back problem is elementary. It is sufficient that the state issue currency-notes which are loaned for performance-worthy investments based on purchase of a margin of goods corresponding to $S'$. If these are performance-worthy employment of otherwise idle capital goods and labor (consuming consumer goods in the form of wages), the result is a deflation of prices generally, through the increase in productivity resulting from higher proportions of the most modern technologies in production as a whole.

In practice, a few additional arrangements must be institutionalized to ensure that the state's creation of new volumes of currency works to the effect intended.

It is prudent practice for the state to emulate the practice of U.S. Treasury Secretary Hamilton, to establish a state national bank whose assigned functions include discounting loan-agreements undertaken by other banks, as the principal mechanism of lending currency-notes issued by the national treasury. The recommended practice is to restrict such lending to specified categories of loan-agreements—those which involve increased investment in high-technology production of goods, and to prefer that the national bank advance only some percentile of the total value of the loan, thus combining the lending of state credit with loan of private bank-deposits in each loan.

The interest rate charged by the national bank for state credit must be low, between 2 percent and 4 percent, sufficient to cover administrative costs to the bank and to offset the small margin of risk incurred in average lending.

The currency-notes issued by the treasury through the discount window of the national bank should be denominated as gold-reserve currency notes. That is, if *a foreign central bank* presents such notes to the national bank for payment, the national bank must be prepared to purchase those notes with monetary gold. Gold should be priced at a competitive price of monetary gold sold by mines. Today, approximately $500 an ounce would be a fair, competitive price for such gold, if nations were presently purchasing gold to meet monetary needs for such reserves.

It is to be emphasized that such gold payment is delivered only against actual foreign holdings of such issued currency, and not against book-money denominated as claims denominated in such currency.

This arrangement obliges a nation and the nation's national bank to keep the value of domestic currency "as good as gold." This precaution ensures against depreciation of the currency through inflation, enabling maintenance of borrowing costs for preferred categories of lending at low rates.

Defense of the currency demands appropriate regulation of domestic financial institutions of foreign financial institutions wishing to conduct business within or with the nation. It also demands measures regulating foreign trade and financial transactions, to ensure that unpayable current obligations do not accumulate.

Never should a republic borrow abroad for purposes of purchasing goods and services from domestic sources. A nation and its banking system should borrow abroad only to purchase foreign goods and services, and the aggregate amount of combined public and private borrowing abroad must be regulated by a national bank operating under direction of the government of the state.

The regulation of the banking system as a whole should efficiently prevent the lending of

anything but either state credit or savings deposits. The generation of book-money within the domestic banking system is to be prevented by means of appropriate regulation through the national bank. Foreign financial institution's lending into domestic markets must also be regulated not only as to the aggregate amount of this permitted in any period, but to enforce transparency conditions on such foreign lenders to ensure that those institutions are not defrauding the nation by lending of fictitious, book-money assets.

The general principle is that no agency but the state shall have the power to create credit in excess of the credit extended by sellers to buyers and lending of savings deposits by regulated private (and public) banking institutions. The duty of the state is to provide an ample flow of created credit, in the form of issues of currency-notes through lending actions of a national bank, to ensure that idle capacity, idle produced goods and idle labor are productively employed as long as performance-worthy borrowers are willing to borrow for the purpose of employing these in ways which increase the productivity of the national economy as a whole.

In general, lending of state credit through participation in loan-agreements, or equivalent discounting operations of the national bank, should be restricted to loans for production of goods or for improvements in basic economic infrastructure, thus ensuring that the production of goods runs constantly ahead of the circulation of money.

The measures of regulation required cannot be regarded as denying any proper expression of freedom in the market place. The measures of regulation specified are either restrictions which the state and national bank impose upon themselves, in execution of a public trust, or are measures to protect the economy and currency against the oligarchical practices which are the mortal adversary of every republic.

## Capitalism and the Modern State

Excepting temporary phenomena and city-state republics, the modern form of sovereign nation-state came into existence with the establishment of modern France by Louis XI during the last decades of the fifteenth century, and the establishment of Tudor England by (chiefly) Erasmian influence shortly afterwards. Modern national-economy was directly an outgrowth of this establishment of the new political form of society, an innovation designed chiefly by the successive influences of Dante Alighieri and that towering giant of the fifteenth century, Cardinal Nicholas of Cusa.

There was no fundamental difference as to objectives of policy between Dante and Cusa later and the Augustinian currency of republicans from Charlemagne onward earlier. The essential distinction was that the effort to create a single republic of Western Christendom had failed, chiefly because the use of Latin relegated the popular forces to brutish local dialects, in which condition of language-culture those populations were too easily made instruments for destruction of their own civilization.

What was essentially new, in the design of Dante and his successors, was Dante's model revival of the Italian language as a literate language to replace the brutish local dialects of Italy. Through the promulgation of literate forms of national languages, and the use of such languages to mediate rationalism and broader language-culture to all of the population, a true citizenry was to be developed. That policy deliberations of government might be conducted in the common, literature language of the nation, sovereign forms of nation-state government were required.

It was not the intent of either Dante or Cusa, among others, that such sovereign nation-states should degenerate into egoistical, chauvinistic existences, into a Hobbesian collection of individual nations, each implicitly in war against all. Rather sovereign nation-states, all sharing the same principles, would represent a truer, more durable community of peoples than the feudalistic order of the old Holy Roman Empire. Dante outlines the point in his *De Monarchia*.

Cusa elaborated international law subsuming the new arrangement in writings beginning with his youthful *Concordancia Catholica*.

The decision to foster what became private entrepreneurial capital developed out of the perception that individual creative ingenuity would be best fostered to the general benefit of society in this fashion. The royal power to grant patents was employed, to extend to inventors and their partners a limited license to produce and market such inventions, creating thus a corporate form of capitalist enterprise contending with earlier, continuing guild-forms of private crafts. The intent behind this innovation, it is to be stressed, was to foster technological improvements, as the relevant law of Tudor England illustrates this.

It has become, most unfortunately, modern convention to regard the coexistence of public and private industries in a national economy as a mixture of "socialism and capitalism." In some cases, such an arrangement may have been fostered by influential political forces themselves persuaded that state-owned enterprises are socialist. From the standpoint of an historical overview of the history of development of modern national-economy, such notions of "mixed economy" are wrong, and potentially a contributing source of mismanagement of the economy as a whole.

The relationship between state and industry in Japan since the Meiji Restoration merits study on this point. Otherwise, from the origins of the modern nation-state, beginning with Louis XI, the principal authority for directing the economy has lain with the government of the nation, and the role of private enterprise, while grown proportionately large, was the outcome of a willful decision to provide areas of exception to state-directed economy.

Looking at these centuries of development of the state retrospectively, we must be struck by the importance of freeing agriculture from feudalistic rent in accomplishing the transition from feudalistic relics to a modern economy. The nature of agricultural development, the importance of the ingenuity, and of decisions to save in the form of improvements by the individual farmer, weigh so heavily in agriculture's performance that the owner-operated farm has not accidentally proven itself the bedrock of U.S.A. national-economic development. Not only was destruction of the oligarchy's grip on agriculture indispensable, but it has not been feasible to substitute state-directed enterprises for the earlier role of the oligarchy.

As for the rest of the economy, there exists in fact no defensible principle which defines precisely where the dividing line between public and private ownership ought to be drawn. Only at the extremes can a clear-cut case be made. Basic economic infrastructure, large works spanning the entirety or large portions of the nation, such as transportation systems, power grids, water systems, ports, and so forth, are clearly the province of public undertakings by the state. At the other extreme, small shopkeeping and small productive enterprises, state ownership tends to become an abomination. In between these extremes, the choice ought to be made on the basis simply of whether public or private undertaking is better suited, in terms of the economy as it exists in fact, to meet the requirement.

Although the state has a more or less unlimited proper authority to delegate economic functions to private interest, as practical considerations justify this, the state must not relinquish its responsibility for the power to regulate commerce, to regulate currency, credit, and banking, and to regulate through development of its power to tax. The regulation of commerce and taxation, although not nominally part of currency, credit and banking matters, are in fact so integral in effect to these matters that they cannot be considered competently unless they are conceived as so connected in effects.

## Regulation of Commerce

The state must act to protect any aspect of economic activity which is essential to the interest of the nation as a whole. So, rightly, the U.S. Constitution enjoins the Congress to regulate foreign and domestic commerce. It is essential that essential industries be defended against anarchic

forms of competition, both from foreign and domestic sources, and ensure that essential industries and farms enjoy a regulation of markets to the effect of ensuring fair prices for their products, a price sufficient both to cover costs and provide a margin of reinvestment. It is also essential to protect the economy and its people from defective products and services.

In opposition to this, the British insist on the evil doctrine of "free trade." By means of this policy, the dumping of products undercuts the revenues of farms and industries, impelling employers to offset low prices by reducing the wages of their employees, reducing the rate of investment in farms and industries, and enhancing the power of rentier-financier and landlord relatively at the expense of entrepreneurs and the development of the economy generally.

This issue was most ably reviewed by Mathew Carey, the former Irish republican, collaborator of Franklin and Hamilton, and father of Henry C. Carey. Carey, reviewing the manner U.S. toleration of British "free trade" had caused the depression of 1815-1818, mobilized the United States to overthrow such "free trade" policies and resume the banking, credit, and economic policies of the American System.[1]

Nothing demonstrates the evil of "free trade" policies more clearly than the policies of dumping agricultural products on the world market fostered by the British and emulated to a large degree by the United States. By dumping these products on the market, the prices of food produced in developing nations are driven down, thus holding back the development of food-production in those nations, increasing their dependency on imported food at dumping prices, and fostering a worldwide shortage of food production.

It is readily shown that the so-called 100 percent parity-price of key U.S. agricultural products is comparable to the Common Agricultural Policy pricing of the Common Market. The 100 percent parity-price represents the average competitive cost of producing food, plus a modest margin of gross profit, the margin for investment in improvement of agriculture. If U.S. agricultural products are sold significantly below 90 percent of parity-price, the farmer is paid less than the cost of production. Since the U.S. farmer is more productive than the farmer of nearly any developing nation, the farmer of the developing nation can compete with dumped U.S. agricultural products only by looting his own person or his land.

The foolish and the hypocritical unite in protesting against parity-price levels. "Cheap food!" they cry, professing themselves noble humanitarians resisting the rapacity of "greedy farmers." The consequence of producing food at below-cost sales-prices is precisely the shortage of food which afflicts the world today. The remedy for the "high prices" of food sold at or above true cost is to increase the earned income of the purchasers of food, such that the social cost of the purchased diet is reduced.

"Subsidy!" shriek the "free traders" of Washington, D.C., threatening nasty consequences unless the nations ruin their agriculture for the sake of Adam Smith's sensibilities in the matter. A nation which submits to ruining its agriculture because of such threats has surrendered its sovereignty and so degraded itself to a mere colony of those who dictate its policies.

## Taxation

Taxation has two proper functions: to provide the necessary revenue of the state, and the power to employ taxation to tax undesirable economic activities relatively or absolutely into extinction. In general, the tax schedules of the state must shift the relative burden of taxation away from the most-desirable forms of economic activity, to weaken the wealth and power of those activities which are undesirable.

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1. Cf. Allen Salisbury, *The Civil War and the Battle for the American System*, New York, 1978, passim for documentation of this and of the circumstances in which it appeared.

The clearest case for proper application of "punitive" degrees of taxation is taxation of actual or imputed capital gains derived solely from speculative appreciation of ground-rent income, or income and capital appreciation derived from usury. The republic which does not use its power of taxation to destroy such oligarchical manifestations, is permitting the republic itself to be destroyed by its oligarchical adversaries.

Since investments promoting technological progress in basic infrastructure and production of useful products are the most desirable forms of expenditures of income, apart from maintenance of the subsistence of the household, the most favorable treatment of earned income (in excess of basic income levels of households) must be provided in taxation policy for investment of profits or savings in equity in technologically progressive enterprises which contribute to the expansion of scale and other improvements of productivity of the national economy as a whole.

There are various, alternative mechanisms for accomplishing such results, which it is not our proper task to discuss in full here.[2] Our point is to make the principle of the matter clear.

