

The Lost Art of Management

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As of mid-August, the world's ongoing financial crisis has reached the terminal phase, at which there can be no reasonable doubt of this fact among leading circles. The U.S. economy is lurching at the brink of the worst systemic, global financial collapse which European culture has experienced during recent centuries. Today, only pathetically ignorant people, outright liars, or fearful hysterics, still deny that the early eruption of an inevitable, great, global financial collapse is already in progress.

The current economic crisis is not something which might, or will happen; it is something which is already under way. The only relevant questions are, when the already existing, hopeless bankruptcy of the system will explode into the streets, and whether this will occur as a single event, or as the cumulative effect of a chain-reaction series of crises ricocheting around the world.

The evidence of this factual state of affairs, is not only conclusive; it is also massive. For example, there is the decades-long decline in the share of total U.S. national income represented by the lower eighty percentile of family-income brackets (**Figure 1**), and by a fearful attrition in the demographic functional composition of the households in those brackets.

There is the decades-long collapse of physically essential basic economic infrastructure, and the increasing savagery with which the health care and other social-welfare standards are being gouged presently by the supporters of both Governor George Bush and Vice-President Gore, in the attempt of both to rig flows of funds, away from the real economy, into the pockets of the financial speculators dominating the upper twenty percentile of family-income brackets.

These developments may be compared with the virtually fatal, currently accelerating trend of increase of U.S. national current account deficit (**Figure 2**), and the dependency of the U.S. financial system upon massive inflows sucked out from such sources as the so-called Yen and Euro "carry trades." An ominous indication, is the skyrocketing ratio of global short-term financial indebtedness to the estimated total GDP of all nations combined (**Figure 3**).

Our U.S.A. is, in fact, a bankrupt national economy, subsisting only, like the British Empire of yore, by its tyrannical use of raw political power to exact tribute from much of the rest of an already looted world.

The only notable argument against these facts, continues to be a Goebbels-propaganda-like effort, from leading U.S. and other circles, to attempt to show, that although the evidence shows that the real economy is collapsing, the wonder weapons of Federal Reserve Chairman Alan Greenspan's so-called "new economy," promise triumphant blessings just ahead. Meanwhile, despite intrinsically fraudulent propaganda tricks deployed in attempts to conceal the fact, the current statistical evidence is, that during recent weeks, the U.S. and world market entered into the early phases of a hyperinflationary commodity-price spiral, like that which struck Weimar Germany beginning approximately July 1923 (**Figure 4**). The financial-speculation-driven, zooming price of petroleum and of other categories, shows that, despite official lies, the hyperinflation in nominal financial assets since the Washington monetary conferences of October 1998, has now begun to spill over, inevitably, into a global commodity-price-inflation spiral, one like that experienced by mid-1923 Germany (**Table 1**).

If we are to put our finger upon a workable solution for this presently onrushing collapse, we must start from the fact, that the form of economy existing in the U.S.A., western Europe, Japan, Korea, etc., during the first decades of the post-war period, 1945–1965, with all its vacillations and other shortcomings, must be viewed today as relatively a howling success, when that period is contrasted with the tragically unfolding trend-lines of the more recent thirty-five years.

This does not mean, that we should simply return to the policies of the 1945–1965 interval. It does mean, that we must learn the lessons to be had from comparing today's disaster with that more successful past performance. In making that comparison, our intention should not be to imitate the past, but to identify the lessons to be learned from the study of the two contrasted performances. The object is not to re-create that past, but to build a fresh approach, up from disaster, an approach based upon that study.

That lesson is, in effect, what I applied to the present state of the crisis, in producing my recently published report, *Trade Without Currency*.¹

It was inevitable, and proper, that what I have presented in that report is consistent with the successful policies of day-to-day economic practice, under the conditions provided by cooperation between the governments of the U.S. and western Europe, during the approximate period 1945–1965, the period prior to the inauguration, on October 18, 1964, of the disastrous Harold Wilson as the United Kingdom's Prime Minister.

¹ Lyndon H. LaRouche, Jr. "Trade Without Currency," *EIR*, August 4, 2000.

Speaking in functional terms, what I have proposed is an effective substitute for the kind of economic practice under the 1945–1965 phase of the original Bretton Woods system. My argument presents a new way of establishing *the equivalent of* a gold-reserve-based monetary system of fixed exchange-rates. However, as I explained in that July 18, 2000 report, rather than relying upon that gold-reserve-based U.S. dollar which Mont Pelerin Society dupe President Nixon destroyed, I have proposed a system of credit and trade based on the needed synthesis of a new kind of index for a basket of commodities. My design for a new monetary system, differs in detail from that of the old Bretton Woods system, *but the adducible principle used is the same.*

The way in which I defined the relevant basket of commodities, includes similar other ironies. In the manner in which I defined the structured composition of the proposed basket of commodities, I followed what is to be adduced as implicit in the best practice of the U.S.A., France, and Germany, among others, during the course of the 1945–1965 economic recovery from the combined ravages of the Great Depression and World War II.

Thus, as would any good economist from that period, I defined the economic value of a basket of commodities in terms of return on investment; but, I expressed this in terms of physical investment and physical return, rather than the usual, nominalistic, financial terms. Similarly, I brought the design of these ratios into conformity with the overriding requirement of maintaining and improving the demographic characteristics of populations, and maintaining the scale and rate of improvements in basic economic infrastructure required to sustain those productivities and those rates of growth.

Otherwise, what I added to those lessons from successful past practice, was the impact of my own original discoveries in the science of physical economy, which provides a more rational, more precise and efficient representation of the determinants of economic growth-rates, than were otherwise in use among economists even during that earlier and happier period.

So far, so good. If I were addressing only veterans from the generation presently over sixty years of age, all the actions which I proposed there, excepting the use of my method itself, if not the theory, were within the bounds of the experience of economists and relevant top-ranking executives from that generation. I shall return to make that specific comparison between the outlooks of those and of present generations later, here, as the pivotal feature of this report.

What I shall make clear in that comparison, is that the crucial political problem blocking solutions today, is, that, among age-ranges of less than fifty-five years, virtually none of those among today's economists, political leaders, and industrial managements, have a meaningful comprehension of how a successful form of pre-1971 agro-industrial national economy actually worked. They not only lack such comprehension, but they have, so far, categorically

refused to learn, insisting that such past experience must be arbitrarily disregarded, an experience which they reject on the implied, fatally misguided pretext, that some Hegelian-like spirit of the supposed new age, has put all wisdom of the past into the rubbish-bin of history.

Thus, today's leading under-fifty-five politicians, economists, and corporate managements, like the editorial staff of the *Wall Street Journal*, are chiefly economics illiterates. If they usually make terrible mistakes, it is largely because they not only know no better, but are fiercely attached, as worst-case U.S. examples Senator Phil Gramm, Congressman Tom DeLay, and Vice-President Al Gore are, to their own conceited ignorance on these matters. If they had read the relevant books, or attended the lectures, they have, so far, successfully resisted learning from such sources. To get some sense into their heads now, they must be taught the relevant ABCs, from the ground up. With them, it is useless to rely upon the mere words used by today's radical positivist to describe such past policies. As I illustrate that point later in this report, they must experience the reality of the way in which such policies were successfully implemented. Many among them might prove able to learn, but, like the celebrated farmer's mule, a heavy blow of a breaking crisis must get their attention first.

That latter problem, the economics illiteracy presently popular among virtually all political leaders, economists, and top managements of less than fifty-five years of age, echoes what was previously the frequent general eruption of intellectual and moral decadence during the late, downward phase of a cycle, in the record of the rise and fall of cultures of the past. Plato famously placed emphasis on the significance of this problem. It is a problem which we today must come to understand, if we are to be successful in our attempt to pull our imperilled civilization back from the brink of a threatened global new dark age. I summarize that point, and then return, with that important thought in mind, to clarify what today's leaders must come to recognize as the deeper meaning which they ought to attribute to the term "full set economy."

Since Atlantis Fell

To paraphrase the poet Robert Burns, it were wise of those of present U.S.A. generations to see themselves as earlier generations and other nations might have done. So, Plato warned the Greeks of his time to see themselves. Not that others are necessarily right in their opinion of us on this point, but merely seeing the contrast in views, may impel us to think in a more mature, and saner way about how we should see those others, and, therefore, also ourselves. Plato's reference to an ancient fallen city of Atlantis, came up in the course of warning the Greeks of his time against the danger of being negligent in the overconfident way a people, such as today's typically Romanticist, "other-directed" Americans, may be much too pleased for their own good, by their infatuation with presently popular forms of entertainment, and

their often foolish tolerance of present generations' generally accepted other customs and opinions.

Plato pointed out, that the combined pre-history and history of mankind has been largely a history of catastrophes, in the course of which entire cultures have often been, virtually or actually, wiped out. In this connection, he referenced natural catastrophes, chiefly of a type which, so far, remain still today beyond mankind's present scientific ability to control. However, he placed the emphasis, as I do here, upon the kinds of doom and kindred catastrophes which a culture may bring upon itself.

As Plato emphasized then, so, still today, the chief non-human threats to civilization, come from periodic and related developments inhering in the organization of our Solar System as a whole. These include, in addition to seismic calamities, periodic glaciation, destruction by meteorites, cycles built into the intentions of our Sun, and so on. Until man gets out into the Solar System, and discovers there how to control the cyclical and related habits built into the system, the occurrence of these calamities will continue to be largely beyond our control.

Of more immediate interest to us now, as we are confronted by the world's presently onrushing financial collapse, are the catastrophes, such as dark ages of mankind, which are induced by flaws in the religious beliefs, and in other popular opinion and related social phenomena of the culture itself. The self-induced collapse of pagan Rome in the west, into a great dark age, is a relatively recent example of this. So, the effort of the Venice-directed Guelph League, of the Thirteenth and Fourteenth Centuries, brought about a collapse of both the level of culture and of population, to the degree that the population and number of parishes of Europe had been reduced by about half, during the so-called New Dark Age of the Fourteenth Century. The 1618–1648 Thirty Years' War, is an example of a New Dark Age striking Central Europe, as the result of the combined criminality of not only the Habsburg dynasty over more than a century, but of those people, the victims of that dynasty's Venice-led follies, who could not find a way out, until the 1648 Treaty of Westphalia.

In such self-induced calamities, a culture might be obliterated, or nearly so, or, otherwise, plunged into a depraved condition for generations to come. There are also, as in the experience of modern European civilization, periods of renewal of an upward course of development of a nation, as the U.S. rose, during 1861–1876, to become the world's leading agro-industrial nation, that as a result of the monstrously costly, but necessary war to defend the existence of our nation against the treasonous slave-owners' Confederacy.

Otherwise, the appearances of Mussolini and Hitler, were products of a long rise of Romanticism since the coronation of the Emperor Napoleon Bonaparte, at the beginning of the Nineteenth Century, a long trend which became intertwined with the efforts, by Hitler's

British, New York financial center, and other backers of 1933–1934, to enforce the conditions created by the Treaty of Versailles. The post-war world of 1945–1965 had to recover from that aftermath of Versailles; but, then, during the recent thirty-five years, globally extended European civilization, especially its Anglo-American component, has nurtured a shamelessly self-styled counter-cultural movement, which has been aimed explicitly to destroy all of those cultural values associated with the creation of the U.S. Federal Republic, the same cultural values which earlier generations had fought Hitler and Mussolini to defend.

