Physical Economy Is the Basis of Human Knowledge

by Lyndon H. LaRouche, Jr.

American statesman and physical economist Lyndon LaRouche was freed from prison, where he was held a political prisoner for five years, on January 26. The following is Part 1 of a series entitled "The Science of Physical Economy as the Platonic Epistemological Basis for All Branches of Human Knowledge."

Beginning not long after 1989's economy-driven collapse of the Warsaw Pact system, gradually, those establishment thinkers who were no longer blinded by the hysterical mass-propaganda of the London- and Wall Street-centered monetarist financier factions have appeared to register publicly a fresh overview of what happened to the Soviet system at the close of the 1980s. Not only had the Warsaw Pact system disintegrated, but the collapse of the post-Yalta form of Anglo-Saxon financial and, probably, the political system, too, was not far behind. That succession of changes in economic policy introduced to the world's economy as a whole about 30 years ago, has set into motion a systemic disorder in the entire world's economy: a spiralling collapse of physical economy, a physical collapse caused by the insatiable appetites of an already vast, rapidly growing bubble of financial speculation, a systemic collapse-process comparable to a parasitical cancer feeding upon its dying victim.

Today, the only important economic policy-question confronting really intelligent thinkers in any other part of the world is: This financial system is doomed, can we put a new, healthy economic system into place in time to prevent the political disintegration of our nations which must tend to occur in the wake of the financial avalanche about to crush the world as a whole?

What confronts us thus is not one of your famous boom-bust, cyclical crises in financial markets; this is a systemic crisis, in which case, either the relevant economic policies are destroyed, or the economy is destroyed. Under these conditions, any attempt to divert the discussion of this matter by seeking to forecast the day, or even the month a final collapse might occur, would be a pathetic sort of diversionary exercise in irrelevance. As long as present, monetarist forms of "deregulation" and related "free trade" policies continue to be tolerated, it will be impossible to prevent a financial and economic collapse of entire nations. When? One should answer simply, that unless we eradicate the "free trade" and related

policies which caused this crisis, a total collapse of the system will come all too soon. Under any continuation of the policies currently defended by Wall Street and the so-called neo-conservatives, these Anglo-Saxon monetarist policies of the recent 25 years, it is absolutely assured, that soon, the entire planet will be plunged into the worst financial and economic catastrophe which modern history could recall since analogous Venetian bankers' policies produced the mid-fourteenth-century collapse of Europe.

In any case, even if last-minute policy-changes save the world from a breakdown of the physical economies, the existing world monetary and financial systems are doomed. Any economic recovery will depend upon the creation and unleashing of large-scale state-credit mechanisms which operate in freedom from an old system which will then exist only in the repose of bankruptcy reorganization.

Under such present conditions, it is more obviously urgent that we not measure the relative performance of economies by the monetary yardstick of currency prices, but by the reality of physical output and consumption of households, farms, and manufactures. If we examine the matter according to those physical standards of measurement, the world's economy, taken as a whole, has been, incontrovertibly, in a continuing, downward spiral of collapse since no later than 1971.

There is no natural cause for this economic decline of both the Anglo-American and former Soviet systems. In both cases, bad policy, not nature, is the culprit. The presently ongoing collapse of the post-Yalta economic order of the Anglo-Saxon alliance has been brought about through a quarter-century of wrong-headed choices of economic policy and science policy generally, wrong policies of virtually every government and other relevant institution of this planet. Bad policy, not nature is to blame for this. If one jumps from the roof of a two-story building and breaks one's leg, please have the decency not to file a tort claim against the law of gravity; it was the bad policies which have been defended, or tolerated up to this time by most among the putatively educated citizens of the United States and other nations, which are directly the cause for the holocaust of misery consuming this planet today.

1. Rudimentary Comparative Studies of Physical-Economic Time-Series

First, let us highlight the proof of the argument, that a collapse has been in progress continuously over the past 40 years. After that interpolation, let us proceed, with helpful side-glances toward the recently published report on my 1948–52 discoveries in the science of physical economy, to show the kind of philosophical thinking which must be understood, practiced, and taught by the leading intelligentsia of nations, if the political institutions of

those nations are not to be misled into disasters of the sort now pushing this entire planet into a prolonged New Dark Age.

Any person literate in either a branch of the physical sciences, or industrial cost accounting, could readily prove this post-1971 collapse to be an incontrovertible fact, using the relevant, available historical statistics. An opening summary of the thinking needed to construct a statistical demonstration of that fact will clear the way for presenting the central point of this report.

Since describing that computation is merely necessary background to the deeper issues of current policy-shaping, I shall outline the method of statistical construction as briefly and simply as the subject permits. To construct such measurements for the 1963–93 interval, we begin with a study of typical market-baskets of household consumption.

This includes the essentials of physical consumption, plus the two essential categories of services: health and education. The per-capita requirements for a household vary somewhat, of course. They vary according to the time in which the household is situated, and by the cultural level we are committed to achieving in practice through qualities of life-expectancy, health, rations of time allotted for education, and related development of both the household as a whole and the individual member, and so on.

What we require is a definition of a "standard household-consumption market-basket" based upon these elements. Let us ask ourselves, then: What is the kind of standard we require for comparing the case for different nations, or for the same or another nation in a different period of history? In practice, one should experiment with the changing statistics for any nation during a period of successful growth in both net domestic product and average standard of living: Examine the way in which actual household consumption varies according to both the economic-social characteristics of a household and its demographic composition. If one turns then to discussion of standard compositions of employment of a national labor-force in my textbook *So, You Wish to Learn All About Economics?,* one should recognize the way in which one should proceed to construct a usable approximation of the standard required.

For example, prior to the eighteenth and nineteenth centuries' implementation of Leibniz's proposals for an industrial revolution based upon a system of heat-powered machinery whose technology was continually advancing, the existence of any society required that more than 90% of the labor force be employed in rural occupations. In contrast, if today's technology were generally used, with farm prices at the level we term "parity," less than 2% of a labor force is required in such modes of rural employment to satisfy abundantly the total population's needs for agricultural products. This improvement in productivity depends

upon a prior and maintained supply of needed industrial goods to the farmer, and also a relevant development of elements of basic economic infrastructure which include rail transport, electrical power supplies, and generalized water management.

The solution to the problem of defining a refined standard of household market-basket first appears as we attempt to compare our approximations of market-basket standards for households with the market-basket requirements per capita of agricultural and industrial production of physical goods. One gains thus an insight into the fact of a correlation of such kind between per-capita productivity in production of goods, and per-capita consumption of the physical, health, and educational requirements of the households which, inclusively, provide production with its labor-force members.