By means of its proper use of powers to regulate currency, credit, banking, foreign and domestic commerce, and the power to shape taxation as well as determine the priorities for deployment of public revenues, the state retains to itself the power and responsibility to shape the general economic environment of both public and private economic enterprises.

In this fashion the state determines which sorts of successful undertakings will be "rewarded" so to speak, and which less fostered or even discouraged. To the degree the citizens generally, as well as directors of enterprises clearly understand these actions and their practical implications, the ingenuity of the citizen will aid him or her in shaping his activities, his savings habits, his investments, accordingly.

## Demystifying Money

In the course of the immediately preceding treatment of money, credit, banking, regulation of commerce, and taxation, we have put the floodlights, so to speak, upon the actions of creation and circulation of money and credit.

With such knowledge before us, all the statistical abracadabra of the Oxbridge monetary doctrinaires suddenly appears quite silly or even downright malignant to us. Notions such as "original hoard" of money, or "buy-back problems," vanish from reality into the infantile fairy-tale lands of trolls and goblins.

A remark or two concerning the sort of swindle which occurs under an unregulated banking system's operations helps to show whence the problems of Oxbridge monetary cabbalistics actually originate.

As J. M. Keynes famously demonstrated, in an inadequately regulated banking system with arbitrarily low reserve-requirements, by collusion to this effect among the bankers, the same actual paid-deposit of money may be loaned several times over at prevailing interest rates for each loan. The subordination of the debt of the state to this arrangement, as under the U.S. Federal Reserve System, enables such a banking system to print pyramided volumes of book-keeping-credit circulated through the economy more or less as if it were money.

The monetary process dominated by such arrangements has the same general characteristics as an ordinary chain letter. Only to the extent that the chain-letter process is able to loot payments from the real economy can this chain-letter process be sustained.

This is the reality behind the process which Marx describes, but does not comprehend, in the "Internal Contradictions" chapter of *Capital* III. Indeed, as we shall summarily indicate the

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2. See the 1980 draft U.S. tax-reform proposals of the National Democratic Policy Committee for an elaborated tax policy of this sort.

process intrinsic to the British System, the accumulation of nominal capital outruns the development of the productive basis, as Marx indicates. However, this contradiction, which is indeed the cause of crises in the British System, as Marx reports, does not arise from anything intrinsic to industrial capitalism as the American System ordered industrial-capitalist development. On that latter point, Marx is in error.

The oligarchical aspect of rentier-finance and landlordism parasitizes on the real economy, siphoning off funds which would otherwise go to investments. However, this parasitical process generates a significant degree of employment, both in the form of administrative and service costs associated with its own operations and with luxury expenditures and useless forms of tangible investments (office buildings for parasitical business operations), which themselves generate employment. Furthermore, rentier-financier and allied landlord interests channel flows of private and public funds into activities whose principal function is to generate a cash flow, as leverage, maintaining or even enhancing the fictitious ("price-multiplier") valuation of those investments. For example, a real-estate development, including its shopping-center-mall feature, may be largely a swindle, merely a vehicle for effecting a speculative appreciation in a ground-rent investment.

So, at the same time that oligarchical parasitism draws down the rate of investment in productive enterprises, it increases the ratio of $d$ relative to $C + V$. Over the period 1946-1981, the percentile of the labor force employed (U.S.A.) in either production of goods or transportation declined from 62 percent to less than 30 percent. That shrinkage, which is the principal structural cause for postwar U.S. inflation, is the result, almost entirely of the kinds of oligarchical activities we have just indicated: the draining of funds away from the production-investment cycle in production of goods, into nonproductive employment and investments, those directly or indirectly a result of oligarchical parasitism. As the charges to production for the direct and oligarchical components of charges of $d$ to the production-investment cycle increase, to exceed $S$, the economy is plunged into negative real growth.

Overall, the infection of an economy with such byproducts of oligarchical modes of rentier-financier and landlord operations is analogous to cancer in a living body.

Oxbridge varieties of monetary theory propose, in effect, to regulate the symbiosis between cancer and healthy tissue. This appears to be an acceptable approach to management of the infected economy until the cancerous conditions become very advanced, at which point the Oxbridge schemes can no longer contrive to maintain the monetarist cancer and the healthy tissue (productive cycle) simultaneously, even with a reduced level of healthy tissues functioning. Then, the depression erupts.

The point to be stressed is that the Oxbridge varieties of monetary theory are premised on symbiosis of the cancer and the healthy tissue. The solution is to establish a monetary order in which the cancer does not exist; with such a correction, the essential meaninglessness of the entire Oxbridge monetary doctrine becomes plainly obvious.

# 6. Lazare Carnot and Scientific Culture

Since Bertrand Russell, the first public figure to propose general nuclear aggression in cold blood,[1] popularized the postwar antinuclear and so-called peace movements, it has become fashionable to denounce warfare in the most general terms, even while one is mobilized to support a very bloody and very immoral war, or several such, in particular. So, the same British and U.S.A. circles which were at that moment prosecuting a bloody colonial war against Argentina, mobilized in New York City a 700,000-person "peace demonstration," against nuclear weapons, by 700,000 fans of Dionysiac rock-festivities who registered not a single objection to a just-launched NATO policy of "conventional-warfare" butchery of the people of Latin America, Africa, and Asia.[2]

The background to and implications of that mass hypocrisy we have documented in suitable other, published locations. We have cited the point here to demonstrate a fact bearing directly on the reasons the prevailing contemporary state of mind at once energetically presses national policies leading toward the worst military butcheries in all history to date, and yet, with truly Mandarin hypocrisy, professes to despise the soldier it deploys to die in implementing the policies imposed upon society by monstrously hypocritical, professed "pacifists."

Such Mandarin hypocrites would profess abhorrence at receipt of the information that Leibniz designed breech-loaded weapons, and posed the revolution in warfare implicit in such a revolution in firepower, during the late seventeenth century. The same hypocrites would be more than annoyed that the government of France, during the middle of the eighteenth century, declared the revolution in applied geometry effected by Gaspard Monge a "state military secret" of the highest degree of sensitivity. They would profess contempt against Lazare Carnot for inventing aerial warfare during the 1770s, fostering Fulton's development of submarine warfare at the beginning of the nineteenth century, and himself creating that revolution in the design of warfare which has haunted nations since the deployment of French forces under Carnot's leadership during the middle of the 1790s.[3] They would be truly offended to discover, not only that the Prussian republican reformers of 1809—vom Stein, Humboldt, and Scharnhorst—designed, baited, and closed the Russian trap which destroyed Napoleon Bonaparte's power, but that the design of this military operation was taken directly from the historical researches and corresponding dramas of Wilhelm von Humboldt's mentor, Friedrich Schiller.[4]

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1. In 1947, Bertrand Russell proposed publicly that the Anglo-Americans employ their growing fission-weapons arsenal for a "preventive war" against the Soviet Union. The same policy was pushed by Winston Churchill. Russell, Churchill, et al. premised their argument on the insistence that Moscow would require a decade to develop an operational model of a fission-weapon, before which the Anglo-Americans would have accumulated a monstrous arsenal. Within five years, the Soviets had produced not only an operational fission-bomb but had beaten the United States to development of a deployable form of H-bomb. With that latter development, Bertie Russell was converted to preaching against the immorality of nuclear weapons, and resumed his unshakable objections to war.
2. On the linkage between the "nuclear freeze" campaign and the campaign for NATO "out-of-area" deployment for "conventional wars" against Latin America, Africa, and Asia, see L. H. LaRouche, Jr., "The Harrimanite 'Peace Movement' Pushes U.S. Military Policy Toward 'Population Wars'," *EIR* Special Report, delivered to a Washington, D.C. *EIR* conference, May 16, 1982.
3. See, J. Cheminade, C. Albert, D. de Paoli, U. Parpart, L. H. LaRouche, Jr., *La science de l'education republicaine*, Paris-Wiesbaden, 1980, for reports and reflections of continuing extensive studies into French and other archives on the roots, work and influence of G. Monge, L. Carnot and their collaborators of the Ecole Polytechnique.
4. Schiller, best recognized for his work in drama and poetry, was otherwise one of the most important historians, Professor of Universal History at the University of Jena, and the strongest intellectual figure of a circle of republican plotters which otherwise featured Wilhelm von Humboldt. One of the leading proponents of the American Revolution

From the contributions to modern political economy of George Gemistos (Plethon) during the early fifteenth century, through revolutions in the art of warfare by Leonardo da Vinci and his collaborator Niccolò Machiavelli, Leibniz, the work of the Ecole Polytechnique, and the interrelationship of logistics and warfare defined by the Prussian republican reformers of 1809, the development of political economy and warfare have been so closely intertwined that no competent study of either can be effected without profound consideration of the other. At this point in our report, it would be impossible to represent the added, crucial features of economic science without noting the inseparability of Carnot's revolutionary contributions to warfare, political economy, and fundamental advances in mathematical science, all simultaneously.

This writer's own breakthroughs in economic science, as epitomized in the work and methodological approach behind the LaRouche-Riemann method of forecast-analysis, depend upon notions which must tend to appear to contemporary opinion the most forbiddingly profound and abstract contributed to science generally up to this point in history. That is merely the appearance of the matter. If one looks at the same conceptions from a different vantage-point, the seeming abstruseness vanishes. If this were not so, if the conceptions involved were as abstruse as they might appear to most contemporary opinion, we could not present such conceptions, such methods in a report of this nature and selected audience. The conceptions to be introduced in the concluding chapter of this report are in fact elementary; it is necessary, however, to view such conceptions from the historical and methodological vantage point in which their elementariness is accessible to the range of readership we have adopted for this account.

To provide the reader that vantage point, it is necessary that the writer identify those mistaken, but generally accepted beliefs respecting both modern history and the internal history of scientific progress which are the true source of the indicated difficulty of perception. This account, both as to history in general or the internal history of science in particular, cannot be rendered without stumbling over the interrelated military, scientific, and economic contributions of Carnot and his immediate collaborators.

The source of the problem to be removed is that the British-led victors over the United States (1876-1938) and the Kaiser's Germany (1914-1918) have exploited this consolidation of power to rewrite the memory of their principal adversaries out from school books and general opinion, leaving but a libelous few glosses, utterly falsifying history, in place of the truth in these matters. Fortunately, although it has been proven that some among the crucial primary documents of statecraft and science have been either destroyed or hidden for factional reasons, the writer and his collaborators have found the true account buried in libraries and other archives still accessible, principally in European depositories. The case adduced, as it bears, for example, on the content of this present report, is conclusive, and totally contrary to what passes for prevailing political and scientific historiography generally today.

The kernel of the matter, for our purposes in this report, is the internal history of modern science since the powerful influence of the fifteenth-century Cardinal Nicholas of Cusa. The fundamental differences, both respecting scientific method and notions of the meaning of physical lawfulness, governing the progress of physics from Cusa, through Kepler, Leibniz, the Ecole Polytechnique, Riemann, et al., with respect to the opposing empiricist faction, are the indispensable matters bearing directly upon the writer's own fundamental discoveries. That is the essence of what must be considered if the elementariness of the LaRouche-Riemann method is

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and Constitution in Europe, all of Schiller's later dramas are designed to impart principles of statecraft to mass audiences, and are based on extraordinarily thorough historical researches. After his death, his friends turned to Schiller's studies of the Thirty Years War (1618-1648), the basis for his Wallenstein dramas, to devise the strategy for destroying Napoleon Bonaparte. So, they designed, baited and closed the Russian trap into which Napoleon was lured, Clausewitz among the Prussian officers Scharnhorst et al. assigned to Moscow while Scharnhorst, at home, created the new Prussian military force.

to be established to the reader's advantage. However, as these issues of scientific method were not elaborated in a political vacuum, it is unavoidable, that we consider briefly the most relevant points of that political history as well.

We begin now by focusing on key features of the case of Carnot's Ecole Polytechnique. From that initial point of historical reference, we outline the developments leading into Carnot's work, and then account for the crucial contributions of Carnot's (principally) German successors. At that point, we are prepared to consider directly the matters set forth in outline in the final chapter.