The famous poem of Solon of Athens points to the problem on which attention is to be focussed here. Solon had led in the freeing of Athens from the oppressive rule of an oligarchy. Yet, years later, he found his fellow Athenians slipping into a depravity which threatened to bring about the oppressive conditions from which Solon had led, earlier, in freeing them. Personally, I feel the sentiment of Solon, when I recall the experience of returning from the war to watch my country sliding, year by year, decade by decade, into a form of moral and related corruption, of a sort even worse than that from which the leadership of President Franklin Roosevelt had freed us.

Take as much of the known facts of the pre-history and history of mankind as we might know it. Given, all of the complexities of that past as we know it. A certain pattern prevails among all these otherwise highly varied cases.

Repeatedly, cultures which have risen to a certain level of relative moral and material improvement of the conditions of social life, degenerate. If those people are fortunate, leaders appear, who use the occasion of crises to inspire the people to remedy their corruption, and to recover from their own folly in that way. President Franklin Roosevelt thus led the U.S.A. up out of the gutter into which Theodore Roosevelt, Woodrow Wilson, and Calvin Coolidge had misled it. In Germany, in the same year as Franklin Roosevelt's inauguration, the Germans were not so fortunate: the representatives of Germany's Versailles creditors, led by Britain's Montagu Norman and Manhattan's Brown Brothers, Harriman, gave Germany Adolf Hitler's Chancellorship. Each time a people recovered from a down-slide, sooner or later, the people began to slip back into the slime again!

Should the scholar not cry out? "O Solon! Will the people never learn from history?"

Despite that, for the long run, I, like my teacher Gottfried Leibniz, am personally, and justly optimistic about the future of humanity. The problem which I have just described, as Solon and Plato presented it earlier, is the reflection of a certain continuing moral and intellectual immaturity of all known past generations of people in all parts of the world. Our populations have been, and are, in the main, still morally children, or, even, as the existentialists are, like the followers of Nietzsche, such as Adolf Hitler, Martin Heidegger, Jean-Paul Sartre, Karl

Jaspers, Theodor Adorno, and Hannah Arendt, more or less psychotically infantile. The latter are, like the present-day, Nintendo-games-influenced, amok killers at Littleton's Columbine High School, morally psychotic in respect to the characteristic features of today's relevant, popularized form of entertainments and of related cultural and moral development.²

Faced with calamity in times of crisis, the morally immature members of the popular majority, may be sufficiently responsive to the best available leaders among them, to become inspired to rise to the occasion, and thus to follow and support such leaders in ways which either simply revive a fallen culture, or even carry it to unprecedented heights, as the American Revolution uplifted all of European civilization—for a while—in that time, or as the people of the U.S. rallied behind President Franklin Roosevelt. If we could only induce the people to put aside permanently their customary moral childishness, and even infantilism, mankind's progress could become more steadily upward, without such frequent backsliding.

Contrary to the perennial pessimists, human follies, such as those which inhere in the past thirty-odd years of morally downward trends in the U.S.A., are not inherent in human nature. Such follies inhere rather in the resistance of morally immatured human beings, to assuming the responsibilities of a truly human form of moral adulthood. The plague of a new kind of violence, which has been engendered in today's children and adolescents by aid of induced addiction to Nintendo-style games, typifies, as does the fictional *The Lord of the Flies*,³ the fact that evil within cultures is chiefly an outgrowth of preying, as the popular middle-class child-rearing dogmas of the suburbanite 1950s did, as the plague of Nintendo and related games does, upon fostering the susceptibilities for corruption inhering in the immature, and therefore susceptible, suggestible infant and child.

In the long view, the essential purpose of the true leaders of mankind, is to bring about the education of all the children of society to the post-adolescent degree of moral and intellectual maturity in which regressions, such as those experienced in the U.S.A. during the recent thirty-five years, cease. In the meantime, we who are faced with the great crises, such as that looming immediately before us today, must simply do as well as we can, working, first of all, to save our people from the consequences of their own folly, and hoping that, in that effort, we might also contribute something toward bringing about the future true maturity of humanity, in which, hopefully, such follies do not recur.

Let us apply that point of view, just described so, to the practical matter immediately before us here. From that view of history to date, what should we take as the lesson applicable to the problem I have once again described at the outset of this present report?

² Pokémon is such a Nintendo game.

³ William Golding, *The Lord of the Flies* (London: Faber, 1954).

1. Human Nature and Culture

The susceptibility of the people of the U.S.A., to fall back into the same kind of folly from which President Franklin Roosevelt's leadership had rescued them, is to be recognized as among those great failures in U.S. history which were brought about largely as an outgrowth of preceding use of regressive methods of education, methods analogous to those expressed by predominant trends in general and higher U.S. education today. By "education," I mean education as this occurs variously within the child-rearing activity of the family household, within the social experience of the community at large, and as formal education in schools and universities.

Typical of destructive trends in U.S. education, are the overlapping influences of the Fabians and the philosophical pragmatists, such as Harvard University's William James and Rockefeller protégé John Dewey, during the earlier part of the Twentieth Century, and of the logical positivists, the London Tavistock Clinic, and the followers of the so-called "Frankfurt School" of neo-Kantianism and existentialism, since the 1930s. These notable examples only express a commonplace sort of underlying problem, a common quality of miseducation of the young, a quality known to western European civilization generally as *Romanticism*. Strictly defined, Romanticism signifies nothing other than the cultural legacy of ancient pagan Rome, as that folly is to be contrasted with the opposing Classical Greek tradition, as the latter was transmitted into the culture of modern Europe by the Apostles of Jesus Christ.

The simplest way in which to identify the induced mental state responsible for the more general characteristics of that most commonly recurring folly of our population, is to examine today's widespread popular delusion, the deluded belief that all knowledge about great things, such as the laws of the universe, must be derived from nothing more sophisticated than the simplistic prejudices of what often borrows the much-abused name of "common sense."

The currently popular academic form of that delusion about common sense, is key, for example, to understanding the premises upon which worst-case doctrinaires, such as the Mont Pelerin Society's Friedrich von Hayek, were able to spread those destructive, actually fascist dogmas of "globalization" and "free trade," which are presently destroying the U.S. economy from within. Once we have traced the causes for today's economic-policy follies to such sources, the principled solution to today's global financial calamities becomes more easily understood.

In today's domain of physical science so-called, the characteristic expression of this prevalent academic foolishness, is a view embedded within today's generally accepted classroom notions of mathematical physics. I point to the prevalent popular delusion of the university

classroom, that everything concerning the principles of physical science could, and should be proven mathematically as if at the blackboard. Such perverted, popularized, “ivory tower” misconceptions of physical science, are a reflection, albeit within the narrower domain of mathematics, of the same moral corruption responsible for the recent thirty-odd years degeneration in U.S. policy-shaping.

Although most among today’s secondary and university teachers of mathematical physics are ignorant of that fact, the prevalent, modern “ivory tower” misconception of physical science, takes its origins from the influence of the founder of British empiricism, the notorious Venetian “mafia boss” of that time, the same Paolo Sarpi whose notable contemporaries and followers included the empiricists Sir Francis Bacon and Sarpi’s own house-lackey Galileo Galilei. From this doctrine, which Sarpi confessed that he had derived from the irrational babblings of medieval William of Ockham, came the dogmas known today by such names as empiricism, Cartesianism, and the logical positivism typical of the followers of Ernst Mach and Bertrand Russell.⁴

I am not claiming that the moral decadence prevalent among today’s under-fifty-five generation of university graduates, is entirely the responsibility of the Sarpi tradition’s corrupting influence on today’s teaching of mathematical physics. What I am saying, is that the same mind-set which makes “ivory tower” empiricism appear plausible to today’s dupes of the mathematics classroom, is key to understanding the systemic implications of the kind of infantilism responsible for the terrible moral failures of recent decades, in the shaping of U.S. and other nations’ economic policies.

To put the more general view of this problem into a single expression, it were perhaps sufficient to say, that when some people insist, “Keep it simple, stupid!” they are actually saying, in effect: “Keep it stupid, simpleton!” They mean the same thing which anti-Leibniz fanatic Leonhard Euler argued in his 1761 *Letters to a German Princess*.⁵ Pedants of this stripe are demanding that the student accept, on blind faith, the irrationalist, “ivory tower” presumption of Sarpi’s house-servant Galileo, that no action occurs within the universe, the which can not be reduced to action along straight lines drawn between two points within what is commonly called “Euclidean” space-time. Therefore, when they argue “keep it

⁴ Typical of the Ockhamite irrationalism embedded in empiricist dogmas, is the argument, as by Bernard Mandeville, François Quesnay, and Adam Smith, that, the cause of good is intrinsically unknowable to the human mind, and that, *therefore*, mankind must rely upon the mechanisms of blind hedonistic instinct to ensure that mankind’s behavior follows blindly those impulses through which incomprehensible statistical interactions lead society to the best possible outcome. The doctrine of “free trade” is based, axiomatically, upon precisely that lunatic presumption.

⁵ Leonhard Euler, *Letters of Euler on Different Subjects in Natural Philosophy, Addressed to a German Princess* (New York: Harper & Brothers, 1840). These letters are of a piece with Euler confederate Algarotti’s *Newton for Ladies*.

simple,” what they mean is, that everything must be proven by going back to this simple, foolish assumption of Galileo *et al.* as the starting-point. Such views are the systemic basis for all of the leading ideas about society of Galileo’s pupil Thomas Hobbes, John Locke, Bernard Mandeville, François Quesnay, David Hume, Adam Smith, Jeremy Bentham, and so on.⁶

For our purposes here, the most relevant example of such simple-mindedness, is the argument of today’s devotee of the cult of “information theory,” or, of a related lunatic belief, that to explain the difference between living and non-living processes, we must prove that living processes are nothing but something which might be replicated by robotic forms of non-living mechanical systems. I signify mechanical systems as they might be defined in consistency with Euler’s ivory-tower sophistry, that the universe is nothing but mechanical (linear) in the “Euclidean” infinitesimally small.⁷

To make sense of economy, one must start from the recognition that, *contrary to Sarpi, Galileo, Euler, et al., nothing truly elementary is ever simple arithmetically or algebraically.* I explain.