Looking at the statistics from this standpoint, we conceptualize more easily the nature of the interdependence of productivity with the quality of per-capita and per-square-kilometer development of such forms of basic infrastructure as general transportation, water management, power supplies, sanitation, and basic urban infrastructure.

If we merely bear those kinds of analytical considerations in mind, the available U.N. and related statistics over the interval 1963–93 tell an incontrovertible story. In physical terms, over this period, the per-capita output of the total rural and urban labor force has been declining throughout the world as a whole; the fact that some regions of the world have been exceptional does not change the global picture (see **Figure 1**).

We can see, in this way, that the trend downward begins during the 1960s, with more and more suppression of the industrial development of nations in the southern hemisphere of this planet. The trend begins as an apparent slowing of the rate of economic growth, and then, during 1971–74, becomes an absolute decline in the so-called industrialized sector as a whole, in addition to the so-called developing sector. Even those national economies which do not go into absolute decline during the period 1971–81, are visibly affected by trends in the world around them. The overall condition of this planet during the 1980s is an uninterrupted, generally accelerating downward trend.

Let me speak of the relevant official and popular opinion in the United States. Similar observations are to be made on the subject of opinion in other countries. There are four principal reasons most people in the U.S.A. have been duped into accepting false 1980s or more recent reports of "economic recovery," or even "prosperity."

First, there is the credulity of the majority of the U.S. population today.

The influential Fabian Walter Lippmann proposed a Goebbels-like mass-media brainwashing of Americans in his famous book on public opinion; to similar effect and purpose,

David Riesman made infamous the pathetic type of twentieth-century North American which he named an "other-directed" personality. Hannah Arendt, the one-time lover of the Nazi regime's chief Nietzschean philosopher Martin Heidegger, proposed that anyone who did not fit the model of this brainwashed, "politically correct," other-directed type should be ostracized as what she termed an "authoritarian personality." The average American, including the shallow-minded, highly suggestible "populist type," has come to accept whatever themes are currently implicit in addictive forms of mass-spectator sports, Hollywood entertainment, popular quasi-music, and the mass news media, as axiomatically the basis for constructing one's own "socially acceptable" forms of participation in "politically correct" forms of mass opinion.

Repeat often enough, Goebbels-style, that the basis of economy is "free competition in the market-place," that economy is ruled by a mythical "law of supply and demand," or the popularized lie that the U.S. Constitution was based upon John Locke, or the lie that the young U.S. federal economy was founded upon the ideas of Adam Smith, and the "other-directed" type of American will regurgitate that nonsense ritually as if he believed that were the holiest of eternal verities.

An included factor, the collapse of the quality of U.S. education, especially under the influence of Fabians and Kindred types, such as John Dewey and his followers, had already damaged seriously the cognitive development of nearly all Americans even before the application of such New Age concoctions as the radical positivist "New Math" and other destructive innovations of the recent three decades.

The development of the cognitive capabilities of the young to the degree needed for a pro-scientific, rigorous quality of independent judgment, usually appears only through the form of education rooted in the Greek and later Classics, and emphasizing for instruction in mathematics, biology, and physics the student's re-experiencing the original act of each important axiomatic-revolutionary discovery of his or her forebears. The misguided substitution of the textbook, and of generally accepted algebraic formalisms as a replacement for wrestling with Classical and other original sources has produced predominantly a type of graduate, even among those burdened with terminal scientific degrees, which Friedrich Schiller named contemptuously *Brotgelehrten* (bread scholars).

The result of substituting behaviorist modes of "learning" for development of independent cognitive powers of rigorous original discovery, has produced; among typical academic and other strata, a virtually total lack of capacity for independent thinking, especially respecting axiomatic qualities of assumption. This moral defect of judgment is often seen in its most extreme form in precisely those moments that an American asserts most loudly his "independent judgment" on a matter. Thus, do such foolish conceits of disordered public

opinion render the politically correct true believer the better suited to be a victim of the silly opinions he or she is induced thus to adopt.

Second, current statistical practice of national-income accounting by governmental agencies, and by other widely influential reporting agencies, disallows any efforts at a rational distinction between a physically useless expansion of nominal income and useful production and consumption. For example, if prostitution and drug-trafficking were legalized, over $500 billion would be added to officially reported Gross National Product (GNP), without any actual increase in anything but the credulity of the suggestible cohorts within the population (see **Figure 2**). Thus, a vast, parasitical burgeoning of notional values of financial gains in various purely speculative forms is counted as national income on the same basis as production of food, clothing, education, medical care, bridges, tunnels, railways, and industrial workplaces. As long as the nominal income from parasitical sources such as financial speculation is nominally greater in price than the margin of collapse of infrastructure, producers and households' goods, the official idiot-savants of the statistical and mass media communities will continue to insist, with a fanatic's menacing gleam in their eyes, that our national economy is either at the brink of recovery, or even being "overheated by an excessive rate of growth"!

Third, over all of the past quarter-century, but especially the recent decade, the official statisticians have lied more and more shamelessly, on almost every subject, most of the time. In addition, they have refused to deduct from gross national incomes the cost represented by the failure to repair and maintain essential elements of basic economic infrastructure, such as railway systems, highways, bridges, water management systems, power stations and grids, and so on (see **Table 1**). In the United States, many trillions of dollars of never-existing "value added" have been added routinely, cumulatively, to construct false, greatly inflated reports of annual U.S. GNP.

Fourth, since the Ford Foundation's fraudulent, but influential *Triple Revolution* report of 1964, that doctrine of "post-industrial" utopianism has produced a malignant growth in the percentile of the total U.S. labor force which is either unemployed, about 17% or more today, or is employed in forms of "services" which add virtually nothing, or even less than nothing to either the net physical product-output or productivity of the U.S. economy (see **Figure 3**). Although most of the non-productive service occupations, as in the "fast food" distributorships, are paid wages way below the level required to support a household decently, the aggregate inflationary cost of these "services" is monstrous. The worst, the most savagely parasitical, are legalized gambling, recreational (illegal) drug-trafficking, and financial services.

It ought to be plain enough, as a matter of relatively simple calculations, that such a replacement of productive employment by services is intrinsically a form of inflationary rot which must destroy the nation in the end, if the policy is not reversed. Yet, babbling so-called "experts," whether as "talking heads" on the television screen, or elsewhere, have induced a majority of Americans to "repeat after me: The modern form of economy is a post-industrial, services economy." The Wall Street emperor has no clothes!—but, the credulous crowd of onlookers to that paraded nakedness shouts its admiration of the marvelous fabrics and tailoring.

Credulous popular opinion aside, the scientific importance of stressing the pathological side of expanded rations of services employment is illustrated conveniently in the following way.