## The American and French Revolutions

Contrary to popular mythology today, world leadership in both the fundamentals of science and in applied technology was held by France, from not later than the 1653, crucial defeat of the Spanish Hapsburgs until the aftermath of the defeat of Napoleon Bonaparte and the 1815, Venice-dictated Treaty of Vienna. Nonetheless, as the fall of Colbert from power illustrates, the forces in France responsible for this persisting excellence were an imperiled faction in their own nation, challenged chiefly by a feudalist interest operating chiefly out of the Swiss Burgundian banking center of Geneva and feudalist Berne. The names of the alleged banking families of Schlumberger, deNeuflize and Mallet typify those oligarchical forces based in Geneva, from approximately 1770—the point of the Schlumberger alliance with deNeuflize and Mallet interests—down to present-day France and the U.S. and Caribbean orbit of Houston, Texas and New Orleans, Louisiana.

In early eighteenth-century France, the internal oligarchical faction was typified by the fanatically feudalist aristocrats and a British secret-intelligence-sponsored set of projects including the oligarchist Montesquieu, the evil Voltaire, the Encylopedia project which was the center of contamination of French with British materialism, and Geneva-directed projects such as the Jesuit-directed Jacobins among the followers of Jean-Jacques Rousseau. These oligarchical, Swiss-based and London-connected forces had their chief bastions internal to France in the feudalist-oligarchy typified by the Physiocrats as spokesmen, and by the invasion of French national finance by such Venetian-Genoese conduits as Geneva, Amsterdam and London. These had been the enemies of France's scientific and technological progress since Colbert's period. During the period of Franklin's leadership of the trans-Atlantic republican forces from Paris, and during the adult lifetime of Lazare Carnot, the chief visible spokesman for these oligarchical forces inside France was Franklin's own principal French adversary, the Duke of Orleans.

Contrary to the popular delusion of practice today, the shaping of history does not begin with the birth and episodic majority-opinions of contemporary populations. History is the unfolding of processes elaborated over many successive generations, elaborated through the influence of a transmitted, evolving language-culture in shaping the collective wills of populous factions within and among nations. Among the most influential forces of history, those elites who shape the development and policies of the opposing oligarchical and republican factions, memories are very long. For the leading strata of either the republican or oligarchical elite, the personalities, key events, and factional issues of two centuries or more earlier are known as if matters of yesterday morning. The oligarchy traces its memory to this effect through the genealogies of leading oligarchical families. The member of the republican elite traces this through intensive study of the classics generally, to define his or her point of conceptual reference, and from that vantage point masters the essential facets of the unfolding of political and cultural history.

Hence, Geoge Santayana spoke rightly for once when he warned that "Those who do not study history are forced to repeat it." It is the folly of popular masses and their pragmatic leaderships that they, even today, undertake to relive the catastrophes and kindred follies of the past, which would not be possible if they could see their present follies as a pathetic reenactment

of lunatic popular opinions of the same genre and broad consequences as forgotten generations of their predecessors. Confronted with this contemptible, self-righteous display of ignorance of history by populous political forces of our time, the oligarchical elite gloats ambitiously, like gathering vultures, at the foolishness of the people generally, while we of the republican elite respond by attempting again the seemingly impossible, to rescue once again a humanity which, once again, appears to have misplaced the moral fitness to survive.

The small-minded person attempts to explain every political phenomenon, plausibly, by measure of the assumption that every force acts chiefly in the effort to secure some advantage which might be consumed entirely by existing persons of the faction in question. *Immediate material advantage* must explain everything to the foolish observer of history. Such a little person has no comprehension of organic conspiracies conducted over as long as a span of a century or more, whether by republican or oligarchical elites. The ignorant, small-minded individual—too often a head of state or government, or otherwise an admired and influential leader of large forces—knows nothing of the kinds of passions governing the manner in which members of elites locate their immediate, personal identities in the work of shaping the direction of history in terms of processes spanning generations yet to come, whether we who shape such processes are republicans or oligarchs. It is the kind of future world we bring into being, through shaping in the present that transmission of culture and development of institutions which will determine the future will of nations, which is the immediate focus of our work, the immediate problem always foremost in our process of judgment. By such means, it has always been and will be one of us, whether republican or oligarchical elites, who will actually shape the future course of history, whatever the little people of contemporary popular majorities imagine to the contrary.

It is only from the vantage point we have just identified that history can be comprehended, whether political history in general or the internal history of science. It is that which the case of Carnot exemplifies.

To understand the case of Carnot, you must know this.

Approximately twenty-eight hundred years ago, the priests of the Temple of Amon, faced with the irreversible general moral and cultural decline of Egypt and the Middle East, reached out to then illiterate Greeks and to the Etruscans of the western Mediterranean, fostering the resurrection of Athens, the rise of the Ionian city-state republics, and the Etruscans, to be a counterforce in culture, in economic development, and in arms, against oligarchical forces centered in a faction known variously as the Chaldeans, Magi, or Mobeds. This principle of statecraft embodied in that undertaking by Amon was later treated by Plato in his dialogues, outlining the function of development of colonies, as designed to create a force to tilt the strategic balance against the power of oligarchism in the home countries. Through the dialogues of Plato, chiefly, this specific aspect of the practice of statecraft has been transmitted into modern times.

Such views of the potentials of the Western Hemisphere were prominent in the thinking of leading republicans faced with new insurgency of oligarchical forces during the late fifteenth and sixteenth centuries. Then, to Plato's counsel on this point of statecraft was added chiefly the impact of St. Augustine's *City of God* and other of his writings. During the middle of the sixteenth century, the titular republican leader of Tudor England, Robert Dudley, proposed that Elizabethan England mobilize its vastly superior technology, as inclusively relevant to warfare, to create a fleet well-suited to sweep the Spanish Hapsburgs from the seas, to liberate the indigenous populations of the Western Hemisphere from Hapsburg genocide, and develop those people through making available to them only the best technology and other culture European culture could provide. This mixing and alliance of those oppressed peoples with the republicans of Europe would, Dudley proposed, create a powerful force to alter fundamentally, advantageously the position of the republican cause in the Old World. Balancing between the Dudley faction on the one side and the Genoese-owned Cecil faction on the opposing side, the Queen Elizabeth I depicted as Hamlet by Shakespeare waffled.

In a bloody coup d'etat, which the Cecils led on behalf of Genoese interest over 1589-1603, the republican faction of Tudor England was crushed, and Genoese puppet James I was installed in the newly created throne of Britain. In the ruinous circumstances unfolding under Genoese tax-farmers looting of Britain from 1603 onwards, the republican party of England, the Commonwealth party, connived successfully to establish Commonwealth party colonies in the coastal region of North America to the north of the Virginia plantations. When the Commonwealth was overthrown, through aid of the Pallavicini-influenced follies of the part-Pallavicini Oliver Cromwell, the rightness of John Milton's policy was recognized (too late for Britain) by the Commonwealth party forces which then pursued the North American colonization effort more energetically. During the same general period, a similar, largely abortive effort of colonization to the same purpose was undertaken by the republican faction of Tremblay, Richelieu, Mazarin, and Colbert of seventeenth-century France. Later, especially under Charles III of Spain, the so-called Francophiles of the Spanish court circles attempted, with fruitful ultimate consequences, to bring the Iberian colonization of the Western Hemisphere into line with republican principles in such matters.

Thus, the colonies established by the Commonwealth party in North America, nurtured chiefly on the influence of the King James Version of the Bible and Milton's poetry and prose, emerged as a small but potent force during the eighteenth century, reaching during that century literacy rates (over 90 percent) more than twice that in Britain.

Against the chartered semiautonomy and cultural-economic development of these colonies, which the British monarchy had reluctantly endured as long as a North American logistical base was required for wars against France and Spain, the British, in 1763, unleashed a determination to quickly nullify the republican institutions of local self-government of the colonies, and to suppress manufacturing and culture there, in order to bring these entities into conformity with the colonial policies later defended by the British East India Company's Adam Smith, in the *Wealth of Nations*.

In 1766, Benjamin Franklin, already the established leader of the republican conspiracy in English-speaking North America, journeyed to England and to the continent. Persuaded by his experiences in England and the counsel of leaders of British republicans such as Joseph Priestley, Franklin and Priestley enlarged their existing contacts with the networks of Colbert and Leibniz on the continent of Europe, initiating the political conspiracy which was to bring the United States into being a decade later.

Franklin, already an acknowledged and respected scientific thinker in Europe, expanded his already established scientific contacts in France, Germany, Italy and Sweden, using the cover of his travels and correspondence under scientific auspices to organize the vast republican conspiracy subsequently mobilizing both French direct aid and the strategically decisive League of Armed Neutrality.

The republican conspiratorial networks of continental Europe, reaching significantly into the Petrograd court of Queen Catharine of Russia, responded to the American republican cause with a conscious appreciation of its implications as a colonial venture of the type launched by Amon and prescribed by Plato. A new republic on the coasts of North America was to become, as the Marquis de Lafayette described the young United States to George Washington and others later, a "beacon of hope" and "temple of liberty" to inspire and strengthen the peoples of the Old World. It was to that purpose that these European republicans mobilized defense of the United States against its mortal adversary Britain, and adopted the American republican struggle as the cynosure of republican reflections throughout Europe.

It is impossible to understand the republican movement in eighteenth and early nineteenth century except from the vantage point of the American revolution. The composers Wolfgang Mozart and Ludwig van Beethoven exemplify thus, as do the dramas of Friedrich Schiller, the leading moral and intellectual influence of that Weimar Classic circle which launched the 1809

republican reforms and nineteenth century explosion of scientific world-leadership in Germany. The network of "reading societies" which developed in Germany, organized to collect and discuss the most recent news from the United States, and the involvement of Herder, Kant, Forster and all the republican leaders of Germany, as well as Schiller, Mozart and Beethoven, merely typifies the American influence energizing German republicanism as a whole during the last decades of the eighteenth century and the first period of the nineteenth century.

In reaction to the certification of the independence of the United States at the 1783 Treaty of Paris, a sweeping transformation in the strategic policy of the British government was effected around the leadership of the evil Lord Shelburne, the true power behind the puppet William Pitt the Younger.

Shelburne, deploying agents such as Jeremy Bentham, allied with the oligarchical leaders of continental Europe, to the combined purpose of subverting the United States and destroying it, with aid of complicity of Jefferson and the Jacobin clubs, and to destroy France from within, to thus eliminate the power base for the republican forces of Europe generally. Shelburne's key ally inside France was the Duke of Orléans, but Orléans, although de facto a British agent on this account, as later conduct underlines, was deployed chiefly through the power of a Geneva-based Swiss Protestant rentier-financier and allied Jesuit networks inside France.

The highlights of that period, into the rise of Napoleon Bonaparte, are indispensable to situate the circumstances of Carnot's leading role. The most convenient point of reference for tracing out the oligarchical operations inside France during the 1783-1815 period, is the personalities of Jacques Necker and his notorious daughter, the Madame de Staël, the foremost puppets of the Geneva rentier-financier interests intimately involved, and the indispensable collaborators of Orléans, Robespierre, Danton, Marat, Talleyrand, Fouché, and others, and intersecting generally the Schlumberger-deNeuflize-Mallet, Genoa-linked control over the Corsican Bonaparte.

Added to this, as a matter of broad references, one must take into account not only the role of the Jesuits (officially suppressed by the Vatican at that time, and hiding—officially—in Czarist Russia). Two oligarchical orders are crucial for tracing out the environment. Most prominent then, and to the present date, is the Hospitaller Order, today composed formally of the British, nominally Catholic (SMOM), German (Johanniterorden), and sprawling Russian, or "fourth" order. Less noticed, but crucial is, and was, the order of St. George. This was organized in the vicinity of Beirut, transforming a pagan deity, in one of those Chaldean-Eastern Rite syncretic concoctions, given the name of St. George, still based outside Beirut as its nominal world headquarters. This St. George cult was spread to Venice, and also became the patron saint of Genoa, whose city-flag is the Cross of St. George. During the thirteenth century, this cult entrenched itself in England, with aid of Genoese userers then called "Lombards," placing the Cross of St. George on the English flag in the fashion of a usurer nailing his mortgage-claims to the door of an hypothecated property. The added mention of these two nasty, powerful cult-orders suffices to indicate the general picture of the adversaries faced by Carnot.