All truthful human knowledge starts with two elementary facts about the human species. First, that we are a living species in the sense that France’s Louis Pasteur and the Russian scientist Vladimir Vernadsky set living species *systemically, functionally*, apart from and functionally superior to non-living ones; second, that the human species is the only one which has demonstrated the characteristic potential, called cognition, to increase its power to exist in the universe by an act of will. Thus, the elementary beginning of all wisdom is: *Know thyself*; know what ought to be understood as the unique characteristic of human nature: *know yourself as what should become a typical representative of that unique quality of living species.*

⁶ Unfortunately, what continues to pass for science education in today’s universities, is to a large degree purely and simply dirty politics first, and, only as if in an afterthought, some effort to make some actual scientific work appear to conform to the official political line. The usual excuse for such lying might be summed up: their political careers in academia depend upon observing such disgusting rituals. This pattern should remind us of such formerly notorious models as left-wing forms of political lying about science matters attached to what is otherwise presented as reports on the matters of physical science, such as “Marx proved,” or as “Great Stalin has taught us.” In the “right wing,” it is as bad, or worse. The most celebrated cases of frauds of this same type, encountered in university classrooms and kindred places, are the “dirty political” hoaxes perpetrated against Kepler, Leibniz, and Riemann. For those familiar with habitual U.S. political lying by the mass media and official institutions of the government, the explicitly political character of generally accepted academic opinion on matters of principles of science, could be overlooked only among persons ignorant of the relevant classroom, textbooks, and conferences. Usually ritual political lying of that academic sort, genuflects to the mystical authority attributed to the empiricists and the followers of Kant, as in the popularized classroom frauds against Kepler, Leibniz, and Riemann.

⁷ Precisely such simple-mindedness is the axiomatic premise of the empiricist doctrines of Sir Francis Bacon, Thomas Hobbes, John Locke, Bernard Mandeville, François Quesnay, David Hume, Adam Smith, utilitarians such as Jeremy Bentham, Bertrand Russell, Friedrich von Hayek, and Russell acolytes such as Norbert Wiener and John von Neumann.

It is only through man's ability to prove his species' *willful* success, in attempts to increase his species' physical power, per capita and per square kilometer, in and over the universe, that man is enabled, thus, to discover what are truthfully the laws of that universe, or not. So, in contrast to the form of pseudo-science represented by the "ivory tower" methods of Euler *et al.*, *physical science*, as Gauss's follower Bernhard Riemann defined it, proves experimentally mankind's methods for increasing our species' power over the universe. The science of physical economy, my specialty, addresses the issue of proving that man, in each case, has either succeeded or failed to increase our species' power in and over the universe, as to be measured in physical terms, per capita and per square kilometer of the Earth's surface. In coming to understand that willful connection, we define those characteristics of our species which are rightly distinguished from those of other species, as the characteristics of the quality to be known as *human nature*.

That comprehension of that meaning of *human nature*, is the only truthful form of common sense. The only existent form of knowledge, is *human knowledge so defined*. That, so defined, is all that is truly *elementary*. No other sort of claim to knowledge represents anything which is truly elementary. That is what is to be recognized as the only sane meaning of "common sense."

To repeat what I have taught consistently, to the present day, since my regularly repeated, 1966–1973, thirteen-week series of campus lectures on the elements of economic science, all our knowledge of the universe, including political economy, depends upon exploring the distinction and connections among three kinds of elementary *physical* principles. As I have already indicated above, these three distinct categories of elementary physical principle, are a) non-living processes, b) living processes in general, and c) the processes of cognition unique to the human species. All knowledge is to be derived from discovering both the distinctions and the efficient connections in action among these three sets of elementary principles. That is to say, that contrary to Sarpi, Galileo, Euler, *et al.*, elementary knowledge—true common sense—begins from the top of the pyramid, not the gritty common statistical dirt presumed to squat, like mythical gnomes, below the pyramid's base.

For our purposes here, it is necessary that I repeat here, if only summarily, what I have repeatedly taught about these matters of principle.

Begin with the principled characteristics of non-living systems.

During the middle to late Nineteenth Century, the imitators of Leonhard Euler's attacks upon Leibniz, such as Clausius, Grassmann, Kelvin, Helmholtz, Maxwell, Rayleigh, Boltzmann, *et al.*, developed what became known as certain allegedly universal thermodynamical characteristics, the so-called "Three Laws" of thermodynamics. This became known as the neo-Newtonian doctrine, that the universe is governed by *universal*

entropy.⁸ That contention is true only for what are ostensibly non-living systems, and that only within certain definable bounds, but, nonetheless, it does fairly describe, if crudely, the way in which non-living systems must appear to function if the functioning of one's mental powers is delimited to the notion of fixed systems. However, this same notion of universal entropy, is shown to be false, once we shift even our view of non-living processes as such, as belonging to a universe seen as a Riemannian sort of multiply-connected manifold. The standpoint of Clausius *et al.* reflects, thus, the scalpel-like effects of applying Ockham's Razor too generously to one's own brain, or, in other words, the influences of radical reductionists such as Galileo and Euler.⁹

Living systems, when considered and defined as whole processes, that is to say, in terms of the reproduction of living systems by living systems, are characteristically *anti-entropic*. However, each living species is characteristically self-bounded in respect to its potential relative population-density, as measurable per capita and per square kilometer of surface-area.

Unlike inferior living species, the potential relative population-density of the human species has, by definition, no assignable fixed bounds within the universe as a whole. The type of *anti-entropic* action which distinguishes the human species from all others, on this account, is the cognitive potential expressed by the sovereign cognitive powers of synthesis of the individual human mind: the *non-deductive* power to generate the discovery of an experimentally validatable new universal physical principle. *It is application of this power of cognitive synthesis to the productive process, which defines the science of physical economy. This is the only sane basis for defining real economic growth.* In the final analysis, when we go beyond what are merely useful rule-of-thumb approximations, there is no competent definition of economic growth possible on any other basis than the principle which I have just summarized.

These three, functionally distinct sets of universal physical principle, have a certain kind of hierarchical organization among themselves. As Vernadsky showed for biogeochemistry, the

⁸ Cf. Gottfried Leibniz on the subject of Isaac Newton's doctrine of God's Clock. "The Controversy Between Leibniz and Clarke," *Gottfried Wilhelm Leibniz: Philosophical Papers and Letters*, Leroy E. Loemker, ed. (Dordrecht: Kluwer Academic Publishers, 1989), pp. 675–721. Clarke was a leading British agent of Paris-based Abbot Antonio Conti, the leading Europe-wide controller of the Eighteenth-Century British-French "Enlightenment." It was Conti, from Paris, who created the myth of Isaac Newton; for that purpose, Clarke was Conti's controller of Newton. Cf. J.M. Keynes on Newton's chest of laboratory workpapers: John Maynard Keynes, "Newton the Man," in *Essays in Biography* (New York: The Norton Library, 1951).

⁹ Two examples of fraudulent attacks on Bernhard Riemann, on this account, suffice here. The first, is the fraudulent attack, by Clausius associate Grassmann, on Riemann's contributions to electrodynamics, and the hilarious folly of Britain's Rayleigh in the latter's attack on Riemann's *Plane Air Waves of Finite Magnitude*. The general rule which governs the overturning of the Clausius-Kelvin doctrine of universal entropy is that defined by Riemann's 1854 habilitation dissertation. Any change in the composition of a multiply-connected manifold, that corresponding to a change in the characteristic curvature, overturns the rule of universal entropy.

Earth is dominated historically by the cumulative effects of the superior authority of anti-entropic, living processes over the non-living. Similarly, through the discovery and application of valid new physical principles, the action expressing the characteristic distinction of the human species' cognitive powers to discover valid new universal physical principles, mankind's anti-entropic action dominates all other living processes, and occupies an increasing part of the activity of the Earth as a whole process.

Therefore, the experimental validation of such cognitive discoveries in the domain of physical economy, is the ultimate test of the validity of what we might call scientific knowledge. The test is the demonstration that a discovered universal physical, or related quality of principle, enables mankind to increase its power in and over the universe, *anti-entropically*, as measurable, in physical terms, per capita and per square kilometer of surface-area. *That is the only real form of economic growth.*

Thus, it is the study of man from the standpoint of this notion of a science of physical economy, which is the only appropriate approach to defining the nature of the human species, and, therefore, of the human cognitive individual. It is a conception of the universe premised upon precisely this universal-humanist principle of physical economy, which defines those elementary notions upon which all knowledge is to be premised.

To that, the following two general observations respecting the required definitions of universal principles, must be added. In other words, we have, thus, first, the notion of a universal principle of progress, as rooted, second, in the promotion of the benefits of scientific and technological progress.

The Birth of the Idea of Progress

The modern conception of a process of *universalizable* social progress, is slightly more than five hundred years old. The notion was implicit in, most emphatically, two of the most widely influential writings of a leading and seminal figure of Europe's Fifteenth-Century Golden Renaissance, Cardinal Nicholas of Cusa. These two exemplary writings are his prescription for a modern, *universal* form of a system of respectively sovereign nation-states, ***Concordantia Catholica***, and the founding work of modern experimental physical science, his ***De Docta Ignorantia***. The first modern state designed by intention to conform to such Renaissance principles, was the reform of France by King Louis XI, as echoed by the subsequent reforms under England's Henry VII. The relevant principled distinction of this new conception of a principled community of sovereign nation-states, is the same notion of the general welfare (e.g., *commonwealth*) expressed in the opening three paragraphs of the 1776 U.S. Declaration of Independence and the Preamble of the U.S. Federal Constitution.

From the Second-Century B.C. rise of Rome to relative world power in the Mediterranean littoral, until Europe's Fifteenth-Century Golden Renaissance, all forms of political society, whether benign or malevolent, were premised upon the notion of the state and its subjects, as, in principle, the property of a ruling oligarchy, in respect to which the majority of the population lived actually or implicitly as human cattle. Although a kindred notion of the necessity of a modern nation-state was already elaborated as the pervasive thread tying together all of the work, including *De Monarchia*, the *Commedia*, and other writings, of Dante Alighieri, it was the Fifteenth-Century Renaissance which first effectively introduced a notion of *natural law* to modern practice, the principle that no government has the moral authority to govern, except as it is efficiently committed to promote the general welfare of each and all of the people, and their posterity. Hence, the so-called *general welfare principle*.

Hence, our Declaration of Independence declared as nullifiable, any oath of allegiance to a sovereign, if that sovereign, such as the British monarchy, *systemically* violated the natural-law principle of the general welfare.¹⁰ The same principle of the general welfare, as stated in the Preamble of the U.S. Federal Constitution, is the clearly intended fundamental principle of constitutional law of U.S. Supreme Court Associate Justice Antonin Scalia's radically positivist, pro-Lockean, pro-Mont Pelerin Society sort of ideological excursions notwithstanding.

Thus, the new form of sovereign nation, required that the sovereign be accountable for that development of all of that territory, and of all of that population, which was relevant to the universalized promotion of the general welfare in that domain. Thus, the individual member of society ceased to be a mere subject of the ruling sovereign, while the sovereign government was to be held accountable for efficiently meeting its responsibility for promoting the general welfare of both all of living persons and their posterity. This change in definition of sovereign government, made the government accountable to serve efficiently as a mode of self-government of the whole territory by the whole people.