Up to modern times—in other words, up to about 550 years ago, even as recently as 300 years ago—over 90% of the population must labor in the rural life, simply to keep the whole society from collapse into mortal want. The margin of decrease of the required rural percentile of the labor force, which technological progress has made possible, was absorbed chiefly by a smaller but, initially, nearly proportionate increase in two categories of physical-productive employment: the building and maintaining of basic economic infrastructure and the direct production of useful physical necessities for consumption by individual households or industries. President George Washington's treasury secretary, Alexander Hamilton, accurately forecast this coordinate growth of urban industry and rural productivity in his famous official 1791 report to Congress, his outline of the anti-Adam Smith "American System of Political Economy" upon which our constitutional federal republic was founded, his *On the Subject of Manufactures*.

Also, in addition to the growth of the percentile of the labor force employed in urban production of physical goods, modern history's successive transformations in the "structure" of employment have been accompanied by an, aggregately, relatively smaller margin of employment distributed among four categorical "overhead" elements of social cost which are not explicitly, directly productive of physical out-put or goods or infrastructure: education, health care, science and technology *per se*, and administration.

In general, the change into these directions, from the old, pre-industrial, bucolic base, is associated with three correlated developments: increase in per-capita physical productivity of operatives, increasing complexity of the social division of labor, and increase of power-flux-density. Among the principal other features of these directions in structural change of labor-force composition, we have the following. The absolute increase in level of technology, combined with the rate of that increase requires an increase of the segment of employment assigned to science and technology as such. The educational requirement is increased similarly, both cumulatively and with respect to the rate of technological progress.

The educational and related culture requirements of the household members place a premium upon prolonging healthy longevity of the population, and what that implies otherwise. Justifiable increase in administrative burdens is chiefly a reflection of the growth of industry, education, scientific progress, and health requirements. Also, a continual increase in physical productivity, per capita and per square kilometer, correlates with an increase of the ratio of employment in producers' goods production to employment in households' goods production.

One point to be singled out here, is the danger of exceeding justified levels of administrative employment. The combination of unjustified burgeoning of sales and administration expenses, plus growth of redundant employment in questionable expansion of so-called "services," is an inflationary economic disorder akin to cancer in living processes, a sickness which could ultimately bring about the death of economies—as it has been slowly, but visibly killing the U.S. economy during the past 40 irrational years of continued drift into post-industrial utopianism.

Once the implications of these observations are grasped, the usefulness of the following, somewhat simplified approach to comparative statistical analysis should be intelligible.

For estimating the relative growth or collapse of a national economy, or world economy over successive years, or decades, a good rough estimate can be made in the following way.

Make all measurements in terms of per-capita, per-household, and per-square-kilometer values. Measure basic economic infrastructure, agriculture, mining, industry (manufacturing, construction other than infrastructure), and employment in education, science and technology as such, and healthcare. Measure consumption and production, coherently, as follows: market-baskets of household consumption (physical plus health, education), per household, per square kilometer and per capita; market-baskets of producers' goods, consumed and produced, per capita, per square kilometer and per household; ratios of producers' goods to household goods turnover, per capita, per square kilometer, and per household (see **Table 2**).

In examining these statistics take special note of the following consideration. Distinguish between the productivity of labor as measured, on the one side, with respect to monetary price of direct labor employed, and, on the other side, productivity as physical economy measures it, the latter in terms of comparable physical ("market-basket") units of output. For example, in physical economy, measure the percentile of the total labor force of a nation required to sustain the essential contents of a household market-basket for all members of that labor force.

In the first, monetary case, a rough, first-approximation measurement is as follows. One subtracts from the wholesale manufacturer's price of produced goods sold, the price-cost of materials consumed by that production; this yields a difference, a gross margin, corresponding roughly to nominal (monetary) "value added by production." In the second case, we make a formally analogous rough measurement, substituting physical market-baskets of inputs and outputs of production; this defines a physical margin of "value added" per capita, per household, and per square kilometer. Let us concentrate now solely upon the physical measurement, in opposition to the monetary one.

First, refine the rough physical measurement. Let us make that physical margin of "value added" the numerator of a fraction; make the denominator the total physical investment, per capita of labor force, in household and related consumption by productive labor, and of materials and physical capital of production. This calculation yields a useful estimation of productive "return on investment," in physical, non-monetary terms. One obvious advantage of this enhanced estimation is, that it reflects more accurately the relationship between productivity at a local point of production and the productivity of the national economy's productive sector as a whole.

To render such physical output comparable with physical input, we reduce each to its labor-content. This content is reflected, in first approximation, by hours of direct productive labor consumed in production. These raw hours, for each case of an item in the market-basket list, are corrected by an adjustment-factor. This compares the households' market-basket of consumption of the actual direct labor employment in production of an item, with g standard consumption. That standard consumption is obtained by averaging total national consumption of direct labor's households with the total number of direct labor employed in the nation. This provides a mean value of consumption per capita of direct labor for the average household of direct labor. That tactic provides the indexing of the actual case required. The mean-hour of industrial-engineering type of cost-accounting is indexed for each type of production in this way.

Thus, it might appear to some Cambridge systems analyst who is thinking carelessly, or to a like-minded student of the input-output schemes of Wassily Leontief, that we are treating this as a case of apparent production of commodities by commodities consumed. In fact, we are employing such an assumption merely to refute it: The fact that when commodities are consumed by direct productive labor, apparently the commodities are modally reproducing themselves negentropically, reflects the function of labor, as distinguished from any other form of consumption of produced items. Implicitly, we are refuting directly the famous axiomatic assumption of the eighteenth-century French and Swiss Physiocrats. It is only the labor process which can impose willfully such forms of negentropic, or should we better say

"evolutionary-type" transformations of functional processes to a higher state. This is adumbration of Genesis 1:26–28 as shown by the modal form of a durably successive form of society.

By taking the ratio of the activity of the productive sector's labor-force households to the physical costs and income, per household, of the nation as a whole, a useful estimate of relative national productivity is obtained.

We may thus compare different nations, and the same nations during different periods both in terms of their respective productive sectors, and the results of relating each productive sector to the nation as a whole in this way.

1.1 The Myth of 'Cheap Labor'

This approach to estimating relative productivity of nations provides a simple, implicitly conclusive exposure of the fraud in British economist David Ricardo's celebrated myth of a "comparative advantage" allegedly inhering in "cheap labor." Our view of today's widespread "free trade" delusion affords us a better approximation of the actual process of this past 20-odd years of the worldwide economic-collapse spiral.