The Swiss protestant bankers imposed Jacques Necker as the finance minister of France, to the effect and purpose that Necker bankrupted France in much the fashion Jimmy Carter and Federal Reserve Chairman Paul Volcker have brought the once-powerful United States under shameless submission to the British monarchy and virtual national bankruptcy. The crisis created, with aid of destabilizations organized by covert operations of Orléans and others, was the crisis of 1789.

Lafayette and republicans responded to the crisis with the policy of transforming France into a constitutional monarchy, using a constitution modeled upon the 1787 U.S. Constitution. This enterprise was destabilized chiefly by aid of two insurgency-riots organized and led personally by the Duke of Orléans.

On July 14th, the day curiously celebrated as the equivalent for France of the U.S. 4th of July, the Duke of Orléans personally assembled, armed and directed a mob of ruffians to storm

the Bastille. The prison's inmates at that moment numbered a grand total of seven, featuring two certified lunatics, a convicted sex-offender, and assorted thieves. The warden surrendering to the mob, he and his officers were promptly butchered by Orléans's ruffians, their heads severed and hoisted upon pikes. With that orgy accomplished, the mob departed, triumphant, bearing the heads on pikes, bearing the babbling lunatics on shoulders of several of the ruffians, and presenting at the head of this obscene, grisly procession, a carved bust of the mob's political hero at that moment, the man who had just bankrupted France, Swiss swindler Jacques Necker, who thereupon became the chief executive of the new government.

Later, Orléans organized, armed, and directed a larger mob to march on Versailles. This mob butchered the personal bodyguard of the King and Queen, Orléans's cousins, and bore the captive monarchs back to Paris, beginning the sequence of events which led up to the beheading of both, and consequently, the Duke's later, British-sponsored accession, as surviving legitimate heir, to the throne of France. On that latter occasion, Orléans, lacking the funds to travel to Paris from London for his own coronation, was advanced the necessary sum from the personal pocket of Nathan Rothschild—so much for the honor and dignity of the government of Restoration France.

The Jacobin force which seized power in France, to conduct the infamous Terror, was composed at the base chiefly of vagabonds recruited from the countryside with promises of dole. At the top, the Jacobin party was a composite of Jesuits working undercover and a circle, including Robespierre himself, enjoying the joint patronage over preceding years of both the Duke of Orléans and the salon of Jacques Necker and his daughter. The Terror itself was coordinated from London. Danton and Marat, both London-trained agents of the British Secret Intelligence Service, under the immediate direction of Shelburne and Bentham, were dispatched from their London safehouse-residences to France. The consequence: Into 1794, until the coup d'etat of Ninth Thermidor organized by Lazare Carnot, most of the intellectual leadership of France was either decapitated or murdered in less ceremonial fashion.

Out of this shambles, a group led by Carnot recreated a powerful France, later to lose that power through a succession of coups which brought Napoleon Bonaparte to power.

France's foreign enemies had, obviously, quite unintentionally, saved Carnot from the fate of others of his persuasion and qualifications. In the disorders of military affairs in 1793, Carnot already regarded as a leading genius in military science since as early as 1780,[5] took direction of the equivalent of the military general staff, and organized a circle of his surviving close collaborators to organize a revolution in modern warfare, a process of accomplishments aided much by this circle's constitution of the Ecole Polytechnique under the joint leadership of Carnot and his former teacher Gaspard Monge. Within a few years, this circle under Carnot's leadership created new, large-scale metal-working industries including those of the Metz region, producing such critical elements of warfare as unprecedented numbers of a new type of mobile field-artillery. Around the potentials of mobile field-artillery, Carnot redesigned the composition and deployment of arms of warfare, to the effect of shattering not only the armies of France's adversaries, but shattering in the process the established military doctrine of the eighteenth century. These reforms by Carnot were the model for the design of the Prussian system by General Scharnhorst later.

Although the work of Carnot was broadly incorporated into the reforms of West Point under Commandant Thayer, one serious flaw was added. Emphasis was placed on the study of Napoleon Bonaparte's battles by the Swiss military commentator Jomini. This reflected a widespread error reverberating to this day. The impact of Napoleon's military victories fostered the myth of Napoleon, a fallacy of judgment which overlooked two decisive sets of facts bearing upon the correct assessment of Napoleon's military victories.

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5. He produced two major military papers during the 1770s, and became the target of the Prussian monarch's efforts to lure him into Prussian service in 1780.

First, the basis for Napoleon's victories was not merely tactics, but was chiefly Napoleon's capable deployment of a new kind of military capability, designed chiefly by Carnot. The second set of facts focuses our attention on the downfall of Napoleon. Within four years after the adoption of Scharnhorst's reforms, after the total shattering of Prussian military forces at Jena earlier, Prussia organized the defeat of Napoleon—twice, on the second occasion saving the shattered forces of brutish Wellington's crude British "meat wall" at Waterloo. The defeat of Napoleon was accomplished by chiefly two means. Fundamentally, Napoleon was lured into a Russian trap which had been designed, baited, and closed under the orchestration of Schiller's admirers, as noted earlier. Additionally, in designing the new model of Prussian strategic capabilities and military arms on the model of Carnot's reforms, Scharnhorst et al. had created the only kind of military force capable of matching the French military instrument designed by Carnot.

In the military equation of firepower, mobility, and depth immediately paramount in deploying the means for competent conduct of warfare, it is the combination of the total capacity and *creative executive will* of the society which is ultimately at play, the latter quality that which Clausewitz too superficially describes under the tital "Entschlossenheit." Although military capabilities do not exist until they are realized as forces under qualified leadership, the potential for developing and deploying such military capabilities is defined by the nonmilitary material and political potentials of the society. A true strategy is based upon enriching those nonmilitary potentials vis-à-vis the potentials of potential adversaries, and within that subsuming consideration, to realize the explicitly military potentials required.

The "secret" of Carnot's military genius lies in the fact that these military qualifications were subsumed under both an extraordinary scientific capacity and Carnot's achievements in effecting a virtual industrial revolution within a span of a few years. It was shaping the conduct of warfare from the vantage point of scientist and nation-building which defines the proper estimate of Carnot's work as a whole. Although Napoleon was an extraordinary combat commander, in fundamental matters of strategic thinking, he was a lilliputan compared to the giant Carnot.

That essential background situates the immediate point to be made concerning Carnot as an economist.

## The Ecole Polytechnique

To any qualified economic historian, the very name of Ecole Polytechnique is telltale. "Polytechnique" was, as we noted earlier, the French cognate for Leibniz's "technology." The central feature of the work of the Ecole Polytechnique under Carnot's leadership was the practice of Leibnizian economic science, in the sense we defined the notion of physical economy earlier in this report.

The related activities of the Ecole Polytechnique may be conveniently subdivided into three interdependent categories: deployment of technology, the development of new technologies, and forced-draft advances in fundamental knowledge of science to make possible needed forms of new technologies. The war-time U.S. Manhattan Project and its H-bomb-project successor is but an echo of the Ecole Polytechnique's role as what we today sometimes term a "science-driver" institution. The German wartime aerospace work at Peenemünde and the NASA aerospace "crash programs" of the early 1960s are also echoes of this.

The superiority of the Carnot Ecole Polytechnique over such cited, later imitators lies in the breadth of work and comprehension guiding that work. Assembled around the mastery of geometry by Monge, and Monge's new methods for producing "brigades" of newly qualified scientific workers, the Ecole Polytechnique effected a revolution in fundamental scientific knowledge, bringing to a state of semi-completion, as typified by Lagrange, Poncelet, Abel et al., the work brought to semi-perfection by the circles of Gauss, Dirichlet, Steiner, Weber, Riemann, Weierstrass, and Cantor in Germany.

The collapse of French science occurred during the 1820s, in consequence of a virtual

inquisition deployed against the work of the Ecole Polytechnique and the method of Leibniz by a concert of forces centered around their agent Augustin Cauchy. Cauchy's frauds and shameless plagiarisms in the name of science are a subject unto themselves, a heritage from which, despite Louis Pasteur and some others, French science has not recovered to the present day. The immediate result of Cauchy's deployment to destroy French science was that French science accepted Alexander von Humboldt's invitation to move to Prussian Germany. The accomplice of Humboldt in organizing this emigration was Lazare Carnot. Exiled from France to Marburg, Germany, by the 1815 Treaty of Vienna, Carnot spent the remaining years of his life (1815-1823) chiefly at Berlin.

There was nothing of mere opportunism or "sour grapes" in this migration of leading French science to Germany. The connection between the scientific and republican communities of the two nations, strengthened by Leibniz, had never been broken, especially in scientific circles. When Napoleon's forces imposed a fine upon Karl Gauss, which Gauss lacked the means to pay the occupation forces, the Ecole Polytechnique rallied to pay the sum. The arrangement was not without opposition on the German side. Evil oligarchical scoundrels, including the Delphic, influential G. W. F. Hegel, joined with Savigny and others in Bavarian-Wurttemberg-Hapsburg interest, to attempt to prevent Humboldt from establishing professorships for French science at Berlin.[6] Humboldt outmaneuvered this obstacle in a number of cases by having the Prussian Military Academy provide professorial habilitation, and conducting the scientific education at Berlin University under the sponsorship of the Department of Philology. Crucial was the establishment of *Crelle's Journal,* through which French science and German advancements were published, a journal whose existence was made possible by a subsidy of subscriptions provided by the Prussian military general staff and military academy!

After 1848-1849 events, the Hapsburg-British faction at the Prussian court used the republican sentiments of professors such as the great Lejeune Dirichlet (the husband of a Felix Mendelssohn sister) to hound some of Germany's greatest scientists from that university. The Carnot-Humboldt faction in science fell back to its remaining chief bastion, Göttingen University. Even as early as 1857, attempts were launched by the anti-Carnot-Humboldt faction, to have Bernhard Riemann's professorship suppressed at Göttingen. During the 1860s, Riemann left Göttingen for Italy. This was partly for reasons of health—he was gradually dying of tuberculosis, but also because Göttingen was no longer what it had been during and immediately following the last years of Karl Gauss. Riemann dedicated himself largely to a group of Italian scientists in the circle of the Italian republican and opponent of Giusseppe Mazzini, Cavour. Riemann's influence and teaching there fostered one of the most important scientific circles in the world into the period of the Mussolini dictatorship. The excellence of Riemannian hydrodynamics in Italy was reflected in the fact that during the 1920s, into the 1930s, Italian aircraft design was in advance of anything else in the world.[7]

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6. Archives in East Germany have produced important evidence on the Hegel case. Internal features of Hegel's work tell the rest, including Hegel's surviving, published correspondence. The collaboration between Carnot and Alexander von Humboldt, and Carnot's presence at Berlin (1815-1823) when he was officially exiled to Marburg, are documented. The role of Alexander von Humboldt, in recruiting French scientists and importing French science, as well as the special arrangements associated with this effort have been massively documented, although the bottom of the archive material on this matter has by no means been reached at this point of writing. It is sufficient to say that the history of science during the 1815-1883 period, as unveiled massively by primary materials from even existing archives, bears no similarities to the fraudulent accounts usually encountered in the journals, classrooms and textbooks of today.
7. Adolf Busemann, one of the team of German rocket scientists at Peenemünde, reports that Versailles's prohibition of German aircraft development obliged German industry to rely on collaboration with the Italians during the Weimar period. This collaboration aided Italy's supremacy in aircraft design during that period, but the current of Italian physicists developed around Riemann's collaborators there during the 1860s were in fact one of the finest concentrations of hydrodynamicists in the world, the kernel of Italy's limited but outstanding excellence in physics generally.

Until the emergence of Professor Felix Klein, and Klein's organization of the Göttingen circle of wealthy industrialist backers of basic research, political conditions for great scientists in Germany became much worse from the 1860s onward. The two most notorious cases are those of the hoaxster Helmholtz, and that "Rosencrantz and Guildenstern" of the German scientific tragedy, Leopold Kronecker and Richard Dedekind.