This change also implied, as Cusa's *Concordantia Catholica* requires, that relations among sovereign states so defined, be implicitly accountable for promoting the general welfare among respectively sovereign states, as in their own, to the degree they might be able. Thus, later, in the 1648 Treaty of Westphalia, all that pre-existing law which had been the root of the 1618–1648 perpetuation of that new dark age, was nullified insofar as such pre-established laws and customs might tend to prevent the realization of the conditions of the prescribed peace. Thus, the Roman and feudal notions of *customary*, or *common*, or *contract*

¹⁰ The reader must not confuse this use of *systemic* with a like-sounding term, *systematically*. By systemic, I signify not an intruding, but an axiomatic, and thus essential, or genetic *characteristic* of the entire process, as a species of process, and therefore universally characteristic of every aspect of that process.

law, were nullified in principle, insofar as such notions might tend to prevent the efficient realization of the general welfare principle in and among the respective nations.¹¹

Admittedly, in the wake of the betrayal and defeat of the League of Cambrai, Venice's financier oligarchy orchestrated most among the old feudal powers of Europe as accomplices, in a persisting, most aggressive effort to undo the work of the Fifteenth-Century Renaissance, and to eradicate the then emergent institution of the modern sovereign nation-state. However, as the much-publicized figure shows (**Figure 5**), the impact of the Fifteenth-Century Renaissance and its reforms upon the improvement of the demographic characteristics of Europe's populations, reflects the fact, that, despite the Venice-led use of religious warfare, during the period from A.D. 1513 through 1648, to attempt to drown the Renaissance reforms in blood, and despite the use of related efforts of Europe's feudal and financier oligarchies to crush the new form of nation-state later, the advantage in power which nations gained from the influence of the new principles of progress, enabled the United States to come into existence as a model constitutional republic.

This economic and demographic benefit of the Renaissance's influence, made the example of the U.S.A.'s overthrow of rule by its British monarchical oppressor, an inspiration for the cause of freedom among the peoples of the world. This remains valid, in principle, still today, even if the inspiration supplied by the U.S. example waned significantly after the death of President Franklin Roosevelt, and although that inspiration has tended, increasingly, to be buried in the spreading and deepening muck of global despair, since the trend of events in the aftermath of the assassination of President John F. Kennedy.

The modern sovereign nation-state republic, and also its approximations, converged upon what modern usage conveniently describes as a "total system," a system of sundry cooperating elements working in voluntary partnership to achieve an implicitly agreed-upon total effect. U.S. Treasury Secretary Alexander Hamilton's 1791 Report to the U.S. Congress *On the Subject of Manufactures*, is to be seen as an intended approximation of such a notion of a voluntary total system. The intended effect was progress, most emphatically scientific and technological progress, that to the end of increasing the potential relative population-density of the nation, and also to the purpose of promoting such increases among nations.

¹¹ Typical of the contract law which the general welfare principle must subject to a sweeping nullification on principle, is the celebrated English Magna Carta, which perpetuated the inhuman traditions of barbaric Norman baronial rule against the people generally, and the duty of the nation-state to promote the general welfare. The superiority of the principle of *agapē* to prescriptive law, is emphasized in a most relevant fashion, in the Apostle Paul's *I Corinthians* 13, as the term *agapē* is also defined from the mouth of the character Socrates in Plato's *Republic*.

*The emergence of such an economic process as a total system of cooperation of dissimilar and distinct actions around a unifying common objective, the objective of progress, was the occasion for the birth of the conscious practice of an emerging profession of economics in the course of the Fifteenth Century.*¹² The study and application of such progress became a branch of science which, contrary to certain foolishly exuberant readers of Aristotle, did not exist in practice prior to Fifteenth-Century Renaissance Europe.

It is of crucial importance to understand, that actual economic science simply could not have existed under earlier conditions. On this account, it must be emphasized, for contrast, that under earlier forms of society in the Mediterranean region, in which most subjects were functionally human cattle, the interest of the state was limited, by definition of practice, to the convenience and caprices of that oligarchy represented by the sovereign government. The people generally, were bred, used, and culled, as cattle, to whatever effect the oligarchical form of sovereign considered expedient at that time. The notion of universal human rights did not exist; the distinction of the subjects, and also of the rulers themselves, from mere beasts, was either non-existent or both doubtful and tenuous. The argument of contract law, as made by the Confederacy's ideologues, that a person who had been born a slave might be therefore held forever as property, typifies the depravity of the oligarchical mind, as it does the pleadings of John Locke and his followers.

This point is illustrated most forcefully by viewing the effects of a currently ongoing attempt to reverse the flow of modern history. Observe, that a return to feudal-like, pre-nation-state conditions genetically akin to the practice of slavery, is echoed in the current policies of both the Bush Presidential candidacy and Al From's Democratic Leadership Council (DLC). Such trends have been introduced into the thus-corrupted institutions of U.S. law, including the current majority of the U.S. Supreme Court, and pollute extensively the currently habitual, oligarchical practices of the Criminal Division of the U.S. Department of Justice. These throwbacks to feudal times, now treat U.S. senior citizens, and the poor generally, as lives which are to be treated as those of human cattle, persons to be treated as expendable under notions of contract law, that as an oligarchical form of shareholder interest may perceive as to be to its advantage.

¹² This emerged as a branch of professional practice which became known as *cameralism*. The work of Cardinal Mazarin's leading protégé, Jean-Baptiste Colbert, is among the best examples of cameralist practice, together with the work of the early decades of the Massachusetts Bay Colony under the leadership of the Winthrops and the Mathers. The development of an actual science of economics within the framework of cameralism, was almost entirely due to the founding and initial development of the principles of physical economy, by Gottfried Leibniz, a development which proceeded over the interval 1671–1716. The development of economic science in North America, was the outgrowth of the work of cameralists such as the Winthrops and Mathers, and the powerful and increasing influence of Leibniz's writings and conceptions during the course of the Eighteenth Century.

So, under the impetus supplied by circles such as Bush, Al From's DLC, and the fascist influences of the Mont Pelerin Society, today's policies tend to a convergence on the systemic characteristics of practice by Adolf Hitler's regime, which, during the 1930s and later, accelerated the death-rates of those whose condition was deemed to be either that of "lives unworthy to be lived," as the practices of today's HMOs do, or as, more plainly, "useless eaters."

So, such atavistic turns in U.S. foreign policy associated with then Secretary of State Henry A. Kissinger's 1974 population policy NSSM-200, and President Jimmy Carter's later ***Global 2000***, explicitly required that the U.S. treat Africans, and others, as either human cattle or wild animal herds to be culled, for the purpose of conserving natural resources which the Anglo-American financier oligarchy might deem required for that oligarchy's future needs. Such are the population policies of Vice-President Al Gore's book, ***Earth in the Balance***.¹³ Similarly, it is increasingly difficult to distinguish the practice of Governor George Bush's, and others' current criminal justice and related prison-labor policies, from the spirit of practice under Adolf Hitler's regime. The idea of a radical version of John Locke's and Jeremy Bentham's notion of "shareholder value," which has become hegemonic among the U.S. fellow-travellers of the Mont Pelerin Society today, is, in effect, either no different than Hitler's policies, or perhaps, potentially, even much worse.¹⁴

The idea of progress, as defined in practice by the emergence of the modern form of perfectly sovereign nation-state, could not become a universal principle of practice, except as the organization of cooperation in society made progress an efficient principle of practice, the principle of the right of every person to have access to participation in bringing about progress, and to enjoy those improvements in the conditions of life which were consistent with that objective.

The notion of universal progress, is more than merely a political and legal principle. That is to say, it can not be viewed as a dispensable fiction of merely positive law. It has the same significance and rightful authority in political and social life, that universal physical principles command in physical science.

This notion of universal principles, both physical and social, as it arose, together with the birth of economics, during the Fifteenth-Century Golden Renaissance, is traced chiefly from the dialogues of Plato, as such notions were echoed in the manner in which Johannes Kepler

¹³ Albert Gore, Jr., ***Earth in the Balance: Ecology and the Human Spirit*** (New York: Houghton Mifflin, 2000).

¹⁴ The comparison to Hitler's policies is in no way exaggerated. Under the Nazi law derived from the legacy of Savigny's neo-Kantian school of Romantic law, the Nazis dreaded provoking the Romantic tradition of regard for custom. The English tradition of John Locke does not know such sensibilities; the radical positivism which has lately invaded so much of our Federal Court and Congress is utterly feral on this point.

established the foundations of modern astrophysics. The similarity of the principle of the general welfare to the systemic outlook of Kepler's astrophysics, is deep-going, extensive, and organic. It is also directly relevant, for its exemplary and historical features, to defining the competent practice of economics today. I explain.

Unlike Galileo and his imitators, while Kepler was the first to discover and define the mathematical principle of universal gravitation, which Isaac Newton later parodied from his circles' reading of Kepler's *New Astronomy*, Kepler never accepted the notion that planetary orbits are determined simply by pairwise attractions among solar objects. Rather, for Kepler, the Solar System is a coherent system, in which each available orbital pathway is defined primarily by the Solar System as a whole, not the Solar System by the mechanical accretion of individual orbital pathways. In modern language, Kepler's notion of the Solar System is the fruit of an impulse toward defining a multiply-connected Riemannian physical-space-time manifold. The effort to elaborate exactly such a conception, is reflected in the way in which Kepler derived his method immediately, and chiefly, from his study of the scientific writings of Cardinal Nicholas of Cusa, and of the two most notable followers of Cusa in physical science, Luca Pacioli and Leonardo da Vinci.

Kepler's method, like Leonardo's, is that of the *Docta Ignorantia* of Cusa. The ultimate origin of Kepler's approach to founding astrophysics, was the relevant work of Plato, with notable emphasis on the principles of physical geometry featured within Plato's *Timaeus*. The relevant principal immediate followers of Kepler's founding of astrophysics, are Fermat,¹⁵ Pascal, Christiaan Huygens, and Gottfried Leibniz. After Leibniz, the principal follower of Kepler in the development of astrophysics, is the Carl Gauss who proved Kepler's case for a missing, destroyed planet, the asteroid belt, lying in an orbit between those of Mars and Jupiter. The connection between the Fifteenth-Century emergence of modern experimental physical science, and of the economy of the modern sovereign nation-state form, is no coincidence. Both had their ancient root in Plato's notion of a republic, as that Classical outlook erupted in force in the Italy-centered Fifteenth-Century Golden Renaissance.

Thus, the lawful outcome of Kepler's approach to astrophysics in particular, and physical science in general, is commonly typified by the world-outlook expressed by the work of Gauss and Gauss's follower Bernhard Riemann in physical science. Thus, it is no mere historical accident, that Riemann's revolution in mathematical physics, his 1854 habilitation

¹⁵ E.g., Fermat's demonstration of the need to supersede a naive notion of shortest "straight-line" distance, by that notion of *least time* which Christiaan Huygens, Gottfried Leibniz, and their collaborators developed further as Leibniz's principle of universal least action, the latter thus replacing the simplistic, arbitrary, and false notions of an *aprioristic* "Euclidean geometry" of Galileo, Descartes, Newton, Euler, and the latter's followers.

dissertation, is crucial for a competent comprehension of physical-economic processes in the required systemic terms.¹⁶

There appears, thus, in Kepler's astrophysics, a notion associated with expressions such as "the Mind of the Sun," the "Mind of the planet," and so on. I describe this as a matter of my accountability to the reader, while recognizing that most readers will suffer some difficulties in understanding what is for them an unfamiliar, but nonetheless, for statecraft, an indispensable notion.