On behalf of the proposition that a U.S. corporation, for example, should situate a new manufacturing plant in some underdeveloped nation noted for its favorable tax climate and supply of cheap labor, today's Wall Street financial houses console the North Americans who will lose their employment in this way: "If you wish to stop your jobs from flying away to cheap-labor markets, you have only to lower your wage-expectations to levels which are competitive with foreign competition." Similarly, in the university economics departments, the spin-doctors will assure all foolish enough to believe them, that cheaper imports from foreign sources are a boon to the U.S. consumer, and therefore a boon to the U.S. economy as a whole.

Imports are an actual boon to the U.S. economy, for example, under different circumstances than those referenced by such academic spin-doctors. If a technologically developed economy can move its culturally developed labor out of low-skilled employment into more highly productive, more technologically advanced modes of production, the total and per-capita productivity of the whole U.S. economy is increased to everyone's advantage. Thus, if we assign the less-skilled forms of market-basket item to a nation whose labor force has yet to reach generally the level of the U.S. labor force, we are benefitting both nations by optimizing the utilization of the labor force of the less-developed nation, and maximizing the productivity of the relatively more developed one.

The directly opposite result would be the case if we moved chunks of the employed U.S. labor force either into unemployment status, or into less-skilled, lower-paid employment, or out of production of physical goods into services employment. In the former case, the U.S. economy would have the added production and income to be a market for the product of the developing nation; in the latter case, the purchasing power of U.S. households would be reduced, and, therefore, also the U.S. market as a whole.

In that reality which appears to exist only outside the mouths of free-trade ideologues, the effect of the "runaway shop," under today's post-industrial policies, is to shrink the percentile of the total U.S. labor force employed in producing useful physical goods. The displaced labor from these runaway industrial enterprises becomes either unemployed or employed in relatively marginal, even essentially almost useless occupations. The industrial purchases from U.S. suppliers, especially medium and smaller producers and maintenance services, collapse. The tax revenue base of the affected community is collapsed more or less severely. The "downsizing" of the per-capita scale of the U.S. agro-industrial producers' base, and the "downsizing" of the percentile of the total U.S. labor force employed in production of physical goods, signifies a collapsing of the U.S. economy's earned real purchasing power, and a collapsing of the U.S. economy below a physical break-even point (see **Figure 4**).

In consequence of this and other policies born of the same deranged, if media-popularized mind-set, we have the following picture of the U.S. economy itself.

Over the interval 1965–70, the rate of growth of the U.S. physical economy slowed toward a net zero growth for the economy as a whole (in terms of rate of increase of physical output per capita, per household, per square kilometer). The slowdown was triggered by the "downsizing" of the highly stimulative, "post-Sputnik" aerospace "crash program" and investment tax-credit programs upon which the post-1960 economic recovery from the 1957–60 recession had depended almost entirely. This "downsizing" was worsened by the combined influence of such "post-modernist" lunacies as Robert Theobald's *Triple Revolution*, Robert S. McNamara's lunatic "systems analysis," Herbert Marcuse's ultra-leftism, and sundry "post-industrial" utopianisms. The international effects of these and similar "New Age" policies led to Prime Minister Harold Wilson's November 1967 collapse of British sterling, and the ensuing first round of successive collapses of the U.S. dollar erupting visibly during February and early March 1968.

During 1970–71, the U.S. net expenditure on basic economic infrastructure (additions and replacements versus wear, tear, and obsolescence) entered a phase of negative growth which has not only continued, but accelerated downward to the present time. The resulting repair bill for water-management systems, transportation systems, power systems, general sanitation, and urban infrastructure generally now totals many trillions of dollars at

constant-dollar prices. The combined Chrysler and Penn Central crises of spring 1970 signalled the next round of collapse of the U.S. dollar, leading to the collapse of the Bretton Woods gold reserve system during March through August 15, 1971.

The further downsizing of the U.S. productive sector by the Nixon administration's successive, so-called "Phase I" and "Phase II," was followed, during 1973 and 1974, by the shockingly depressive effects of Secretary of State Henry A. Kissinger's arranging the OPEC oil-price hoax on behalf of the London-based oil multis, then known popularly as the "Seven Sisters." This a direction in U.S. domestic and foreign economic and related policy and trends was accelerated by adoption of those sets of policies sponsored by David Rockefeller's Trilateral Commission and the New York Council on Foreign Relations' "Project 1980s." These included the "shock therapy" measures introduced by President Carter's newly appointed Federal Reserve chairman, Paul A. Volcker, in October 1979. Volcker's high-interest rate hoax, which had been put forward first in the CFR "Project 1980s," and backed by the Trilateral lobbyists, had an immediately catastrophic effect upon the U.S. economy. Thus, over the course of the 1970s as a whole, the U.S. economy collapsed in all productive sectors excepting a few electronic and related spin-offs of the Kennedy aerospace program; the rate of contraction of the U.S. and world economy, over the course of the 1980s was transformed into a virtually terminal collapse-process by the Anglo-American policies of 1985–92, especially those introduced by Margaret Thatcher and George Bush.

"Downsizing" has become an irrationalist, fanatical cult. This popular myth currently includes the delusion, that one could collapse 85% of this planet into plague-ridden barbarism, during a time as long as a century, and yet keep a residual 15% of this planet relatively secure and stable. This delusion is closely related to the false axiomatic assumptions underlying the popularized fallacy known as "comparative advantage" of "low taxes and cheap labor."

The ability to continue to produce physical goods of ever-better quality ever-more cheaply is an excellent, indispensable policy. This realization of this praiseworthy goal demands a constant emphasis upon investment in improved technologies generated by vigorous scientific progress in such directions as beyond the outer limits of present-day astrophysics and microphysics. This improvement in conditions of life also depends upon essential considerations of basic economic infrastructure; this requirement cannot be compromised without disastrous effects upon the economy.

In transport, for example: the promptness and cheapness of inbound and outbound passengers and freight. Availability of reliable water supplies (see **Table 3**). Availability of adequate power supplies of the required quality. Local communications. Sanitation. Education and healthcare systems. Apart from that class of correlatives, a potential level of

per-capita physical productivity is principally a function of health and cultural development of the labor force.

In all cases, these qualities of the local situation for investment in production must be produced chiefly by, and at the cost of the society in which the investment is made. Either that society is able (and willing) to reproduce these required "environmental" preconditions, or it is politically unwilling to do so. If it is willing to do so, then that society as a whole must be repaid amounts sufficient to regenerate those improvements. Even were it willing, it might be incapable of doing so. If a large number of investors in a country pay so cheaply for their employed labor, and so forth, that the country is strained beyond the limit of its means to continue to reproduce these required "environmental" conditions, then a spiral of collapse is introduced by cheap-labor, low-tax fostering of such investments.