The latter pair of culprits were formally former students of the great Dirichlet, and on that account did as well as they might to emulate Judas's role as a Disciple of Christ. Essentially, both Kronecker and Dedekind were members of the faction of Cauchy. In their coordinated activities against the persons and works of leading German scientists, the activities of this unwholesome pair anticipated two cartoon characters of the twentieth-century U.S.A., Mutt and Jeff: The "Mutt and Jeff" routine which Kronecker and Dedekind paired up to conduct against Georg Cantor is exemplary.

Formally, there were two columns of assault against German science into the 1920s' outburst of hired hooliganism against E. Schrödinger et al. at the notorious Solvay Conference: the one deployed from Britain, the other sweeping up from Hapsburg Vienna, aided by the Cauchy faction from France. Helmholtz is the clearest, outstanding case of a nominally German scientist who committed frauds under British sponsorship, under the sponsorship of the circle of the pathetic plagiarist Kelvin. Kronecker and Dedekind we locate, according to the differentia specifica of the internal features of their work, as in the Hapsburg-Jesuit faction of Hegel.

The exemplary case of British campaigns to destroy German science at the turn of the present century is that of Bertrand Russell's deployment by the Cambridge University Apostles group. Russell's first published book consisted of a series of lectures on geometry, which he had delivered at locations such as Baltimore, Maryland (U.S.A.): a set of scurrilous and pathetically incompetent productions, devoted chiefly to libellous falsehoods against the work of Bernhard Riemann[8] and Georg Cantor. In these lectures, Russell is most vitriolic against Riemann's 1854 habilitation dissertation; against this dissertation, Russell offers no analytical argument—Russell's later silly efforts to explicate Einstein's notions of relativity show that Russell could not have understood Riemann well enough even to oppose him formally. Later, Russell made a trip to Germany, including Göttingen, where he dedicated himself to attacking Riemann, Cantor, and the leading Göttingen figure of that period, Felix Klein. Russell's work with Whitehead, and all of Russell's other putative contributions to mathematics, were in service of the British determination to eradicate all influence of the 1871-1883 work of Georg Cantor on the issues of transfinite ordering.

The evil factional assault launched against the great Max Planck by the Hapsburg ruffian Ernst Mach, prefigures the later assaults against E. Schrödinger et al. by the scurrilous British agent Bohr during the 1920s.[9] With Bohr, the three currents of evil invading science—British, Cauchy-French, and Hapsburg—were essentially united under a single, British command.

Although Russell professed to have withdrawn from science during the late 1920s,[10] in 1938, in collaboration with the University of Chicago's Robert Hutchins, Gregory Bateson, Margaret

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Unfortunately, the crippling effects of tuberculosis prevented Riemann from writing during the concluding years of his life. Thus, his contributions to physics during this period, among his most fruitful, are recorded only in the manuscripts of close Italian collaborators such as Enrico Betti. It is this important circle of Riemannian physics in Italy which is indicated to have been crucial for bringing Riemannian physics to Einstein's attention.

8. *Lectures in Geometry*. Russell's vile antics in Germany turned up in records of a Göttingen archive.
9. Heisenberg recorded, later, his astonishment at Bohr's shocking personal conduct toward Schroedinger, and in the final years of his life, his second thoughts about the doctrine of quantum mechanics over which such an ugly brawl was presumably staged. Bohr was not, of course, the complete fraud that Bertrand Russell represented in science. This is not much to Bohr's moral credit, since he could not have failed to recognize that he was engaged not in a factional issue within science, but a determination to stamp out the premises—human and formal—for continuing progress in science.
10. Cf. White, op. cit., passim.

Mead and other scoundrels, Russell organized a "unified sciences" project, under whose continuing auspices a wide range of evil has been unleashed in the world during the postwar period to date. Insofar as this project continues to focus on assault against science narrowly defined, it and its work today are chiefly represented by the "Unification of the Sciences" project sponsored by the Reverend Moon cult and a Harvard-based coordinator of historical and other hoaxes in the name of physical science, known as the History of the Exact Sciences project.

The hegemony of this, presently British-coordinated assault against the heritage of Leibniz, Carnot, and nineteenth-century Göttingen—and their predecessors, has been sufficiently effective as a military-occupation-like operation, that competent references to the work of continental science over the span from the fifteenth into the close of the nineteenth century have been virtually eradicated from the classrooms and textbooks of Western Europe and the United States today.

True, relevant published sources giving true accounts of the work suppressed from the classroom knowledge still exist, including copies of published works representing primary source-materials. These are limited in copies to a relatively few, and rapidly diminishing, private and university libraries' archives. Although there is evidence to show that certain crucial documents have been either destroyed or hidden away willfully, there is still an abundance of primary manuscript materials scattered among a relatively few archives. However, as study of the Göttingen Riemann archive shows, plus the Riemann archive material deposited at Pisa, no thorough published effort has been attempted to treat the archives of Riemann since the abortive work of the dubious Richard Dedekind.[11]

Although a true account of the history of modern science could be—and has been[12]—constructed from primary sources still extant, virtually no would-be university professor in Western Europe or the United States today would risk his professional career by showing interest in such an inquiry. Barring a crisis leading to an overthrow of the inquisitional forces against the "bad thoughts of Kepler, Leibniz, Carnot, Riemann, Cantor, et al.," the only hope for recovery of science today must be found in the developing nations plus, possibly, Japan.[13] Although the work of the writer and his immediate collaborators has broken through the inquisition to some significant, very limited degree, even in the United States and Western Europe,[14] the circumstances which have permitted this limited success demonstrate the rather extraordinary means which must be deployed even to win back a few precious inches for science.

## The Political Issue Generally

The case of eighteenth and nineteenth-century French and German scientific leadership, which we have just outlined summarily here, is the more recent reflection of a battle which has raged since the fifteenth century, and which erupted into the continuing, modern lines of factional

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**11.** A team coordinated by U. Parpart has conducted the first extensive survey of the Riemann archive indicated to have occurred since Dedekind hauled off some of the material for his own writings.

**12.** The historical material bearing on the history of science employed in this report is chiefly an extract of the cumulative work of teams aggregating to scores of persons working with archive and other materials from a half-dozen nations over the span of more than a decade.

**13.** Japan presently confronts an important national-policy problem in this connection. Since the financial systems and major industries of other leading industrialized nations have been suppressing use of new technologies developed at home over an extended period, Japan, with a saner policy in such matters, has made good use of new technologies it has selected from the otherwise neglected patents, etc., of the United States and other nations. Now, as scientific work is collapsing in the United States and Western Europe, Japan's ability to maintain technological progress will require increased allotments for fundamental and related development research. Japan has a strong interest both in increasing its scientific capabilities at home and in finding in developing nations concentrations of science with which to collaborate closely, the latter in order to establish an adequately broad base for satisfying Japan's own requirements.

**14.** Most notably, in influencing policy-outlooks affecting development of thermonuclear fusion.

division with the inquisitional attacks against the work of Gilbert[15] and Johannes Kepler, chiefly Kepler,[16] at the beginning of the seventeenth century. The Inquisition against Giordano Bruno and Galileo, under the Venetian-Hapsburg Dark Age of 1525-1653, are merely additional reflections of the same process.

It is sufficient, in the effort to be as brief as the subject permits on this subject here, to focus on the cases of Kepler and Leibniz. It was Kepler who established modern mathematical physics, chiefly through the medium of three books whose contents are totally misrepresented in every present-day English textbook and related source, three books which have so far never been published in an English translation.[17] In the course of that work Kepler defined the need for several main continuing lines of work by his successors, including his specifications for the establishment of a differential calculus and his emphasis on the need for a rigorous treatment of elliptical functions. It was Leibniz, employing B. Pascal's private archive as well as Pascal's work on differential number-series, who first defined a differential calculus in a work, still extant, submitted to a Paris printer in 1676.[18] Leibniz's work was in fulfillment of Kepler's earlier specifications, and prompted by Leibniz's preceding, page-by-page working through Kepler's work, as Leibniz's marginal notes in copies of these publications still attest the content of that study. Working in close association with Christian Huyghens, both under the patronage of Jean-Baptiste Colbert in Paris, Leibniz established the foundations of all modern physical science to follow him.

Although the name of "Jesuit" has become the kind of epithet used to blame members of that order for far more unpleasantness than they have actually contributed, this Venice-created order, with its notorious role under the Hapsburgs before 1653 and from 1815 onwards, does typify one of the two, allied currents ranged against science since the turn of the seventeenth century. The attack upon science by Abbot François Moigno, Augustin Cauchy's Jesuit patron, is the key to the content of Cauchy's corruption of French science, and to the role of such as Kronecker and Dedekind in German science. The other branch of this assault is typified and more or less defined by Francis Bacon's scurrilous assault on one of the world's greatest scientific thinkers of the Tudor period, William Gilbert, the philippic against science which is usually cited as the original master-work of modern empiricism. The Royal Society established under direction of John Locke during the Stuart Restoration, together with the Scottish Encyclopaedia Britannica project of the same period, gave the general institutional form to British attacks against science continued through subsumed later evolutions of that institutional practice to the present day.

The Jesuit and British methods against science have been essentially the same, both modelled upon the so-called Delphi method, that named in memory of the fourth century B.C. schools of sophistry, typified then by Isocrates's school of rhetoric at Athens and radiated from Tyre and

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**15.** Typical of his character as a public embezzler, Sir Francis Bacon, who contributed less than nothing to scientific progress, professed to have freed science of the constipation of medieval ideas by focusing his attack on scientific method directly against the person of William Gilbert, Tudor England's most accomplished scientist, and discoverer of the magnetic plasma!

**16.** Kepler first came prominently under attack by the Inquisition and an exotic cultist, the hermeticist Fludd. With the 1660 Restoration in Britain, Locke's Royal Society launched its libelous lying against Kepler. To this day, the only cited English translation published of Kepler's work is a passage in the *Encyclopaedia Britannica*, a passage selected not to expose the obvious lying of Newton and his successors respecting the crucial features of Kepler's work.

**17.** *The Harmonies of the World* (1619), *The New Astronomy* (1609), and the *Mysterium Cosmographicum* (1596). The German translation, *Weltharmonik*, is the work generally used by the writer's collaborators, and an English translation is in progress.

**18.** This business was turned up in a Hannover archive. More important than the 1676 manuscript itself is the collection of previously unreported working-papers from the pre-1676 Paris period, which detail the nature of the day-by-day work Leibniz was conducting in connection with this, and other subjects. Already, by about 1673-74, Leibniz's knowledge of the calculus as a whole was substantially beyond the scope of the 1676 Paris paper. There are approximately 100,000 pages in the archive representing Leibniz manuscripts which have never been published, and of which less than ten percent have been examined to date!

the cult of Apollo at Delphi.[19] The method of sophistry, or the Delphic method, is the tactic alternative to more obvious, more plainly brutish tactic of simpler inquisitional burning of scientists as heretics. Like the work of the Royal Society and Encyclopaedia Britannica, the Delphist collects everything he finds to be known about science throughout the world, relaying these collected materials to some central archive, such as the seventeenth-century Royal Society in Restoration London. There, the collected materials are processed (sometimes, even as Delphic agents are attempting to assassinate or otherwise destroy the influence and reputations of the original authors of the collected work). The collected materials are reworked by specialists, such as Robert Hooke for the Royal Society during Locke's, Newton's and Boyle's lifetimes,[20] and aspects of the discoveries are published in the form of descriptions, descriptions which purport to explain the discoveries as accomplished by means directly contrary to the scientific method by which the original discoveries were actually effected.[21] With aid of such practices, the Delphic institution attempts to establish its reputation as the world's leader in scientific knowledge, so attempting to make the original discoverers (and their scientific methods) appear "unnecessary."[22] So, the methods which the Delphic institutions allege to underlie successful, important discoveries are promoted as the methods to be emulated by scientific inquiry everywhere. That is the gist of both the Jesuit and British Delphic methods against scientific method.