The implications of Kepler's relevant intention could not be made fully clear until the successive work of Gauss and Riemann in defining a physical geometry (i.e., a hypergeometry), in which all *a priori* ("ivory tower") notions were eliminated, in which only experimentally validated universal physical principles survived as "dimensionalities." Thus, we have the Gauss-Riemann notion of the unfolding of an orderable series of multiply-connected manifolds, a geometry in which that notion of *analysis situs* which had been introduced by Leibniz, superseded simply algebraic notions. This successive development of a true relativistic physics, by Gauss and Riemann, made clear, at least implicitly so, a crucial feature of Kepler's earlier definition of astrophysics, the notion associated with phrases such as "the Mind of the Sun."

Kepler's empirical work had already shown, that the determination of the orbits of the planets, and also the composition of the entire Solar System as a coherent organization, supplied to the orbits of each planet a built-in *intention* which was superior in its efficiency to any simply algebraic conception of the mathematical determination of such an orbit.

It was from the implications of this discovery, by Kepler, that he assigned to future mathematicians such matters as the mathematics appropriate for a calculus. Contrary to the British and French "Enlightenment" ideologies of the Eighteenth Century, it is a simple historical fact, that the Leibniz calculus was an original development by Leibniz, based directly upon such requirements set forth by Kepler. The proper definition of the term *non-linear*, as applicable to the successive development of astrophysics by Kepler and Gauss, is of this Kepler-Leibniz form, the form corresponding to what Leibniz defined as a principle of universal least action.¹⁷

¹⁶ An historical note here, to ward off captious quibblers. Admittedly, my principal discovery in the science of physical economy was made prior to my taking the fuller implications of Riemann's 1854 habilitation dissertation into account. Although my principled discovery was clear, the manner in which to express that discovery in terms of a generalized physical system, depended upon my intensive 1953 study of the relevant work of both Georg Cantor and Riemann.

¹⁷ This definition of non-linear has no congruence with notions associated with John von Neumann, for example. Kurt Gödel's devastating refutation of the life's work of both Bertrand Russell's *Principia Mathematica*, and of Russell acolyte John von Neumann in mathematics, typifies the class of fallacies underlying both von Neumann's and Russell acolyte Norbert Wiener's efforts to explain away the challenge of

“Non-linear” does not signify an algebraic, or “non-algebraic” number, but, as Cardinal Nicholas of Cusa, in opposition to the earlier work of Archimedes, was first to define rigorously the significance of π ,¹⁸ a hypergeometrical locus in physical space-time, a place yet to be ever more precisely defined within a higher order of notion of number. This notion belongs to the domain of a Riemannian orderable sequence of multiply-connected manifolds, in which the physical meaning of such non-linearity is made perfectly clear functionally.¹⁹ This notion accords exactly with the intent of Kepler’s definition of the governing orbital intention of a planet, or the Sun, which he identifies as the “Mind” of that planet or Sun. The point to be stressed here, is that exactly this notion of non-linearity occupies a crucial place within the science of physical economy.

In physical economy, the primary measure of progress is, as I have stated repeatedly, here and elsewhere, an increase of the *potential relative population-density* of the human species. The first approximation of this measurement, is obtained by measuring the relative anti-entropy shown empirically in man’s physical relationship to the universe, as that relationship may be measured over time, per capita and per square kilometer of the Earth’s surface-area (i.e., the biosphere as broadly defined by Vernadsky).

The primary impetus for such anti-entropic action, is supplied by experimentally validatable discoveries, or replications of such acts of discovery, of those universal physical principles which qualify as *physical dimensionalities* of a Riemannian form of multiply-connected physical-space-time manifold. The technologies which are generated as features of an experimental design which successfully validates such discovered universal principles, or the relationship among such principles, then define the new forms of action (technologies) by means of which mankind’s physical power in and over the universe is accomplished. The *action* represented by realization of such discoveries, is the sole *direct* cause of the anti-entropic increase of the potential relative population-density of the human species.

This anti-entropic function is characteristically non-linear. That is, this function can never be reduced to the form of the universe according to Euler’s *Letters to a German Princess*.

non-linearity. Those hoaxes by Russell, Wiener, and von Neumann, are an hereditary outgrowth of Euler’s childish *Letters to a German Princess*, as Euler’s tactic for dealing with the definition of π led to the interesting but epistemologically inconsequential work of Hermite and Lindemann on the problem as misdefined by Euler.

¹⁸ *De Docta Ignorantia (On Learned Ignorance)*, trans. by Jasper Hopkins as *Nicholas of Cusa on Learned Ignorance* (Minneapolis: Arthur M. Banning Press, 1985).

¹⁹ This is the same domain of number associated with Georg Cantor’s use of the term *transfinite*. Although Cantor’s work on this matter during the middle 1880s is lucid and profound, it were better, for several reasons, to resituate that notion of the transfinite within the physical setting of Riemann’s habilitation dissertation and notions of *analysis situs*. Under sundry pressures, including the inquisitional savagery of Leopold Kronecker and association with pro-satanic Aleister Crowley’s sometime confederate Rudolf Steiner, Cantor’s writings of the 1890s bring some awful ideological baggage into the subject of the transfinite.

However, because of the nature of the discovery of universal physical principles, we can not define *the quality of action* responsible for progress in per-capita terms. We may describe the effect in per-capita terms, but not the human *action* which generates the effect. This involves a crucial point which standard accounting and related practice today never seems to wish to understand.

Strictly defined non-linearity, as I have indicated here what it is not, appears within the science of physical economy in two types. First, it is expressed as a form of action associated with the universal physical principles underlying the discovery of the technologies employed in production and related physical activity. Second, it is expressed by the intrinsically non-linear nature of the mental processes by means of which validatable original discoveries of universal physical principle are generated, or, in the alternative, the original experience of that discovery replicated, as by a student.²⁰

In the second of those two cases, the crucial factor is the relevant development of the personality of the actors. This development is pivoted upon two requirements. First, we must take into account that accumulation of discoveries of physical principle upon which the maintenance of the present level of technology of economic practice depends. Second, we must take into account the accumulation of universal principles of a social-cultural quality, upon which effective cooperation, to economic effect, among the members of the society depends. The Classical principles of artistic composition in plastic and non-plastic art-forms illustrate the nature of the second; however, the conceptions of history and of statecraft derived from the combined effect of scientific education and practice and also the influence of Classical forms of artistic composition, are an integral part of that required cultural development of the members of society upon which the cooperative realization of scientific and physical-economic progress depends.

The latter requirements coincide with a corresponding cultural development and general health of the individual and family household. For example, a modern economy could not exist without a life-expectancy in the order of eighty to ninety years, and without a degree of leisure and quality of family-household and community life consistent with *playful* fostering of the relevant creative-mental (i.e., cognitive) qualities of the individual personality.²¹ The

²⁰ I have elaborated the non-linear characteristics of the cognitive processes in sundry published *EIR* and other locations. See, e.g., “The Becoming Death of Systems Analysis,” *EIR*, March 31, 2000.

²¹ In earlier published locations and public addresses, I and my associates, such as Helga Zepp-LaRouche, William Wertz, and Ralf Schauerhammer, have frequently discussed this notion of cognition in connection with Schiller’s aesthetical letters [*Über die ästhetische Erziehung des Menschen*]. Schiller compares, and contrasts this principle of playfulness [*Spieltrieb*] in animals with that in human individuals. All truly creative persons are dominated by a more or less effervescent, irrepressible quality of playfulness, which horrifies the ponderously pedantic, but which is expressed by creative persons in a cognitive mode non-existent among animals. The happy play of a gifted child and a happy puppy demonstrates the connection and axiomatic difference between animal and human playfulness. It is precisely the quality of cognitive playfulness typical of a

requirements obviously include a net growth of the population, which means a corresponding birth-rate. It means, in modern economy, a school-leaving age in the order of a quarter-century of development of the education and related development of the new individual.

The proverbial “bottom line,” in all of the aforelisted and related requirements, is the anti-entropic increase of the potential relative population-density of the human species. This implies a measurement which must take into account at least a quarter-century span into the future.

A quarter-century is the lapse of time required to transform a newborn infant into a functioning adult qualified to assume the levels of professional responsibility a modern economy typically requires. It is also today’s lapsed-time between the birth and qualification of a professional of one generation and the appearance of a member of the successor generation. A quarter-century, is the minimal span of useful economic life of today’s typical long-term sort of physical-capital investment in the productive capital and basic economic infrastructural development of a modern form of agro-industrial economy. Unless such essential capital factors of the economy are being adequately maintained, shorter-term apparent gains in unit physical cost of production are illusory.

Such are the considerations upon which the definition of the notion of progress depends.

2. Process Sheets and Bills of Materials

We come now to the pivotal topic of this report, the matter of defining the principles which control the proper composition and use of what I have described, in my *Trade Without Currency*, as a standard basket of commodities. The latter is the standard which I proposed be crafted as a new international, practical index of economic value.

The general method to be employed for crafting such a basket of commodities, can be illustrated, if only in first approximation, by reference to certain well known industrial engineering and related practices to be found presently, almost exclusively, among the relevant professionals from a generation born before or about the time of the 1929 U.S. stock-market crash, a generation now more than sixty years of age. I remind those from that older generation of what they used to know, and offer the younger ones a sense of that

true genius such as Wolfgang Mozart, a Beethoven, or Johann Sebastian Bach before them. It is the characteristic quality of state of mind of all great Classical, as distinct from and opposed to the methods of Romantic compositions in poetry, plastic arts, and song. The form of punning expressing true Classical metaphor, as distinct from infantile barnyard varieties of rhyming games, is typical of all creative personalities. It is precisely such cognitive playfulness, in the Classical tradition associated with the honored memory of Plato’s Athens, which must be the foundation of child-rearing and public education.

presently indispensable experience, which, under present world crisis conditions, they most urgently need to come to know.

In the following pages, I shall also remind many among my fellow-survivors of that older generation, that there are some other important things they, unfortunately, had not yet learned. The immediate object at this point in the report, is to focus upon the evidence of what used to be more or less traditional industrial engineering practices, as a platform from which to launch a practical approach to an understanding, by today's readers, of what a "basket of commodities" implies.

I begin this section of the report with an outline of the bare rudiments of the production cycle, as these might be needed by most chief executive officers of today's giant industrial corporations, whose recent, publicly visible performance attests, that even persons of their rank and age have little or no experience, who have virtually no comprehension of the interior of a durable form of competently directed agro-industrial economy in general. From those introductory observations, I shall proceed, by successive approximations, to identify and resolve the apparent paradoxes of the productive process which involve the essential, determining function of those interrelated notions of *non-linearity* and *anti-entropy*, to which I have referred above.

Formerly, as recently as thirty years ago, the beginning of even rudimentary competence of an individual in any aspect of the management of production, or accounting, was centered in the apprenticed prospective production executive's ability to prepare a reasonably accurate version of two measurements of the most simply defined of the directly incurred costs of production of any physical product manufactured. These were *process sheets* and *bills of materials*.

During the recent three decades, with a skyrocketing proportion of managerial and quasi-professional occupations of doubtful utility to society, or worse, the ration of business executives competent in even the most rudimentary aspects of production economics has collapsed, both in relative quantity and quality. If the U.S. economy, in particular, is to be resuscitated, presently continuing trends respecting composition of employment, must be sharply reversed, returning the economy to approximately the ratios of composition of employment of thirty-odd years ago. Restoring competence in what might have been lately shunned, as "old-fashioned" types of production management skills, will be urgent.