Otherwise, if the so-called "cheap labor region" in which the investment is made is paid generally sufficient tax revenues and wage-levels to enable it those necessary preconditions, then the labor in that nation will no longer be truly "cheap." As the legacy of eighteenth-century Dutch and British colonialism, and nineteenth-century British imperialism show throughout the relevant southerly regions of this planet, the "comparative advantage" of cheap slave or paid colonial labor lies entirely in the power of the colonialist to conduct a mass-murderous, Nazi occupation-like type of asset-stripping of the population and natural resources of the subjugated region.

Thus, it is a matter of economic principle, that the true cost of producing anything, including the public sector's contributions of general, national; infrastructure, must be seen as the physical cost of reproducing and improving all of those natural and developed resources upon which the continued local production, even by a localized investment, of an equal or greater quantity and quality depends. Among the included actually incurred costs of an investment: each local investment in production must contribute its share to meeting the reproduction costs of the total population from whose households the labor employed is drawn.

'Asset-Stripping'

Since the mid-1960s turn, the U.S. financier interest has adapted to that induced physical collapse of the U.S. economy which its post-industrial policy has induced, responding to this collapse with an increasing emphasis upon sundry forms of asset-stripping. We should understand "asset-stripping" as various ways in which to make a financial profit by acquiring physical or monetary assets for resale by purchasing them at a price way below the replacement price for the physical assets underlying the notional financial values assigned to them. "Junk bond" dealings are one example of such looting. It will probably be helpful to

many readers to present the following, additional example of commonplace "asset-stripping" practices.

In a typical case, a banker linked to the organized crime circles formerly run top-down by Meyer Lansky assists a credulous client's investment today, but with the intent to loot him at some point down the line—make the calf happy with today's fattening, that he might become a richer feast the day he is driven into the asset-stripping slaughterhouse. One day, often years later, after the investment has been "fattened up" by aid of what seemed to have been generously supplied masses of credit, one of the creditors, not the original banker, mysteriously calls in a loan. Other things happen. The client is thrown into bankruptcy. His former patron, the banker, with an interest in the enterprise all along, buys out the other creditors by taking the assets at one or two dimes' worth for each dollar of replacement cost of those assets, and readily disposes of the assets so acquired for three or more dimes, at a 50% or greater profit in the relatively short term. In typical real instances of such widespread practices, this buyout of the bankrupted assets occurs by looting the original investor, the bank depositors of relevant banks, and sundry other creditors.

That and analogous forms of monetarist "downsizing" within an existing local, national, or world economy, generates a relatively substantial, if local rate of return, substantial relative to the notional value of base being shrunken physically by these means. One way of accomplishing this result, is to send a "runaway shop" into a cheap-labor market, to loot both the market and the basis of that national economy out of which the "runaway shop" has been wrenched. The already-referenced "junk bonds" are the same species of asset-stripping rip-off; so are "derivatives." The London and Wall Street private bankers do not invest in cheap labor for the purpose of obtaining wealth from production; the only significant source of wealth from such operations is the wealth taken from a domain outside the production process itself, the looting of the host economy by the levers of exchange manipulations and of tax- and price-concessions. In short, this is accomplished through an asset-stripping operation, in which the production side serves only as a lever.

Another form of asset-stripping, is arbitrarily lowering the birth rate. The ability to maintain the whole economy on the same scale requires a reproduction of the labor force in that or an increased number of surviving post-adolescents of a suitable quality of cognitive development and health. For example, by eliminating new births altogether, or virtually so, one could lower the level of income required, per capita, to reduce the number of mouths to be fed sufficiently to reach temporarily an otherwise impossible level of market basket enjoyed by the survivors of this population-collapse spiral: Labor-force members from households without dependent children are much cheaper to employ, since they have fewer mouths to feed per member of the labor force (see **Figure 5**).

Similarly, by putting health-caps upon care for persons whose age is above 55 years, one could eliminate, Hitler-style, most of the older strata of the total population; this would lower the income required by the survivors, per capita, to maintain the current standard of living for the survivors. The significance is, that to have a population which could afford to provide the existing middle-range U.S. standard of income per capita, a population which describes an infant-based demographic pyramid with a modal life expectancy of up to 85 or more years, is required.

It was inevitable, that once the neo-malthusian fanatics had succeeded in their goals of dropping the birth-rate and introducing a "post-industrial" utopia, the Orwellian goal of killing off large fractions of persons who reach the age of retirement must be seen by the malthusians as the economically required next step. Reducing the birth-rate means reducing the economic basis for sustaining persons in retirement age-ranges. All "life-boat economics" of this sort, fairly called "Hitler-style economic policies," have an analogous effect.

The use of asset-stripping forms of "privatization" of public education, combined with outcome-based education's (OBE) emphasis on eliminating compulsory public education of cognitive potentials, is also an "asset-stripping" form of forerunner for Hitler-like healthcare and other population-control measures tomorrow. Without a form of obligatory public education which emphasizes European civilization's classics and a geometrical approach to development of the cognitive potentials, the result converges upon a deranged population reminiscent of fourteenth-century European flagellant mobs, a population incapable of mastering the standards of technological proficiency required by modern agriculture and industry.

None of these "lower taxes," "cheaper labor" forms of asset-stripping are truly sustainable forms of cost-control measures. They are, each and all, essentially one-time modes of deriving income from mass-murderous forms of asset-stripping of the accumulated physical and cultural wealth of our collapsing society.

Thus, in order to discover the approximate degree of post-1963 declines, during, respectively, the 1960s, the 1970s, the 1980s, and the early 1990s, one must consider first the apparent levels of output per capita, per household, and per square kilometer. One must deduct from this apparent output the amount of current physical wealth attributable to the various guises of asset-stripping.

The additional considerations to be applied to the statistics are presented in my referenced 1984 textbook. That taken into account, you have before you the outlines of construction for an incontrovertible statistical proof: Since 1963, the world economy has been declining in

net production of wealth per capita, per household, and per square kilometer. "This rate of decline has itself been increasing over that period, most emphatically the past ten years.

2.0 Smith, Ricardo, and Marx: British Imperialism's Zero-Growth Economists

During 1983–85, I forecast repeatedly, both in private and widely distributed published statements, an approximately 1988 collapse of the Warsaw Pact economic system, should Moscow refuse to reject the form of cooperation which President Reagan had proposed in his initial presentations of a Strategic Defense Initiative (SDI) offer delivered publicly on March 23, 1983. I also warned, similarly, from 1983 onwards, that under Anglo-American policies in force then and now, that the western economic system was also headed toward a systemic form of collapse far worse than any mere cyclical depression. During the October 1988 U.S. presidential campaign, I warned a nationwide U.S. television audience of such things as the impending threat of a generalized Balkan war launched by certain Serbia factions, and also forecast an impending, early reunification of Germany under conditions of an imminent "East bloc" chain-reaction collapse. The collapse of the former Soviet system erupted in 1989; the intrinsically bankrupt Anglo-American financial system is now wobbling at the edge of a precipice.