Both the Jesuit and British factions against scientific method are nothing but aspects of the oligarchical faction more broadly. The sixteenth and seventeenth-century versions of the Delphic method are merely a more sophisticated version of the rationalist apologetics of the "Black Guelph"-directed Inquisition against Roger Bacon and the alleged influence of Avicenna (Ibn Sina) during the thirteenth and fourteenth century—actually an Inquisition directed against the influence of St. Augustine. The dominant distinguishing feature of the seventeenth and eighteenth century form of Delphic practice, relative to the thirteenth and fourteenth centuries' Inquisition, was the fact that the institutions of modern sovereign nation-state, set into motion by the fifteenth-century Renaissance were too powerful, too influencial, to be crushed by cruder Inquisitional methods. Scientific progress and associated technological progress could not be simply halted and reversed, as had been done during the late thirteenth and early fourteenth centuries. Science and technology had to be assimilated by the oligarchical faction, if that faction were to develop the material powers adequate to combat nation-state republics and republican forces generally. However, this oligarchical assimilation of scientific and technological practice to such a purpose must not become a fostering of scientific method and, thus, consequently, of the kinds of republican ideas given concentrated expression in that scientific method. The oligarchy must obtain intellectual hegemony respecting the reputation of science, but in such a manner that this very hegemony aided in causing discredit to scientific method actually. That was the essence of the British Royal Society, and such Russell-spawned Delphic projects as the Harvard-based History of the Exact Sciences today.

It is from this standpoint, and no other, that the factional history internal to science over

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**19.** Several of the writers associates specializing in classics, including Criton Zoakos, have compiled the documentation of the Apollo cult at Delphi, Alexandria and Rome over the recent half-dozen years. The most important added material, bearing on Tyre and the Chaldeans Magi-Mobeds generally, has been provided either directly or as a result of helpful suggestions of Professor Aly Mazheri of Paris.

**20.** The evidence is conclusive that much of the work published by Newton and Boyle was actually pulled together by Hooke. Hooke's public protests against one act of naked plagiariam by Boyle prompted Boyle to postpone the text at least until Hooke was safely deceased. Newton's working papers have proven to have been devoted chiefly to queer experiments in out-and-out witchcraft, including the period he was presumably developing his *Principia*. There is evidence much of the actual work was done by Hooke.

**21.** It is clear that in the case of the notion of gravitation attributed to Newton it was principally Hooke who referenced Galileo's work to invert Kepler's laws thus producing the appropriate formulation, but in the guise of action-at-a-distance.

**22.** Newton begins his *Principia* with "Hypothesis is not necessary;" in other words, it is unethical, in the profession of the thief, to engage in the honest production of wealth.

recent centuries to date can be comprehended. So, the pro-Malthusian former Nazi and present-day neo-Nazi, Armin Mohler of the Siemens Stiftung justifies the pro-Malthusian Siemens family's moving its firm not only into monopoly, with ITT, over much of the world's communications industry, but also into dominion over Germany's nuclear industry—the better to wreck the latter industry's progress from within.[23]

The opposition to this British-Jesuit Delphic faction within science has been the faction which the British, from the late-seventeenth through nineteenth centuries, described venomously as "continental science." This, the British have clearly understood and identified to have been the current traced through Kepler, Pascal, Leibniz, et al. through Carnot's Ecole Polytechnique, into the work of Riemann, Weierstrass, Cantor, et al., and to include the more epistemologically cautious circles of Felix Klein, Planck, et al., into the 1920s. Broadly speaking, Albert Einstein, although chiefly under the patronage of the Marburg School and the British, was a product of "continental science" influences (e.g., Hermann Minkowski) including, significantly, the Italian followers of Riemann's immediate collaborators around Betti, and in his best aspects does represent the methods and outlook of the twentieth-century, epistemologically diluted continuation of "continental science."

This latter faction has been, as we have already emphasized, the offshoot and correlative of the oligarchists' opposition, the republican faction.

Although "continental science" has deep roots, traced to Archimedes, Plato; and the Cyrenaic Temple of Amon, modern science was set into motion as a coherent movement with a well-defined method by the work of Cardinal Nicholas of Cusa during the fifteenth century. After Cusa, the molding of modern science's foundations was developed chiefly by the circle associated with Leonardo da Vinci, as reflected in the work of Pacioli, Durer, and the School of Raphael as continued into the Neapolitan school of Campanella et al. From the outset, during the fifteenth century into the close of the eighteenth century, this movement was associated with *cameralism* and, in France, under the name of *mercantilism*. To understand "continental science" adequately, as the case of Leibniz exemplifies this point, one must understand the manner in which physical science (or, "natural philosophy") was situated in the world-outlook of the cameralists generally.

As for Cusa, the universe was a process of continuing creation, as opposed to a single, fixed, "Big Bang" sort of creation. This process of continuing creation was ordered by lawful principles congruent with the consubstantial Logos of the Christian Trinity. The understanding of Logos was consistent with the theology of leading Apostolic currents since the Gospel of St. John (and also, essentially, the commentaries of Philo of Alexandria). It was based on comparative reference to the notion of consubstantiality of Logos and Godhead featured in Plato's *Timaeos* dialogue. In the language of physical science as such, the Logos was the transfinite corresponding to the highest level of Plato's notion of the hypothesis of the higher hypothesis.

This standpoint governed Cusa's works on theology, including *De Non Aliud* and *De Pace*

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23. Mohler's 1949-1950 *Conservative Revolution*, written under the supervision of Professor Karl Jaspers, is the standard modern reference work on fascist ideology (including Nazism), reissued in revised editions into the 1970s. The *Conservative Revolution* thoroughly and accurately debunks the popular mythology, that the Nazis were a creation of German industrialism and Prussian militarism. The Nazis were fanatical opponents of industrial society, imbued with a Nietzsche-modeled hatred against Jesus Christ, Socrates, technological progress, and rationality generally. Their ideology was back to rural-pastoral life. Not accidentally, the modern "universal fascist" organization, formally based in Geneva and Lausanne, Switzerland, is a principal coordinator of the international terrorist and environmentalist movements, as the Breguet affair in Paris has underlined this fact, and as the neo-Nazi coordination of the Society for Threatened Peoples (the violence-oriented separatist movements' coordinator) indicates.

Among the relevant documentation of the *Conservative Revolution*, Mohler, himself a former Swiss volunteer to the wartime Nazi SS, elaborates the need of the fascists to destroy industrial technology by infiltrating and gaining control over crucial parts of high-technology industry. Mohler is based at the Siemens Stiftung, churning out fascism and antitechnology propaganda, some of which has been mass distributed through Siemens firm offices in Germany.

*Fidei,* and was his standpoint for the elaboration of law, including international law, as *natural law,* beginning with his influential, youthful *Concordancia Catholica.* Theology, natural law, statecraft, and what we view as physical science today, were all of one piece, facets of the same transfinite body of higher, universal law coherent with the Logos. From that standpoint modern physical science emerged as a coherent practice out of the influence of Cusa's scientific works centered around his criticism of the contributions of Archimedes. One can not trace out the development of modern science without reference to those writings of Cusa's, which contain, in essence, the program followed by his successors, including Kepler. So, physical science, or "natural philosophy," was situated within a coherent body of universal knowledge for the fifteenth-century Renaissance, and for the cameralists and mercantilists of the seventeenth and eighteenth century. So, the exemplary "universality" of scientific outlook associated with the name and work of Leibniz.[24]

The central feature of the scientific accomplishments of the late fifteenth and early sixteenth centuries was emphasis on the implictions of the "five Platonic solids," the direct foundation for Kepler's founding of mathematical physics on a geometric basis at the beginning of the seventeenth century. This is the point of methodological emphasis, as to mathematical physics, from Kepler through the work of Riemann and Cantor, and the standpoint from which the solution to the central problem of economics becomes more or less elementary to one knowledgable of this vantage point in scientific method generally.

This historical-political account of the background of Riemannian physics brings us to the contents of our concluding chapter.

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**24.** The popular truism, "Leibniz was the last universal thinker." Not true in fact, but indicative of the fact that oligarchical policy during the recent hundred years has been to crush, or simply murder any who exhibit propensities to become influential universal thinkers.

# 7. The Basis for Riemannian Economics

The basis for modern scientific method, the method underlying the modern accomplishments of "continental science," was developed during the fourth century B.C., during the lifetime of Plato, by work accomplished at the Cyrenaic Temple of Amon, proving that only five regular polyhedral solids could be constructed in Euclidean space-time. This discovery, effected by a collaborator of Plato, became one of the central topics of Plato's *Timaeos* dialogue, in which Plato attempts, among other undertakings there, to outline a method for physical science premised on the implications of that discovery. Consequently, these solids became known in modern times as the "five Platonic solids."

This discovery and its implications became a central feature of the scentific work around Leonardo da Vinci during the late fifteenth and early sixteenth century, work which provided, and in the most indispensable fashion, the basis for Kepler's successful founding of modern mathematical physics.[1] In brief, as Leonardo elaborates in his notebooks, there are demonstrable anomalies incurred through reliance upon linear perspective, some of which are efficiently eliminated by locating the image on a convex mirror, rather than a flat plane; the mapping of the convex-mirror image to the flat plane is one form by which such corrections might be presented to the viewer of a painting. This sort of inquiry converges upon the necessary judgment flowing directly from the fact of the uniqueness of the five Platonic solids. If Euclidean space permits only five regular polyhedral solids to be constructed within it, this crucial characteristic of Euclidean space signifies that the space-time of vision is not in itself real, that what we see is governed by aspects of space we do not see.

This discovery of the significance of the five Platonic solids, led, chiefly by way of Kepler and his followers, into the discovery reported by Riemann in his 1854 habilitation dissertation. We describe the principal features of that dissertation now, and then trace the principal features of the process by which this is developed, beginning with the work of Cusa, Leonardo, et al. during the fifteenth century.

The universe as we see it is not the real universe, but merely a subsumed aspect of the universe, upon which aspect the whole universe is projected as an image in a distorted manner. (This is, and precisely so, "Plato's Cave" and St. Paul's reality as seen in a glass darkly.) What we see, as collections of objects ostensibly interacting upon one another at a distance, is the distorted image projected to our senses by a real, larger universe which we do not see directly.

The universe of visual space-time, which we see, we call the *discrete manifold,* signifying that substance appears to exist for us, in that projected image-form, as self-evidently embodied in discrete particles. The real, larger universe, for which the discrete manifold is but a subsumed facet, is in the form of a *continuous manifold.* It is in this continuous manifold that substantiality in the universe is actually located; what we see as the disrete manifold is merely the distorted projection of processes regulated as to cause and effect in the continuous manifold.

This does not imply that the continuous manifold is a continuous state of "blah," an undifferentiated continuity in which nothing corresponding to discrete existences is to be found. Rather, what appear to us as discrete existences correspond to topological singularities in the continuous manifold. With aid of stereographic projections of the general class for which Riemannian stereographic projection is one possible form, the projective equivalence of the singu-

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1. See, Kepler's list of credits in his introduction to *The Harmonies of the World.*

larities of a continuous manifold to the objects of a discrete manifold is readily demonstrated even to schoolchildren. The existence of objects in the discrete manifold suffices as empirical proof of the reality of the corresponding singularities of the continuous manifold.

The problems, apparent paradoxes, do not end there. The characteristic empirical feature of objects in the discrete manifold is that they are efficient existences, that their existence causes the discrete manifold as a whole to undergo change. This means that the singularities of the continuous manifold corresponding to such objective phenomena must also be efficient. This could not be the case if the continuous manifold existed in the form of a fixed number of degrees of freedom. This could only occur if the universe of the continuous manifold were constantly undergoing transforming from any given number of geometric degrees of freedom, as designatable by the number $n$, to a higher number of degrees of freedom, $n+m$, as approximated by $n+1$. Since the empirical evidence is that the objects are either efficient or do not exist, the continuous manifold must be of a quality approximated by potential functions defined conceptually in terms of $n$ going over into $n+1$.

That hypothesis requires that we also define a kind of experiment, applied to the discrete manifold, which will test whether or not the general hypothesis is provable.

In the design of physical experiments, which depend upon experimental observations made in terms of phenomena of the discrete manifold, experiment requires the specification of appropriate terms of measurement. This sort of measurement is based on interpreting the physical process being examined as a physical phase-space, interpreted in terms of number of degrees of freedom of the process under consideration. For $n$ degrees of freedom, action in a unified field is measured in terms analogous to

$$S = \sqrt{X_1^2 + X_2^2 + \ldots X_n^2}$$

This general, "Pythagorean" measure underlies all competent measurement of such experimental processes.