Among professionals, and in the related published literature of that field, there have been various definitions of these cited two kinds of production-related documents. My definitions here, while brief, are both competent and fair, and will probably prove satisfactory for the pedagogical purposes immediately at hand.

The first of these two kinds of reports, *the process sheet*, was completed by tracing the progress of production through the successive points of action upon work in progress on that item, from point to point of the production sequence, from beginning to end of the cycle, to the packaging of the completed product for delivery. This included an identification of the materials and components introduced at specific points in the succession. The *bill of materials* complemented the process sheet with an overlapping identification of the gross and net quantities of components, materials, power, and supplies, the which were incurred as costs at each point of the sequence represented on the process sheet.

The process sheet was premised upon either an existing, or implied mapping of the total points of production, and of operations auxiliary to production, thus mapping the enterprise's production-process as a whole. Each particular process-sheet so situated, was associated with a specific product or group of products, associated with a definite workplace in each point in the sequence, and associated with the kinds of technology specific to the operations performed at each such location.

The flow of production through the relevant sequence, was not measured in units as such, but either measured in economic lot-sizes, or in unit-quantities implicitly corresponding to, and thus convertible into either standard, or adjusted kinds of economic lot-sizes.²² For these process sheets, production activity was thus measured actually, or implicitly in such lot-sizes, and units processed at each point in the sequence, that in amounts corresponding to output at that point, per working shift during all or part of a working day.

The bill of materials identified the identity, and the estimated gross and net amounts of the materials and components, and of power and other supplies, required for each average unit

²² Generally speaking, only by exception, was production-flow organized in single units of output of a specific design of product. In most cases, the flow was usually organized in batches, batches selected to meet the standard of what was called an "economic lot-size," batches in which the average incurred cost per unit tended toward either a simple minimum, or an optimum balance between cost per unit processed and the requirement of maintaining a desired mix of types of unit-products flowing through the process during the entire day, week, or month.

Notably, the value of the output of a factory, or closely related group of factories, requires that the producer organization's market be satisfied, by a reliable level and balance of flow of produced output among the product-mix, that a variety of kinds of things proffered to the usual customers by the producer's catalogue. Obviously, there is an implied asymptotic, economic limit to such variety, a limit expressed as an inverse of the function of economic lot-size. Therefore, as in automobile manufacturing, tying design of type of product to model-year marketing, or increasing the variety of types according to garment-manufacturers' efforts to saturate a market for current style-preferences, tends to increase the costs of production and prices, as well as the tendency for chaos and outages in output. Related kinds of problems arise in the manufacturing of military-combat aircraft, for example, in which understandably frequent modifications of design tend to create an administrative, and both a production and a maintenance nightmare.

Those interested in pursuing such matters may study extensive literature on the overlapping topics of critical-pathways in production scheduling, and the relevant impact upon input-output analysis.

within the lot produced, also locating the point in the process sheet's *critical pathway*, at which the consumption of such items occurred.

Estimated prices, such as that of labor and other components, materials, power, and other supplies, were then applied to the results of that study.

Such backtracked connections were not only the model for tracing the process of production in manufacturing plants, but also for general construction, transportation, and agriculture. This practice also provided an approach to a rough but meaningful mapping of the flow of production and products through entire economies, even the world economy as a whole.

As I used to point out, in my series of lectures on economics, if we backtracked, from the process sheets and bills of material for any product in production from enterprise A, to define the process sheets and bills of materials of the set of vendors, located collectively at point B, the latter being those who supplied each among the essential elements consumed by A, and then proceeded, similarly, to the set of vendors, gathered at point B, who supplied set B, set C, and so on, we might discover, that backtracking the sources behind a single cup of coffee sold and consumed in a particular restaurant, would soon take us around much of the world, confronting us, so, with the vision of a "world-wide cup of coffee," so to speak.

This backtracking must take into account not only the direct costs represented on relevant process sheets and bills of materials, but also the incurred, indirect requirement of the physical capital improvements associated with each point in the network.

Thus, reflecting so on all the direct costs and required capital improvements expressed in the existence of the world-wide cup of coffee standing before us, a conception of much of the entire world comes into view, not only the world of the present moment, but of many generations past, and, for the more thoughtful person, an insight into the possible future.

That is the gist of the matter, thus far. At that point, with study of the physical (rather than monetary) capital factors, we go beyond the limits of the world as seen in terms of cost accountants' linear estimates of elements of simply direct cost in process sheets and bills of materials. Now, bringing capital factors into play, the factors of non-linearity, which I have indicated earlier, dominate our investigation.

The productive process is intrinsically non-linear, the more ominously so as the capital-intensity increases, and as increased rates of changes in technology are incorporated into both the performance and the decision-making. The development and performance of the labor-force itself, is intrinsically non-linear in all respects. The actual results of taking into account physical-capital factors of these varieties, therefore rarely correspond, even in approximation, to the linear assumptions popular among such economics illiterates as most present-day financial accountants, business-management school courses, and the like.

The same conflict with conventional financial-accounting world-outlooks, erupts with great force in matters pertaining to the organization of the productive process viewed as a whole, and as it is to be viewed in light of the consideration of capital factors generally.

Notably, from the standpoint of the qualified production-management specialist, recent decades of increasing domination of the administration of production by a linear financial-accounting mentality, have produced remarkable increases in the variously hilarious, sometimes slapstick, or profoundly tragic results of increasingly weighty interventions of Wall Street mentalities into the direction of the U.S. economy. The introduction, from the 1950s on, of the follies of management propagated by institutions such as Harvard Business School, with their calculations of such tulip-bubble-speculation-like considerations as “financial opportunity loss” factors, are notable.

The difference between the risk of the kind of blunders more typical of the qualified production management in earlier decades, and the follies, then and now, of Wall Street’s and kindred financial-management supercargo, is that Wall Street has had an increasing preponderance of public-relations control over mass-media, and has enjoyed that and other old and recently introduced existing modes of the political power, for covering up the variously scandalous and tragic consequences of the follies intrinsic to a typically linear Wall Street mentality.²³

To understand that Wall Street mentality, and its echoes among the Street’s more pathetic varieties of bucolic lackeys, such as a U.S. Senator Phil Gramm or U.S. Congressman Tom DeLay, we must bring into focus such persons’ common, aggressive form of imbecility respecting the capital factors of technology and labor. The technical side of the causes for the present global financial crisis, is to be found in the sources of what has passed for the education of the like of Gramm and DeLay: that is to emphasize the linear mentality commonly expressed in the academic domain by the influences of such disgusting creatures as Thomas Hobbes, John Locke, Bernard Mandeville, David Hume, François Quesnay, Adam Smith, anti-Leibniz fanatic Euler, and utilitarians and hoaxsters such as Thomas Malthus and the original head of the British Foreign Office’s secret committee, Lord Shelburne’s lackey Jeremy Bentham. In other words, those names typify the mentality common to that taught by what pompous academic fools, such as Senator Phil Gramm, teach, still today, as “Classical political-economy:” the legacy of the opium-trafficking British East India Company’s Eighteenth-Nineteenth-Century Haileybury School in political-economy (**Figure 6**).

²³ “Your Baby-Boomer cronies will stop laughing at you for wearing it, when they read how good the sale of that product looks on their corporate balance-sheet!”

Economic Time and Anti-Entropy

As I have already indicated here, the first-approximation definition of intrinsically non-linear expressions of capital factors, is the implicitly non-linear characteristic which is to be recognized from close study of certain paradoxical peculiarities of the role of *lapsed time* in the production process. Certain stubborn paradoxes oblige even the simply intelligent observer to see that this notion of time can not be the linear time of Galileo's *aprioristic* or "ivory tower" notion of reductionist matter swarming in so-called "Euclidean" space-time. This is time as defined as "least time," or "pathway of shortest time," in the spirit of Fermat, Christiaan Huygens, Leibniz, and of Riemann's notion of multiply-connected manifolds.

Thus, broadly speaking, it is the action which accomplishes its objective in relatively shorter time, which yields either an only apparent, or real increase in physical-economic productivity. This notion of measuring in terms of the pathway of shortest time, in opposition to choice of what is apparently the "Euclidean" notion of shortest distance, locates the relevant economic effect not in so-called Euclidean space-time, but in a Riemannian view of physical-economic processes, as a process situated within a relevant kind of multiply-connected manifold.

The relevant objective, is to introduce changes in technology which have the effect of improving the characteristic curvature, and therefore the relative definition of shortest time. Such a notion of shortest time, is not that located in Galileo's "ivory tower" notion of physical action in linear space and time, nor in time as measured by financial accounting. This is time as locatable only within a non-linear, anti-entropic geometry which is axiomatically the domain of the efficient expression of the actual, physical-economic action.

By "actual," I signify the physical action which produces the observed effect, rather than the accountant's usual, linear effort to consider only the effect in and of itself. In other words, such an accountant will stubbornly insist on interpreting the action by representing the apparent effect of successive events in the manner of connecting the dots on a graph. That simplistic view would be comparable to representing the human activity of walking as the portrait of the footprints of the action, rather than the action which produces those prints.

To most persons, at first encounter, this notion of the measurement of shortest time in production, may appear to be a strange notion, but the conception, and its indispensable function, begin to become clear when we turn to measuring economic progress on a scale of increasing anti-entropy.

In first approximation, this notion of least time, is as it appeared in the succession of the work of Fermat, Huygens, Leibniz, and, hence, in Riemann's notion of the characteristic curvature of action in an hypergeometric physical space-time manifold. This conception of least time, serves as an integral part of the notion of long-term capital factors of economy.

Notably, this approach to defining the notion of relatively shortest time, corresponds, as I have just emphasized, to the notion of variability of the characteristic curvature of physical space-time. The characteristic standard of measure of *shortest time of physical-economic action*, is then seen as determined by changes in the principles of the relevant Riemannian type of notion of physical-space-time geometry of the field of action being considered.²⁴

This notion of *economic time* is not only the most appropriate one, but is indispensable for dealing with the definition of relative rates of effective capital attrition under conditions of changes in practiced technology. Some fairly simple, but also crucial illustrations of this point are available.

Those notions come to the surface of attention when we consider so relatively simple a change, as decrease of the average lapsed time between two distant points of production, or of production and consumption, that according to improvements in speed, capacity, classification, or warehousing procedures, in transport of goods or power. Also, consider such notions of changes in rate on account of factors of capital attrition, when technological progress increases both the physical efficiency (e.g., implied contribution to productivity) and rate of attrition of old investments, and yet decreases the real (physical, replacement) cost of old capital investments relative to the productive powers, and incurred costs of labor.

More profoundly, physical-capital factors, when situated within the domain of those actions corresponding to the act, rather than the footprint, of actual or implicitly possible technological progress, define the domain of physical economy as a domain of changes in *characteristic least action*, as such action is to be defined in a Riemannian way. This obliges the economist to view the action of the operative at the point of production, for example, as *action* in Leibniz's use of *Kraft* (e.g., power) in his sense of universal least action. This notion of *characteristic action*, of Leibniz, is also the notion of action implicitly intrinsic to Riemann's habilitation dissertation.