The collapse of both systems was set into motion by policies introduced globally chiefly since the November 1963 assassination of President John F. Kennedy. The common feature of this past 20-odd years collapse of both of the planet's dominant economic systems, the Anglo-American and the Soviet, is that, in both cases, the collapse was shaped chiefly by common defects of policy-shaping thinking. These defects are rooted axiomatically in the British East India Company's Haileybury school of Adam Smith, Jeremy Bentham, David Ricardo, *et al.*

To understand why and how the world's economy entered the past 30 years collapse-spiral, one must recognize that this collapse has been caused solely by the influence of those ideas of zero-growth economy which were embedded axiomatically in the thinking of Adam Smith and Karl Marx, and, more recently, in the "systems analysis" introduced to post-1938 economics by radical positivist John Von Neumann. One also must recognize that, contrary to popular opinion, economist Karl Marx was a follower of this British school in every relevant sense, not merely an admirer of what he so often alleged to be the unchallenged scientific superiority of that Smith-Ricardo school. It is also a relevant fact that, virtually all of his adult life, through 1871, Marx was a controlled asset of two of the principal control agents of Lord Palmerston's foreign-intelligence service: London resident Giuseppe Mazzini and the British "Museum's" chief controller of Marx's education in economics, David Urquhart.

For the purposes of this report, we are interested only in a narrower aspect of Palmerston's control over Marx.

Although his work on economics is usually associated with the notion of "surplus value," in every feature of the formal argument throughout the three volumes of his Capital, he is, mathematically, a zero-growth economist. On this point, there is no axiomatic difference between Marx and those whom he repeatedly acknowledged as his teachers, notably Smith and Ricardo. We stress that, as some postwar Cambridge University economists around Joan Robinson and Nicholas Kaldor have indicated, the formal side of Marx's Capital is readily restated as a relatively more sophisticated version of Von Neumann's zero-growth "systems analysis," that is, as a system of linear inequalities.

Kaldor's Cambridge Systems Analysis group, working closely with the malthusian Zuckerman- Alexander King Club of Rome, plainly influenced the direction of Soviet economic policy-thinking during the 1970s and early 1980s. That influence, exerted through such channels as Lord Solly Zuckerman and Dzherman Gvishiani's International Institute for Applied Systems Analysis in Laxenburg, Austria, did not cause the Soviet economic collapse; nonetheless, to those of us who observed this influence during that time, IIASA's conduiting of British systems-analysis influences into Moscow through that and other channels certainly blinded many relevant Soviet figures to the true causes of the catastrophe then in the making.

On the Anglo-American side of the collapse, the connection to Adam Smith is simple and direct. Radical versions of Smith's dogma are embodied axiomatically in the policy-thinking which is bringing the Anglo-American financial system to an early systemic collapse.

To understand such specific connection of bad economic theory to systemic collapse, we now treat in succession two successive, interrelated points. The first of these is the way in which the underlying assumptions of British economics dogma, since the eighteenth century, became rooted in today's policies of most governments and universities throughout the world. Secondly, we must examine rigorously the axiomatic connection between certain classes of ideas and material effects of those ideas in economic practice. The crucial economic implications of modern systems analysis, including the manner in which this radical version of Smith, Ricardo, Marx *et al.* has shaped the presently ongoing global economic collapse, can be understood only from that twofold standpoint.

In both of those facets of this subject-matter, the most crucial feature of this is the fact that the formal side of the economics teachings influencing both western and Soviet policy-shaping was derived from a doctrine whose formalities tolerate no economic policies which are not consistent with a zero-growth result.

Review briefly the definition of axiomatics. Later, we shall identify how the unscientific axiomatic assumptions of the British East India Company's Haileybury school became generally accepted in ruling twentieth-century academic institutions around the world.

2.1 Axiomatics, Briefly

Let us be certain that we understand one another when we use the term "axiomatics." Stated most simply, we mean what the classic text in Euclidean geometry defines "axiom" to signify in practice. Unfortunately, there are many university science graduates today who, as victims of the so-called "New Math" curriculum introduced 30 years ago, were denied a competent grounding in geometry. Those who did receive such a grounding will please kindly bear with us as the meaning of the term is explained to those who did not.

Fairly said: In its classical usage, "axiom" signifies an assertion which is adopted without proof, adopted on the authority of the unproven assumption that any contrary opinion must be absurd (whether that assumption is relatively valid or false). For example, a "point" in taught Euclidean geometry is the smallest conceivable image in sense-perception, and a "straight line" is imagined to be, similarly, the shortest distance between two points.

Once these, and other axioms have been adopted as building-blocks for that species of geometrical thinking, no proposition (theorem) adopted must be inconsistent with any among the axioms. Thus, once we adopt any choices of axioms and postulates as a fixed set of underlying assumptions for any formal system, not only will every proposition generated within that system be consistent with each and all of those assumptions, but, each and every proposition which could ever exist within that system is implicitly stated in advance. This principle of formal systems, including all formal systems of mathematics, is sometimes known as the "hereditary principle" of a formal logic such as that of Russell and Whitehead's *Principia Mathematica*.

Since the formal aspect of the economic systems of Adam Smith, Karl Marx, and John Von Neumann each and all claimed to be logically consistent formal systems, this rule, the so-called "hereditary principle," applies to each and all of them. This brings into play a second formal principle of all logical systems, the so-called principle of "types." By treating each of these economic systems as sub-types of a common type, we are able to identify the cause of the presently ongoing, worldwide economic collapse in a simple and direct way.

For our purposes here, the following definition of that principle of types will be sufficient.

Once we show that each and all theorems possible within any logically consistent formal system are all embodied implicitly in a single "hereditary principle," we can replace a listing of such theorems by simply stating that hereditary principle. To construct such a statement,

we must present the set of interdependent axioms as a principle for generating, in some ordered or other succession, each and every theorem implicitly possible within that succession.

This leads us to an important, fundamental discovery first elaborated by Georg Cantor. This discovery was echoed by a twentieth-century mathematician, Kurt Gödel. Gödel, by reconstructing a crucial feature of Cantor's proof, discredited the most fundamental mathematical axioms of not only Bertrand Russell, but also of the putative father of modern economic systems analysis, John Von Neumann. Leave the related Cantor topics of non-denumerable sequences and power sets untreated here today; the point relevant to our treatment of Smith, Marx, and Von Neumann, here, is fairly summed up as follows.