What we require, therefore, is the selection of experiments in which the characteristic action measured is a change in the number of degrees of freedom of the process as the characteristic feature of the process under those experimental conditions, in which the determination and value of the underlying action changes during the experimental observation of a continuous function: in which the "Pythagorean" changes.

Such experiments, as specified by Riemann, he termed "unique experiments." In modern jargon of physicists, such unique experiments are subsumed under a more general class of experiments called "crucial experiments"—not all of which are "unique" in Riemann's sense. Such unique experiments all have one phenomenal characteristic in common, relative to the discrete manifold. The experimental phenomena characteristic of the experimental process observed are of the class generally named today "relativistic phenomena."

Riemann, in one very influential and important paper issued in 1859, successfully designed a model type of such unique experiment: the prediction of the propagation of "accoustical shock waves" (plane waves) in a piston-actuated cylinder of indefinite length. This experimental design was derided as incompetent by Lord Rayleigh as late as the 1890s, as part of the general British effort to discredit Riemann's work. However, every child who has heard the "boom" caused by a supersonic aircraft now knows, implicitly at least, that Rayleigh's mathematical physics was absurd.

In addition, Riemann's 1859 experimental design has been proven the unique solution for a wide range of relativistic phenomena (of which, in fact, accoustical shock waves are but one illustration). Erwin Schrödinger employed this 1859 design by Riemann as a reference point for analyzing phenomena intersecting the wave-particle ambiguity of the electron. Later, in the effort to design the combined heat and compression needed to effect thermonuclear ignition, the gen-

eration of the necessary relativistic effect, called *isentropic compression*, proved to be another application of Riemann's 1859 experimental design. The creation of particle-like bodies (e.g., "solitons") in relativistic plasmas is another instance of the same principle.

In sum, Riemann's hypothesis respecting the lawful composition of the universe has been proven experimentally many times over. Conversely, all those varieties of mathematical physics, especially the Newton-Cauchy-Maxwell varieties which preclude such ordered relativistic effects, have been repeatedly proven wrong.

This describes, in broad terms, what is meant by "Riemannian physics," as distinct from contrary sorts of physics. To take the reader into the inside of such physics we must consider the most crucial highlights of the historical process by which Riemann's conceptions were developed, and also indicate to the reader what we mean by a distinction between a geometric and axiomatic-algebraic sort of mathematics for physics. By such means, we trust, we shall have succeeded in indicating, at least, the premises on which we base our report that the Riemannian solution to the key problem of economic science is elementary.

## Da Vinci to Kepler

Of the regular polygons used to construct the five Platonic solids, the most significant is the pentagon. The construction of the pentagon by purely geometric methods involves the determination of a geometrical proportion known generally as the Golden Section—sometimes named, misleadingly, the "Golden Mean." The geometrical proportioning subsumed by this and the so-called natural-logarithmic spiral are the characteristic quantities determined by geometry.

If, reasoned the circle of Leonardo da Vinci, the lawful structuring of visual space-time is defined implicitly by the uniqueness of the five Platonic solids, then this Golden Section must be in some way a characteristic feature of natural phenomena. It proved, to them, to be the characteristic form of what is sometimes termed "self-similar" proportioning in living processes, as Kepler emphasized this same point later. Indeed, growing plants and human anatomy are proportioned, predominantly, under the influence of this principle.

We interpolate, that this proportioning is associated with negentropic processes generally. That statement, made against the background of our references to negentropy earlier in this report, helps to bring attention more readily to the precise significance of Kepler's accomplishments, as we shall begin to notice after a few more background observations bearing on the circumstances of Kepler's discoveries.

This knowledge of the Golden Section, self-similar proportioning of living processes by Leonardo's circle, together with the problem of projective anomalies earlier mentioned, underlay the development and application of the principles of composition in plastic-arts media of Leonardo, Dürer, and the School of Raphael. Contrary to the shocking ignorance of most contemporary art critics on this point,[2] these considerations, including the use of multiple perspective and convex-mirror images, enter prominently into the work of Leonardo and others of that period. In the case of Kepler, such considerations were brought to his attention most emphatically by the work of Dürer, although Kepler's scholarship was extensive and thorough, as his writings and their contents variously explicitly reference appropriate works and demonstrate his mastery of the conceptions studied from such works. It was under the impact of this sort of background work accomplished by his predecessors that Kepler framed his crucial hypotheses. There was nothing of the "wild guess" in Kepler's work; he possessed knowledge of well-researched grounds for his hypotheses.

Kepler rejected emphatically all notions equivalent to the assumption that negentropy is

2. Cf. interview with Dr. Steven Pepper, former Professor at Johns Hopkins University and noted expert on Renaissance painting, concerning the "Madonna of the Grotto," of Leonardo da Vinci, in *New Solidarity*, June 11, 1982.

limited to living processes. Although it might appear that nonliving objects interacted in modes differing from those associated with living processes, the universe as a whole must be governed by lawful principles otherwise expressed by the Golden Section self-similar proportioning of living processes. In classical-Greek terms of reference, that the universe as a whole was *hylozoic* in respect to its higher principles of lawful ordering overall.

Therefore, the appropriate domain in which to test this assumption must be astronomy. The solar system must be ordered in a manner subsumed by the principle of the five Platonic solids. He undertook that inquiry by aid of an intervening phase. He used the plane figures composing the five Platonic solids to divide the circle, and thus determined the harmonic principles of the musical scale. On this basis, he focused on examination of the manner in which those characteristic principles of action, subsumed by the uniqueness of the five Platonic solids, determined the lawful composition of the solar system. The result was the most accurate measurement of the organization of the universe ever devised, a principle which subsumes both the orbits of the planets and their moons,[3] and also the spiral galaxies. In contrast, the "three-body problem" intrinsic to the fallacious Newtonian system, etc., precludes, axiomatically such a determination.[4]

Isaac Newton attempted to discredit Kepler's work, on grounds that Kepler's approximation for elliptical values was but an approximation. The work of Gauss, on the asteroid problem, and the development of elliptical functions into Riemann's work on this matter, show Newton's objections to have been incompetent and absurd in conception. Planck showed that it was Kepler, not Newton, who had discovered the correct approach to the notion of gravitation.

Kepler proved that the orbits and orbital velocities of the planets were proportioned according to the harmonic principles subsumed by the plane figures corresponding to the facets of the five Platonic solids. This was the first, crucial step of modern science toward the thesis of Riemann's 1854 habilitation dissertation. From this same work, Kepler prescribed the development of the differential calculus and the problem of developing a comprehensive solution to the problem of elliptical functions. Most fundamentally, by proving that the organization of the solar system (and, therefore, probably also the universe as a whole) was determined by the five Platonic solids, Kepler proved, implicitly, that the visible universe was shaped by something external to that which might be attributed to a self-contained form of visible space—of Euclidean space-time: that action in visible space is shaped by something external to but otherwise subsuming visible space.[5] On that basis, he outlined the specifications for a differential calculus.

With aid of access to Pascal's archives on the matter of, especially, differential number-series, Leibniz met Kepler's specifications for a differential calculus by 1676.[6]

It is to be emphasized that Kepler had proven that the orbits of the solar bodies are not determined by anything related to action at a distance between bodies; he proved, rather, that the available positions of bodies in the solar system are positions harmonically determined, according to harmonic distributions derived from dividing the circle (a topologically perfect closed curve) according to the implications of the five Platonic solids. The position of the bodies as presented to visual space-time (Euclidean space) is not determined by anything which can be located entirely within axiomatically Euclidean space as such, but by higher principles which subsume visual space-time while lying, so to speak, outside it.

In other words, real physical space imposes, as if stereographically, an image of itself as a whole upon a facet of itself seen by us as visual space-time. The images seen by us are ordered

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3. U. Parpart has compared modern orbital calculations for the planets, and moons, plus the asteroids, and has so demonstrated that Kepler's values are the most exact available to the present date.
4. Cf. S. Bardwell on the three-body problem, *Fusion*, June, 1978.
5. Cf. *The Harmonies of the World;* German trans. *Weltharmonik.*
6. C.B. Boyer, *The History of the Calculus* (New York: Dover, 1949). The relevant work by Pascal is *Traîté des Sinus du Quart de Cercle.*

for our vision according to harmonic principles of ordering which reflect the manner in which "Euclidean subspace" is bounded by the higher-order, real physical space. In that respect, as A. Einstein later emphasized, Riemannian relativity was already implicitly specified by Kepler's work. What was needed after Kepler's work was the unfolding of the successive steps of interdependent hypotheses and experimental exploration of such hypotheses, to arrive at principles for determining what kind of a higher-order physical space satisfied the requirements implicit in a relativistically comprehended visual space-time.

What was needed was the elaboration of an appropriate *topology*. The significance of the kind of topology elaborated over the span from Leibniz's first development of this as *analysis situs* to Riemannian topology is essentially the problem of *invariance*. Most simply, this signifies a recognition that the projection of an image originating in one kind of space upon another kind of perceived space, possibly through the mediation of a third kind of space, results in the difficulty that the perceived relations in one of these spaces are either different than or perhaps do not exist in the other space. Our problem is to determine, to make short of the matter, how much of what we perceive in one space exists as some kind of a relationship in the other space or spaces. That sort of relationship which passes over from one kind of space to the other is termed an *invariant* relationship, i.e., what relationships are preserved, as invariant, in the projection of an $(n)$-into-$(n+1)$ continuous manifold's projection upon the discrete manifold-form of Euclidean subspace? Only the provably invariant features of the subspace, defined in that general way, can be adduced by experimental observation as the real features of the physical process observed. More generally, only lawful principles premised entirely upon such invariant features of the observed subspace are lawful principles of the real universe.

That, in brief, is the only sane meaning of topology. A topology defined on the basis of a different set of assumptions may lead to lunacy.

The progress of "continental science" from Kepler's founding discoveries in mathematical physics, traced through Leibniz into Riemann et al., is properly viewed as nothing but such a progress in the development of an experimentally oriented topology.

## Synthetic Geometry

The development of the pupil's mental powers along a line leading toward efficient comprehension of such a physical topology is achieved, most immediately, by subordinating the development of all mathematical conceptions to a rigorously defined grounding in what is best identified as *synthetic geometry*, a notion of teaching of geometry developed into modern form by Riemann's geometry teacher, Jacob Steiner.

By *synthetic geometry*, one means inclusively that the scope of the thirteen books of Euclid's *Elements* must be mastered by a process different than that outlined by that text itself. The axioms and postulates are outlawed, together with the deductive proof of theorems. No geometrical principle or conception is tolerated as known by the pupil except as that pupil has produced the geometric conception by means of a rigorously defined method of construction.

This method of construction depends upon a correction of the very beginning of geometry instruction, a correction made possible by a "powerful" theorem of topology, the purely topological proof that the circle, defined without assumption of either center-point or radius, is the perfect closed curve of Euclidean subspace. Although this proof is not required of the primary-grade student first drawing circles, knowledge of this topological "theorem" informs the teacher's pedagogy from the beginning onward in geometry instruction, even in the primary grades.

To barely illustrate the way in which that topological exercise begins: What closed curve encloses the largest area relative to the length of its perimeter? First, one demonstrates that such a curve must be everywhere convex. Then, by folding an everywhere-convex curve's area against

itself, one proceeds by successive operations, to define the circle as the unique answer to the question.

The mistaken objection might be offered, that we are proposing to employ principles developed by an advanced elaboration upon primary instruction. We have not fulfilled the requirement of building everything up from the simplest sort of self-evident assumptions, not "inductively." The objection, although popular enough, is premised on a very false assumption.

All scientific knowledge is developed by a method congruent with the Socratic method. As our knowledge increases, we constantly challenge what we imagine ourselves to have accumulated. We apply the increase of empirical knowledge to criticize, repeatedly, those kinds of embedded assumptions which might be viewed as elementary. So, in the imagery of Felix Klein, as the branches of the tree of knowledge are extended, we probe more deeply, more extensively into the roots of this tree—by Socratic methods. We then apply this corrected knowledge respecting roots to elaborating the lawful principles ordering the development of the tree (roots, trunk and branches) as a whole. From this advanced standpoint, we reshape the education of our children, just as we teach children from the standpoint of an advanced, literate form of language, rather than teaching children to develop language from an assumedly original point of Pleistocene grunting.