Thus, to restate that important point, economic action is not to be seen as financial accounting practice usually does, nor as the reductionist school of Galileo *et al.* views action, but in the relativistic sense of Leibniz's definition of universal least action. *The meaning and value of action, such as the productive act of the individual production operative, is thus transformed in ways which correspond to notions of changes in power of action, as determined by*

²⁴ It should be noted, as a matter of precautions against simplistic, "Newtonian" readings of the point being made here, that the notion of relative time must be adjusted when we pass from examining non-living systems to living systems, and, changes in a fundamental way, when we pass from focussing upon only lower forms of living processes, to cognitive processes. In truth, time has a relative, not absolute value. The function of time in living processes, is among the interesting paradoxes still to be addressed more adequately today.

*changes in the technological manifold in which the observable specific action is situated functionally.*²⁵

Simply illustrated, this kind of increase of the power of action, such as that by the operative, is the case, even when the technological form of the action performed by the operative has not changed, but only the technological environment in which that act is situated. The same plumber employed in a production facility, when the latter facility is associated with relatively higher levels of technology, is more productive than when the same plumber was employed, with the same skills, in a plant based overall upon a relative lower level of technology. The rate at which the plumber's contribution, integrated into the process as a whole, impacts the production process and product as a whole, through the division of labor in the plant's process as a whole, is accelerated by being situated within a domain operating, overall, at a higher technological level.

A change in the nature in the choice of multiply-connected manifold, as the latter is represented by technological changes introduced to design and production of products, has the effect of changing the Riemannian form of relativistic physical-space-time curvature of the domain of action in which the action of, in this example, the plumber is situated. The resulting coupling is not, as some would propose, action as mis-defined by Galileo's notions of matter, space, and time, would define action upon another manifold, as if externally. The action is defined by the effective physical-space-time curvature of the technological manifold within which it occurs, as action performed directly upon, and within the manifold represented by all among the interacting technologies of that domain. Thus, the relative anti-entropy of the domain in which the plumber's action occurs, is changed, thus bringing about an increase in the plumber's productivity without any change in the techniques employed directly by the plumber himself.²⁶

Those cases, of transport systems and of the plumber, also illustrate the role of basic economic infrastructure in determining the relative productivity of the farm or factory situated in the relevant locality. This, similarly, illustrates the implicit, principled, intrinsic, vast superiority in economic performance, under the protectionist model of modern sovereign nation-state economy, over the relatively miserable performance, and misery produced by an economy subjected to the IMF's WTO's common practice of the triple evils of compounding the lunacy of Carter-style "deregulation," by adding the draconian imposition of "free trade" and "globalization."

²⁵ It should not be overlooked, that the notion of relativistic time reflected in the foregoing illustrations, are reflections of the impact of human cognitive action in changing mankind's functional relationship to nature in general.

²⁶ Thus, the act of digestion by a chimpanzee in a zoo, has a different significance than the act of digestion of a virtually identical banana by the child watching that chimpanzee eat.

The latter observation also points to the fact, that the attempted technological development of the economy of China would fail, terribly, unless the introduction of new production technologies were situated within the technological realm defined by massive development of the basic economic infrastructure of China's deep interior. The same is true for India; without a revolutionary improvement in the basic economic infrastructure of India's countryside as a whole, technological progress locally within urban centers, would turn out to be an economic and social catastrophe—an existential catastrophe!—for that nation as a whole. Similarly, the development of Asian Russia, and of the associated states of Central Asia, is crucial for the success of technology-driven attempts to revive the economy of Russia as a whole. We shall address that matter affecting those three and other cases, more directly, in the next section of this present report.

Those just-cited considerations are brought into the foreground, by close examination of even the most rudimentary examination of physical factors of capital formation. At this point, we must abandon the simplistic notion of time associated with empiricists such as Galileo; we must normalize the measurement of economic time according to *a universal economic principle of anti-entropic action*.²⁷

As relevant authorities have emphasized, in living systems in general, as I have just indicated for the case of economic processes, the notion of time must be adjusted to the relativistic considerations inherent in the fact that the action to be considered is situated within a manifold, that of living processes, which is characteristically anti-entropic.

As I have stressed earlier here, as in my *Trade Without Currency*, in treating economic processes, all competently defined notions of physical function must be reduced to a measurement of the relative *anti-entropy* inherent in the economic process considered as an entirety.

What should the word “entirety” be understood as including? My generation among economists wrote often of the problem of defining a certain kind of economic “horizon,” the assumed boundary represented by a certain point in the future, a point defined as one beyond which the relevant kinds of significant effects of today's policy-decisions could be seen as more or less settled consequences. As I have stressed, as a practical matter, such measurements, including forward estimates for physical-economic rates of growth, should be constructed for a base-line period defined by a “horizon” which may be estimated today, as of not less than a quarter-century. By relative anti-entropy, we signify, in first approximation, the ratio of the gain to the previous volume of the total expenditures upon which the generation of that gain depends.

²⁷ The choice of the term “normalize,” was made here to emphasize the methods of observation employed successively by Kepler and Gauss in the matter of astrophysical, for Gauss, geodetic observations.

For the benefit of the novice, we return, for a moment, back to the pedagogical tactic of first approximations.

In a monetary system, the apparent competitive value of the total product of a national economy as a prospective investment, is a discounted amount, which, unfortunately, is often estimated, *falsely*, by dividing the margin of profit of the economy as a whole according to a ruse akin to estimating the prevailing ratio of nominal return on investment in that market (e.g., “financial leverage”). Even worse, as in the tulip-bulb-bubble-minded practice of both today’s traders, financial speculators, and central bankers, such estimations are made on the base of extremely short-term estimates of the nominal rate of return for the national economy being assessed.

In a much saner practice than today’s monetarists will tolerate, calculations are to be made, as I have said above, in a physical economy on a standard baseline “horizon” of about a quarter-century into the future. The physical-economic, rather than merely financial standard used for defining an estimated future return, is premised on physical-economic values only.

It is fraud, to have counted as a benefit—“a windfall”—the overlooking of what must be counted, in fact, as a marginal loss to the productivity of an economy, a loss which is caused by an amount of depletion or ordinary depreciation which should have been deducted from reported profit, or economic growth. Such a form of fraud has been commonly perpetrated in recent decades U.S. national-income accounting. That is to say, that it is fraudulent, as the U.S. government has done since 1971, to estimate economic performance in ways which overlook the obligation to replenish the depleted resources and capital one has left to rot, such as past investments in public works, or to overlook the losses to the economy as a whole by scrapping, or not replenishing the quality of future labor-force required, or to disregard the abandoned investment in past capital improvements in production.²⁸

As I have already indicated, the quarter-century estimate has the included significance of not only taking into account the minimal span of a reasonable estimate of a capital-replenishment cycle, but also the way in which the accumulation of productive capital may be expressed in terms of the physical-economic output of the population.

Now examine the implications of what I have just said, in the following terms of approximation.

²⁸ Much of what was counted as gains in U.S. National Income and Product during the 1970s and beyond, counted trillions of dollars of aggregate depletion of former investments in essential infrastructure and so forth as a contribution to the Gross National Product! Had such looting of the combined private and public sector’s prior capital investments been charged against cost and expense, the statistics would have shown the U.S. economy as contracting, especially during and following the Presidency of Jimmy Carter.

The Basket in First Approximation

The standard used should take two classes of current activity-levels chiefly into account.

The first, is the standard of living of the portion of the total labor-force whose employment is “consumed” into the current production-process, as in the form of the work of either operatives or technicians in the production of the physical output as products of the total economy, at presently prevailing levels of technology. This approximation is correlated with the notion of a base mean wage-level of physical-economic standard of income for the households represented by the labor-force’s operatives and technicians, a level of income corresponding to a mean base-level of relative skill and productivity of the labor-force in general.

That estimate includes the market-basket of not only physical products required for the mission of sustaining a defined standard of living and potential productivity. We must include an indispensable provision for maintenance and improvement of those essential public and other services, such as education and healthcare, and also participation in Classical forms of artistic composition, and so on, on which the maintenance of the present and future productive potential of the labor-force depends absolutely.

The second is the replacement value, as measured in current costs of physical production (not historical financial prices), of the combined public and private capital investment in infrastructure and production. Other physical-economic values to be considered are assessed both by relevant forms of comparison with those two, and by their functional relationship to them. In addition, such calculations include a provision for assessing the structure and demographic characteristics of the social composition of the population, the labor-force portion of that population, and related matters.

Also note, that if the population as a whole is in decline, to remedy that decline, there must be either an appropriate form of combined increase of the birth-rate and decline of the death-rates, to correct the tendency toward economic auto-cannibalization of the nation, or the failure to effect such remedial increases, must be reflected in a discounting of the estimated rate of profitability and productivity of the economy as a whole.

The general objective to be met by such estimates, is not to pre-fix prices, as might be attempted in rigid national planning by financial accountants, but to define a scale on which to study comparisons among relative values. The purpose is to secure a clearer conception of the notion of what should be maintained at what are at least present physical-economic levels, as distinct from what must be improved, or decreased, to make possible a better than zero-anti-entropy level over the foreseeable quarter-century or so ahead. Once that level is estimated, then the relevant policies can be identified.

In other words, the notions of “better” or “worse” must be stated in terms which, implicitly, fairly estimate a zero-level of *the ongoing rate of increase of anti-entropy*. Such estimates must be constructed in modes which lend themselves to expressing all estimated values in terms of the social division of labor within a population of relatively viable physical-economic forms of demographic characteristics.

To summarize and reformulate the implications of the points just listed, we have the following.

Put the structure of the content of a basket of commodities to one side for a moment. We shall return to that matter after the following, crucial conceptual problem has been summarily reviewed.

What I am about to say here—which I have said often before this occasion—is beyond the scope of what most people today will be willing to consider as “practical.” Nonetheless, this topic is absolutely indispensable for understanding the underlying principle of all economic processes.

In the present state of world crisis, the likelihood that civilization as we have known it, will survive the present brink of a global new dark age, depends upon an understanding of this matter among at least some leading circles of those influencing the shaping of national policy. Like the practice of medicine, which few patients have mastered, it is a subject in which competence is sometimes essential, if threatening crises are to be overcome by the society, to save the lives of the knowing and witless alike.

The underlying practical reality of any form of economy, is as defined only by the science of physical economy. No form of actual economy could ever be viewed competently as anything other than a reflection, a by-product, of that specific *anti-entropic* quality of individual human action, called (by the hoaxster Kant) *synthetic judgment*, or termed, otherwise, *cognition*, the which sets the human species apart from, and above all other forms of living processes. All the deep, controlling principles of the science of physical economy, and of competent economic practice in general, depend upon a more or less efficient grasp of what are the initially stunning implications of recognizing the function of cognition in determining the potential relative population-density of the human species in general, and societies in particular.

As I have already reemphasized above, the typical, although not the only efficient expression of that specific distinction of the human individual, is the experimentally validated discovery of a universal physical principle, a discovery which occurs, and which could only occur, within the bounds of the non-deductive, sovereign cognitive (e.g., synthetic-judgmental) powers of individual human reason. This notion of individual reason, is the same conception

of the possibility of truthfulness and justice which Plato's Socrates defends against the contrary views of the characters Thrasymachus and Glaucon, as that dialogue is developed in the great work most commonly known today as Plato's *Republic*.