As Plato demonstrated this famous ontological paradox by his Parmenides dialogue: that unifying conception of change which, as a generating principle, subsumes and thus bounds all of the members of a collection cannot be itself a member of that collection. This was demonstrated in a fresh way by Cantor, a demonstration which Cantor situated explicitly in terms of Plato's work, and which Cantor developed as a revolution respecting both the formal and ontological features of all possible mathematical thinking. Thus, if we state the "hereditary principle" of any formal system, such as today's generally accepted university classroom mathematics, in its proper form as a generating principle, that statement lies outside the formal system of elements which it defines implicitly. That fact lies outside the reach of comprehension by today's generally accepted mathematical thinking; but that principle is nonetheless intelligible, knowable.

The history of mathematics itself illustrates this point.

The kind of mathematics which may be derived from the kind of set of axioms and postulates presented as Euclidean geometry, yields a form of mathematics called "algebra," or "algebraic systems." That is the kind of mathematics we associate with René Descartes or Isaac Newton. Over the interval 1440–1697, a higher form of non-algebraic mathematics was established, presented in this form at the latter date chiefly by Gottfried Leibniz and Jean Bernoulli. The higher form of non-algebraic mathematics came to be known as the domain of transcendental functions. The Euclidean axioms of point and line were discarded as axioms, and replaced by isoperimetric, or circular action, also known as a principle of "universal least action." The establishment of non-algebraic mathematics as superior to algebraic forms, was demonstrated by the astonishingly accurate, 1670s measurement of the speed of light by Ole Roemer, and by the successive application of this measurement to principles of refraction by Christiaan Huygens, Leibniz, and Jean Bernoulli.

Although Leibniz and his friends discredited the axiomatics of algebraic thinking, they took away nothing of importance to science. All of the valid features of algebra are understood from the standpoint of non-algebraic mathematics, but free of the fallacies of algebraic thinking. It is shown that non-algebraic mathematics bounds algebra externally, but that, true to the paradox of Plato's *Parmenides*, the truth of non-algebraic mathematics cannot be derived by construction from a formal algebra. In the language of Cantor, algebraic and non-algebraic mathematical formalisms are two distinct species of "hereditary principle," or, distinct *types*, of which all valid propositions in algebra belong to a sub-type under non-algebraic functions. Similarly, Cantor showed the existence of a third, higher type of mathematics, beyond denumerable arrays, which is a higher type than any variety of today's generally accepted classroom mathematics.

The notion of (transfinite) axiomatic types applies to the problem under investigation here. The systems represented by the mathematically representable features of the political economy of Adam Smith, David Ricardo, Karl Marx, and John Stuart Mill belong to a common, Cantorian type of linear schema which is characteristically entropic, as, notably, Ludwig Boltzmann defines entropy in mechanistic models of a gas system, or any analogous system. The same is true of the systems analysis of John Von Neumann.

The fact that Boltzmann's model is axiomatically entropic leads directly to the following paradox. If the universe as a whole were subject to a universal law of entropy, as Boltzmann's mechanistic model implies, then Boltzmann himself could never have come into existence to construct his theory. Thus, if Boltzmann's theory is valid, then both Boltzmann and his theory never existed.

A scholarly defender of Boltzmann's work would raise an objection to our use of that paradox which is more or less the same point made by Boltzmann himself. That objection would be, that Boltzmann himself showed that non-entropic phenomena might conceivably exist locally within a universe which is overall entropic.

The rebuttal to this objection is, summarily, that such a defense of Boltzmann depends absolutely upon Boltzmann's own reliance upon choosing an incompetent definition of "negative entropy (negentropy)." For Boltzmann to have come into existence, he must be a living process which is capable of progressive, and efficient intellectual discoveries analogous in form to an evolutionary model of living processes as a whole, and also analogous to such inorganic forms of evolutionary self-transformation of a process as the generative principle, or type represented by the developed form of the Mendeleyev Periodic Table of elements and isotopes. As an existing person, Boltzmann, despite his theories, did conform to such an evolutionary model. However, these evolutionary "models," including Boltzmann himself,

are not represented by the way in which the purely mechanistic notion of "negative entropy" is defined mathematically by Boltzmann's theorem.

The claim by Norbert Wiener, for example, that Boltzmann's mechanistic model is a model of a principle of living processes, for example, is a plain chicanery. By the time Wiener wrote his *Cybernetics*, there was a well-established, rigorous distinction between the two types of systems, entropic and not-entropic; the formal history of this distinction began with Plato's treatment of the implications of the regular solids' unique construction. In modern science, Plato's argument is developed further by Luca Pacioli, Leonardo da Vinci, and is a central feature of the work of Johannes Kepler. The work of Plato, da Vinci, and Kepler is re-grounded on the basis of Leibniz's *analysis situs* and important later work in this direction by Gauss, *et al.*; the refinement of Mendeleyev's Periodic Table by earlier twentieth-century work, up through the 1930s, in nuclear radiation, fusion and fission, made clear what we ought to signify empirically and mathematically by our obligation to make a strict formal distinction between living and entropic processes. The attachment of the word "negative entropy (negentropy)," as a simple time-reversal of statistical entropy, to the non-entropic features of living processes was therefore childish wordplay; and Wiener's application of the Boltzmann statistical theorem to define a common principle of human communication and living processes a patent sophistry, a hoax.

In physical economy, for example, negative entropy is properly represented in the following way.

The total consumption of combined infrastructural, producers and households' market-baskets of essential physical goods corresponds to a magnitude which modern practice commonly terms "energy of the system." The desired increase of the total output of production over the "energy of the system" previously embodied in the productive process, corresponds functionally to the relative "free energy" of that society as a process. The ratio of this "free energy" to that "energy of the system," is a correlative of the productivity of that society considered as a whole. Follow this several steps further.

These magnitudes are considered in totality, but they are also considered functionally per capita, per household, per square kilometer, and per square kilometer per capita. In the successful cases, the increase in productivity lessens the per-capita amount of productive effort required to satisfy the maintenance of the required level of the energy of the system per capita. However, there are two other outstanding changes which are included among those required to sustain this rise in the ratio of free energy to energy of the system. As measured in physical, but not labor-time terms, the energy of the system per capita must increase Similarly, the ratio of total infrastructure goods plus producers' goods, to households' goods, must also increase, although the absolute, physical magnitude of the content of the

household's per-capita market-basket must increase. The satisfaction of those preconditions provides a model of what "negative entropy" must signify if we are to attribute that term any degree of congruence with the distinctively anti-entropic characteristics of living processes. This model illustrates the required alternative definition of "negative entropy" if that term is intended to reference the distinguishing characteristic of any process which would have permitted Boltzmann himself to have come into existence.