Knowledge is not abstract knowledge, of the variety we might imagine the intellect to develop logically, apart from rigorous investigation of the real universe. We do not, unless our educational policies are criminally insane, instruct children to develop an abstract mathematics, assumedly independent of the real universe, and propose, thereafter to interpret observations of the real universe with such a "pure mathematics." We develop children's minds to adduce lawful principles provably ordering man's progressive mastery of nature—the real universe. Knowing, from the state of progress of civilization what children will be able to prove empirically, before they themselves begin to advance the boundaries of man's empirical knowledge, and knowing what "instinctive" conceptions have been Socratically proven false trails by the progress of literate civilization, we set our children to reproduce the essential features of our cumulative experience in the progress of knowledge.

In this instructional policy, we are informed by the internal history of the development of scientific conceptions, and we communicate to students—unless we are fools—that such a progress in knowledge has in fact occurred. However, we do not take the student back to the beginning of knowledge as that beginning was actually experienced in the past, permitting the child to take account of nothing that was not known to or assumed by mankind or a particular discoverer at the point of each discovery. We do, in fact, lead the pupils to relive the process of discovery, so that the students may develop an empirical sense of the process of ordered discovery, and so become familiar with the principle of ordered discovery. Yet, we do this properly by obliging the student to criticize past discoveries with aid of a rigor which is adduced from a modern, advanced standpoint.

This was adequately resolved before the close of the nineteenth century by Felix Klein et al.

The first step in a program of synthetic geometry is to treat the circle as the only axiomatic figure of Euclidean space: Only the action of generation by rotation, closure, and maximal enclosure are attributed to this circle as its physical-topological qualities. The "straight line" is introduced not as an axiomatic notion, but as a singularity determined by a single, perfect folding of the circle against itself. The "point" is not defined axiomatically, but by folding the semicircle against itself, to determine the point as a singularity.

From that beginning point onward, nothing is developed in geometry but through construction premised entirely upon this initial point of reference. All proofs by construction are defined in respect to circular closure, by aid of either the circle or the sphere. No instrument employed to

aid a construction may be employed unless it has been rigorously determined by application of these principles.

In the course of covering the topics of the tenth book of Euclid's *Elements* onward, the student is led through the topics of Kepler's three books. Thereafter, while being introduced to Leibniz's differential calculus from this Keplerian vantage point, the student is led into the domain of the complex variable by aid of constructing a spiral on a cone, forming a conical surface from a sector of a circle and constructing a self-similar curvature by means of lines drawn on the circular sector prior to bringing the radii-edges of the sector together to form the cone. Cylindrical logarithmic spirals are constructed, too. If transparent materials are used for these constructions, projections of the spiral-figures are easily demonstrated.

The student is led to explore Riemannian forms of stereographic projections, and to generate such projections by reflecting images generated by continuous conical spirals and so forth from a plane reflecting surface. These and related demonstrations are employed to introduce the student to several, interconnected notions. The student learns a demystified, geometric notion of functions of a complex variable, and projective relations of such a continuous function to the corresponding images of a discrete manifold. The student also develops an appropriate sense of the meaning of projective invariance, including the problem of attributing the ostensible metrical relations within a discrete manifold to the continuous manifold from which the images of the discrete manifold have been projected.

The general object of such modes of instruction is to develop in the student a sense for seeking out the kind of relations in a continuous manifold which can be rigorously determined as the necessary conditions determining transformations observed in terms of the discrete manifold. From such a standpoint, the significance of Kepler's proofs and the connection to Riemannian physics is made elementary.

The essential thing is to prevent "brainwashing" the student into the Newtonian outlook, to avoid the delusions associated with the assumption that objects, self-evidently particularities in a discrete manifold, act upon one another at a distance within an infinitely extended, self-contained discrete manifold of the Euclidean form.

This precaution poses the indispensable paradox to the student. If the singularities corresponding to objects and object-relationships are real, in the sense of being causally efficient, what kind of a continuous manifold imparts such ontological significance to singularities? *In the imagery of Cusa, by what means can a singularity become a microcosm of the macrocosm?*—be a human intellect acting efficiently upon the universe? The solution to this apparent paradox can be located only through the pathway defined by Riemann's 1854 habilitation dissertation.

From this vantage point, an entire philosophical world-outlook emerges. From that vantage point, many important problems become elementary.

## Riemannian Economics

From this writer's own experience, in reflecting upon the essential content of his 1952 discovery and the mental transformations leading into that discovery by way of assimilation of Cantor's notion of the transfinite, it is indisputable that the bare conception, rather than any particular, articulated mathematical notions, was the generative aspect of the discovery, the generative aspect which informed the subsequent process of development of that initial discovery in application over subsequent decades. It is thinking about the universe in the terms of reference we have associated with the unfolding of relativistic notions of the universe over the span from Cusa (and Plato earlier) through Kepler, into Riemann et al. which was essential, relative to any articulated conceptions subsumed by that governing philosophical world-outlook.

It is the immediacy of such an outlook in judgment of matters which enables one to reduce

paradoxes to their elementary form, and to seek solutions in those terms of reference. It is bringing the analysis of economic processes to a rigorously defined paradoxical form which makes possible the attack upon analysis of such processes from such a Riemannian standpoint. That is the best elementary definition of Riemannian economics. The Riemannian philosophical world-outlook enables one to specify how an economic process must be defined, to bring forward that feature of the process which poses the question of a unique-experimental approach. Once that matter is posed in that required form, the appropriate hypothesis is implied.

A few illustrations of this point are useful.

First, it should be made easily apparent that technological progress is science, and that all science, properly so defined, is premised upon the authority of economic science as we have defined economic science here.

It is only by increasing willfully man's power to increase society's potential relative population-density, that man demonstrates a willful increase in mankind's per-capita power over the lawful ordering of the universe. Technological progress is, therefore, the only fundamental experiment upon which science can promise any claims to authority. This authority is situated not in any of the particular technological knowledge at any specific point. It is situated only in the demonstration that certain principles of discovery, applied to an existing body of knowledge, lead consistently to those kinds of transformations in knowledge which increase mankind's potential relative population-density.

In scientific work, we encounter two classes of discovery. On the one level, there are those discoveries which extend and refine the range of man's technology, without thereby superseding any generally prevailing principles of scientific knowledge in general. The methods employed to effect such ordinary scientific discoveries are governed by the assumption that the entire domain of human practice might be governed by some set of existing underlying assumptions of science in general; hypotheses constructed with such restrictions upon judgment are ordinary hypotheses. On the higher level, there is the class of hypotheses, analogous to Riemann's hypotheses of unique experiment, which order scientific revolutions, transformations in previously accepted general principles of scientific practice. These are of the class of higher hypotheses. The notion of a general ordering-principle underlying such higher hypotheses is the notion of an hypothesis of the higher hypothesis, or a principle of *necessary reason,* or Logos.

Second, there is the proof that the universe as a whole is governed by negentropy, rather than entropy.

Since unique experiment, modelled upon Riemann's cited 1859 paper, has proven that the universe is Riemannian, and since a Riemannian universe is negentropically ordered, the universe as a whole is experimentally demonstrated to be negentropically ordered. This correlates with the proof—merely underlined by recent observations of Saturn's rings, or Gauss's brilliant proof of Kepler's orbit for the asteroid belt—that visual space-time is harmonically ordered, rather than a self-contained, infinitely extended collection of particles acting upon one another at a distance.

It follows from this that the assumption that energy can be measured fundamentally in scalar units for a universe of implicitly fixed total mass, is a grave error. It follows, from Riemannian considerations, that such a mistaken assumption were adequate fallacy to prevent defining a unified field. We commit this error by adducing only the energy of the system in respect to the observed processes, and have failed to define the process in those terms of reference for observation and experiment, in which negentropy is the primary datum of observation. As we look up, and note the Keplerian, harmonic ordering of planets and moons, or the harmonic ordering of spiral galaxies (also, an implication of Kepler's discoveries), we ought to be reminded of the facts obliging us to know that the universe is negentropically ordered. Or, as we consider Sommerfeld's employment of the Kepler-Riemann notion to sort out the harmonic ordering of the subatomic spectrum, we ought to be similarly encouraged.

Any contrary view, meanwhile, leads us to such metaphysical absurdities that the universe

began some more or less calculable billions of years ago, in a "Big Bang," and is winding down, entropically, to the "Big Poof"—out of Nothing, and into Nothing. Since we know that the "Big Bang" is not a consequence of empirical knowledge of our universe, but of the application of Newtonian methods to interpretation of that evidence, and since Newtonian methods are provably absurd in respect to fundamental questions, the "Big Bang" is provably nothing but the product of an effort to extend indefinitely a Newtonian absurdity in a formal-logically consistent fashion.

The same general criticism is to be made of the Yin-Yang universe according to Hoyle, Fred Hoyle's pulsating universe.

Energy is to be understood from the standpoint of negentropy. In terms of reference of the continuous manifold, energy, as determined by negentropy, is subsumed by the higher degrees of physical-geometric organization of the universe, as subsumed by transformations from order $n$ to $n+m$.

Mankind masters the universe by technological advances in society's power which replicate such negentropy. This power is obtained by applying the hypothesis-generating powers of the human mind to discovery of the lawful ordering of nature, situating that inquiry in terms of reference of increasing man's potential relative population-density. By reason governing the development of man's productive powers of labor in this way, man manifests himself an efficient microcosm of the macrocosm, and reflects in his practice of such technological progress the generative principle governing the lawful ordering of continuing creation of the universe as a whole. Man becomes thus, implicitly, the higher form of organization within the universe through which the universe as a whole transforms itself, by transforming thus the mode in which it changes itself.

It is by viewing the relationship between advancements of science and development of the physical economy from this vantage point—the ordered "injection" of technology into the economic process, that economic science proceeds.

More narrowly and immediately, by driving the descriptive devices of input-output analysis to the point their intrinsic absurdities are the primary datum of the observation, as we indicated this approach earlier, we pose the problems of economic development to ourselves in that paradoxical form which is immediately congruent with Riemannian analysis as the indicated form of solution of this paradox.

By analyzing the problems of economy as a statement of a purely thermodynamic problem—of negentropy, and interpreting this thermodynamic problem from Riemann's vantage point, we specify the characteristic parameters of the kinds of technology required to effect economic growth. These parameters have a clear kind of significance in the domain of physics itself viewed in Riemannian terms of reference. In that fashion, we are guided to think of technological requirements for economic development and problems of breakthrough in basic physical research as mirror images of one another.

Never was this sort of problem posed to humanity in a clearer more immediate fashion than today. To provide for mankind's present and emergent needs, to increase mankind's potential relative population-density to the degree needed merely to avoid a monstrous, genocidal collapse of civilization, we must immediately proceed to break through into controlled thermonuclear energy technology, including the broad domain of applicable relativistic plasma physics associated with such a breakthrough. The application of relativistic processes of such extraordinary energy-flux-density characteristics requires a revolution in the notions of productive technologies and raw materials generally.

What we need to know is the character of the priorities we must assign in forcing through discoveries and in developing needed applications of those discoveries. To define such priorities, we must be able to adduce from study of the economic process the parameters of required kinds of changes in technologies, parameters which implicitly define the kinds of scientific breakthroughs and applications required.

Although the LaRouche-Riemann method of forecast analysis has demonstrated itself the only existing tool for effective economic practice under conditions of successive phase change in the economic process, that accomplishment is merely prelude to the more lasting accomplishment which must be next produced. We must now use Riemannian methods to accomplish what was implicit in Leibniz's founding of economic science as the science of physical economy. We must make economic analysis the mode for more or less exactly defining the priorities in kinds of fundamental breakthroughs and development of applications we must employ to order educational and research-funding policies for scientific work generally.

In connection with this, we must rid ourselves of rentier-financier forms of monetary orders and regulate the processes of currency, credit and banking as priorities of development of physical economy require.