This is also the model which an economic process must satisfy to generate a genuine margin of what Marx termed "surplus value," of profit to humanity as a whole. In the case of Adam Smith, David Ricardo Karl Marx, John Stuart Mill, William Jevons, and John Von Neumann, the systematic formalities of their respective arguments all share the same axiomatic blunder central to both Boltzmann's and Wiener's mistaken mathematical definition of "negative entropy." They are each and all intrinsically zero-growth models, which, as policy-guides, would ensure axiomatically an entropic collapse of any economy foolish enough to tolerate them.

Smith versus the Physiocrats

We are now situated to examine the way in which the zero-growth axioms were embedded in the work of Smith, Marx, Von Neumann, *et al.* Briefly, then, as follows.

The science of political economy was developed originally by Gottfried Leibniz over the interval 1672–1716. The Physiocrats, and Smith, Marx, Mill, and Von Neumann after them were all adversaries of Leibniz in science generally, and in the field of political economy in particular. As economists, Smith, Marx, Mill, and Von Neumann were all philosophical adversaries of Leibniz from the standpoint of John Locke; Locke's model of society is key to understanding the common axiomatic fallacies of their economic systems.

The outstanding features of Leibniz's discoveries in physical economy included, first, his development of the notion of heat-powered machinery, and, second, his notion of technology. The first bears upon the increase of the average productive powers of labor of society as a whole through the use of heat-powered machinery. The second involves that increase in productive powers of labor which follow introduction of a principle of design of experimental apparatus of scientific discovery to tools, product-design, and machinery of production, all to such included effect that the per-capita physical productivity of society were increased by this means even without an increase in the throughput of heat-power per capita.

An alliance of certain aristocratic and financial-oligarchical forces mobilized to eradicate the influence of Leibniz's science of physical economy. The most important of these, until about 1783, were the so-called Physiocrats. Later, beginning 1763, during the rising political power

in Britain, William Petty, the Second Earl of Shelburne, adopted Adam Smith as an agent of the opium-smuggling and slave-trading British East India Company, assigning Smith to study the work of the French and Swiss Physiocrats, to design a scheme for destroying the economies of both France and the English-speaking colonies in North America. Smith's apology for the British East India Company's morally objectionable practices, *The Wealth of Nations*, appeared as a Shelburne-backed anti-American tract in 1776. Smith plagiarized significantly the written work of leading French Physiocrats, such as Turgot, but also included the added, pernicious dogma, intended to destroy the economies of France and English-speaking North America, "free trade." Smith, Ricardo, Marx, Mill, Von Neumann, *et al.*, are each and all direct outgrowths of the John Locke axiomatic model of political economy proffered by the British East India Company's Adam Smith.

In contrast, the U.S. Declaration of Independence was based upon Leibniz's "pursuit of happiness," in opposition to Locke's "pursuit of property." Similarly, what became known worldwide as the anti-British American System of Political Economy was set into motion under President George Washington through U.S. Treasury Secretary Alexander Hamilton's Leibnizian *On the Subject of Manufactures*, and the thorough complementary credit and national-banking policies set forth in Hamilton's reports to the U.S. Congress on credit and a national bank. The Leibnizian system of political economy, as the form of the future U.S. economy's success was described prophetically by Hamilton then, did correspond to a truly negentropic model, contrary to the entropic schemes of Smith, Marx, Von Neumann, and Norbert Wiener.

Of all of these anti-Leibniz economic dogmas, only the Physiocrats allowed a true profit to society as a whole, and that in a most eerie form. For Smith, Ricardo, Marx, Mill, and Von Neumann, profit is something gained by one person out of the pocket of another, as trading profit, as usury, or some outright speculative swindle such as today's "junk bonds." In Von Neumann's language, for them, as for today's malthusians, economy is a giant, all-seasons gambling hall, an "n-person, zero-sum game." By contrast, the Physiocrats argued that all net growth of the wealth of society per capita is generated solely as the "bounty of nature," not man's productive labor. Implicitly, these French rural oligarchs were pagan worshippers of the Delphi Apollo cult's earth-mother and whore goddess, Gaia. The Physiocrats' favorite prostitute, Gaia, produced all gain: in wealth; labor were merely as cattle grazing in Gaia's, field, munching upon Gaia's bounty. The landlord, by owning a piece of land, had the only legitimate title to Gaia's bounty, like the man who had rented the pleasure to an hour of Gaia's services as a prostitute.

The human species is known to have lived on this planet for no less than about 2 million years. It appears, that about that time and later, our species had a planetary potential

population-density of less than 10 million individual persons, about the potential of a creature resembling the baboon in every respect but man's inferior strength and fighting capacity. Had mankind been merely an animal, mankind today would still live in no more than those numbers and with approximately the same table manners. The characteristic of those changes in potential population-density which have brought us to this time is an increase in both standard of living and productivity expressed in both per-capita and per-square-kilometer terms. This Cantorian type of increase in potential population-density is rooted in those mental capacities of the individual human person which permit mankind to generate and to assimilate efficiently those axiomatic-revolutionary discoveries in science and fine arts through which man's per-capita power over nature is increased.

In respect to any formal system, such as generally accepted classroom mathematics, an axiomatic-revolutionary discovery appears as an absolute mathematical discontinuity.[*] Animal and human behavior must be contrasted axiomatically in these terms of reference.

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[*] Cut one line with another. If we make the second of those lines sufficiently thin, can it become the case that the length of the first line coinciding with the second will be a point on the first line for which there is no denumerable determination of exact position? "Yes," says Cantor's demonstration. This issue was already featured in such locations as Bernhard Riemann's 1854 habilitation dissertation; the model of the problem was introduced by Richard Dedekind. It was central in the work of Cantor's teacher, Karl Weierstrass. This is a true mathematical discontinuity. Asymptotic limits which are true discontinuities are therefore never existing theorems of a continuous function which they bound. For an example of this latter principle, compare B. Riemann's construction of his *On the Propagation of Plane Air Waves of Finite Magnitude*, published in 1860, in which the central point is this notion of an asymptotic limit as a singularity which is not a theorem of the function which it bounds. Similarly, true axiomatic-revolutionary discoveries are not themselves functions (theorems) of the formal (e.g., mathematical) system which is their putative point of origination. Similarly, a series of such functions, as a Cantorian type, is a quality of function which resides outside all generally accepted classroom mathematics, yet inclusively bounds the latter externally.