The implications of this quality of individual human cognition for physical science, are those given a rounded expression by Riemann's 1854 habilitation dissertation. The most relevant comments upon that dissertation, are the following.

Riemann's work is to be recognized, and understood, as the outcome of the efforts of many predecessors, that of Carl Gauss most immediately, as also of Leibniz most emphatically, and also of Kepler before Leibniz, and of Cusa, Pacioli, Leonardo, and others before Kepler. The most crucial feature of Riemann's dissertation, is the boldness with which he, at the start, publicly eradicates the authority of all *a priori* (e.g., "ivory tower") axioms of matter, space, and time, including Aristotle's reductionist prescriptions, and replaces such *a priori* axioms by new principles which are defined solely by the authority of experimentally validated discoveries of universal physical principles. The most important among the subsumed features of that dissertation, is that it takes physics out from under the tyranny of the department of ivory-tower varieties of mathematical physics, and places the determination of the universality of discovered universal physical principles, under the dominion of a certain, unique notion of relevant experimental designs.

This view of uniquely experimental proof of the validity of universal physical principles, serves as the axiomatic foundation for the ability to measure the form of the physical-economic increase, per capita, of the power of the individual person in and over the universe at large. That conception, as the implications of Riemann for physical economy were anticipated by the relevant 1671–1716 work of Leibniz in defining the science of physical economy, is the pivotal principle upon which the authority of any competent study of economy depends absolutely.

In this relatively narrower, first-approximation view of the facts of physical economy, one is already compelled to consider a most startling fact. Since mankind's increase of power in and over the universe—i.e., of potential relative population-density, occurs only in the form of the application of valid discoveries of universal physical principles, the generation and application of such discoveries, must be admitted to be the only form of action through which mankind is able to increase its power over the universe. That should be read in, broadly, the same sense Vernadsky, in his work on biogeochemistry, shows the independent power of a universal physical principle of life over non-living processes.

So, taking the facts as considered up to this point in my argument here, the evidence is, that if valid discoveries of new universal physical principles, are the only form of action by means of which mankind is able to increase our species' power in and over our universe, then, such

are the only forms of action which express the principle upon which all competent study of economy depends: the ability to willfully increase the potential relative population-density of the human species.

Suddenly, thus, the meaning of the term *action*, is removed from the sense-perceptual domain as portrayed by Galileo, Newton, Euler, Clausius, Helmholtz, *et al.* Suddenly, we find ourselves, so to speak, in Plato's cave. The world of sense-perception is once again recognized to be merely the shadow-world. The real world lies in those forms of action, by means of which mankind is able, willfully, to increase the human species' power in and over the universe. There, expressed in the experimental validation of universal physical principles, in the partnership of our mind and hands, not in the reductionist's shadow-world of simple sense-perceptions, lies man's functional relationship to the universe and its laws.

For that reason, the notion of action upon which the practice of a science of physical economy must be premised, must be action of the anti-empiricist, anti-Kantian, cognitive form indicated. Furthermore, the characteristic form of action in that domain, can be nothing other than the principle of universal anti-entropy implied by the notion of an implicitly orderable series of successively higher forms of Riemannian multiply-connected manifolds. That is the general definition of anti-entropy for the mathematician. It is within that sort of Riemannian space-time, not the shadow-world of sense-perceptual space-time, that the real universe exists, in which the efficient form of real action is situated.

We are, thus, once more, sent back into Plato's cave. In a universe, in which the only form of man's efficient action, as I have described such action here, is anti-entropic in quality, *change*, as Plato, in his *Parmenides* dialogue, qualifies Heraclitus' famous aphorism, is definable only as the essential ontological form of substance, a quality of substance which stands in contrast to the mere shadow-world of sense-perception as such.

Thus, the adopted functional notion of time, must be in accord with such an ontological principle of time as defined by the action corresponding to efficient universal anti-entropy.

The Universality of Cognition

I have already stressed, that the fact that the increase of society's potential relative population-density is measurable in per-capita terms, does not signify that human progress is determined functionally within the bounds of the individual person's direct relationship to that universe. Here we confront a most important paradox. On this account, I must now summarize, as briefly as permissible, a point which has been central to all of the most important aspects of my work, and related published writing, during more than a half-century.

Every generation of a valid discovery of a universal physical principle, could occur only within the sovereign bounds of the cognitive processes of an individual human mind. That discovery occurs in the same fashion a metaphor is generated and resolved, as the subject of a successful form of what a Friedrich Schiller would recognize as a Classical poetic composition, or Schiller, like Mozart, Beethoven, and Schubert recognized, in their correction of an erroneous opinion of Goethe, as the manner in which Classical poetry—including that of Goethe—should be represented in the domain of Classical musical composition.

A contradiction of a special form erupts in the form recognizable in physical science as what is termed an *ontological paradox*, as Plato's *Parmenides* typifies the notion of an ontological paradox. A true metaphor in great Classical European poetic compositions, is an example of the same kind of contradiction. The pedagogical puzzles of counterpoint, as typified by J.S. Bach's use of the concept of Lydian intervals, in his composition of his celebrated *A Musical Offering*, illustrates this point. As I have elaborated this in many published reports on this subject, the cognitive experiences responsible for generating a to-be-experimentally validated discovery of a universal physical principle, occur only within the sovereign boundaries of the cognitive processes of the individual human mind, an act of discovery which is neither subject to observation by sense-perception, nor by means of the kinds of use of language associated with reporting sense-perceptual experiences as such. Nonetheless, the experience of discovery can be validated experimentally, and the ontological paradox which provokes such a discovery can also be replicated within the experience of others.

Once we recognize the uniqueness of discovery of universal physical principles, as the unique expression of man's power in and over the universe, we are obliged to regard as primary, the only means by which the cognitive experience of one mind can be replicated within the experience of the sovereign cognitive processes of another individual.²⁹ Otherwise, without such replication, the ideas of universal principle can not be transmitted from one individual mind to another. They certainly could not be transmitted by any deductive method, such as literal speech premised on simple observation of sense-perceptions. Otherwise, cooperation

²⁹ The example of the challenge of performance of Classical musical compositions, is among the most convenient demonstrations of this point. The competent performer does not sing the notes, but, rather, the music. The notes are merely a mnemonic device, which the performer accepts faithfully, but which he, or she, as a musician recognizes as the footprints of the music, not the music which defines those footprints. After all, a Bach, Mozart, or Beethoven, knew exactly what he was doing, in putting down certain notes; but, what interests the competent performer, is not the notes as such, but rather the solutions to contrapuntal puzzles which are embedded as challenges to the performer among the notes themselves. Wilhelm Furtwängler sometimes referred to this as "performing between the notes," reenacting the action of the composer, rather than interpreting the footprints. The singer of Classical song, for example, re-creates the experience of the adduced intent of the composer, to the purpose of bringing the effect of that intent to life within the cognitive processes of the individual members of the audience. Such accomplishments are the essence of truly human forms of communication; nothing different can rightly enjoy the reputation of art.

around such ideas, by society, among members of living generations, and with future generations, were not possible.

Thus, just as validatable discoveries of universal physical principle are a unique expression of man's power in and over the universe, so the ability to communicate the replication of such ideas, is an elementary form of efficient cooperation in application of such discoveries within society.

Thus, like the Classical scientific method of Plato through Riemann, those forms of artistic composition known as Classical, as opposed to the Romantic, for example, are an indispensable expression of the means by which the minds of members of society can establish that cooperation through which notions of truthfulness and justice, as well as physical-economic progress are made possible.

Thus, contrary to Immanuel Kant, for example, the phenomena of cognition define those individual and social functions, the which express the specific nature of the individual human being, and of society. The cognitive processes' functions, as associated with scientific and technological progress, are explicitly anti-entropic; those associated, typically, with Classical artistic composition, are implicitly so. These functions of cognitive communication within society, define the mission-oriented cooperation upon which the continued successful existence of successful political economies depends absolutely.

Therefore, the maintenance and development of those cognitive qualities of functional relationship, from one generation to the next, and within contemporary society otherwise, must be considered an indispensable cost of any viable form of political economy. A society of Yahoos, such as the condition to which the unfortunate majority of today's United Kingdom has been degraded, especially since the awful consequences of Prime Ministers Harold Wilson's and Margaret Thatcher's tenures, is scarcely an actually human form of society, and not one of a type qualified as likely to survive in such a form.

Thus, the elements of education and participation, as artists or audience, in what are, at worst, decent approximations of Classical humanist forms of education, is as essential a component of the necessary standard of living of the family household and its members, as food, clothing, healthcare, and shelter. The level to which such aspects of leisure and education are promoted, will determine the level of potential productivity in the labor force, in the society and among its members. Classical humanist education and recreation are, thus, an integral, indispensable part of the cost of living.

The Matter of Structural Reform

Thus, in defining the indispensable elements of physical cost for an economy, we must, of course, put emphasis upon education in the discovery and use of physical principles.

However, to accomplish that, as I have just said, requires the development of the person and of social relations in ways congruent with the notions of Classical, that is, intrinsically cognitive, modes of artistic composition. This requires a composition of the organization of the energy represented by the living day of the family household, community, and nation, in ways in which not only such forms of education are nurtured, but in which leisure is promoted to such specific ends.

Thus, both the physical act of production and that development of the individual personality through which anti-entropy is introduced to economy by means of human labor, are non-linear. The act of production can be competently assessed only by the yardstick of anti-entropy. Economic events are then to be defined, as I have illustrated the case of the plumber, for their relative anti-entropy, in their actual functional relationship to the *relative* anti-entropy of the domain within which those acts are situated.

The context in which those acts are situated, is to be understood in terms of the sort of Riemannian multiply-connected manifold which represents the multiple-connected unity of three classes of universal physical principles: a) ostensibly non-living, b) living, and c) cognitive. As I have already stressed, once again, in this present report, in this configuration, the living dominates the non-living, as Pasteur and Vernadsky have insisted, and the cognitive dominates the living otherwise defined. Of these three, only the latter two are intrinsically anti-entropic, *if each according to a different universal physical principle*—the distinction of the physical principle of cognitive processes from those of other expressions of the physical principle of living processes. *It is the multiple-connectedness, that in the sense of the usages of Gauss and Riemann, of the sets of universal physical principles associated, respectively, with non-living, living, and cognitive processes, on which the anti-entropy of the non-living aspects of a physical economy depends absolutely.*

On this account, the existence of the productive action within an economy, must be defined as situated within the developed condition of the basic economic infrastructure within which the definable individual action of production is situated.

It is in this context just summarily described, that the structural composition of functional classes of employment are to be defined.

As I have prescribed in my *Trade Without Currency*, the physical-economic standard of relative value of the output of an economy considered as a whole, is provided by *the comparison of the net physical output of economy, both per capita and per square kilometer, with the forecastable rate of growth of the net margin of gain in output.* This estimate can not be a deduced value; it must be premised upon foresight into a reasonable choice of horizon, in which relevant capital factors bearing on the medium- to long-term are adequately taken into

account. Hence, the indicated choice of a quarter-century horizon, as a fairly estimated practical standard for present uses.

This required forecast provides a standard of reference for defining what are the necessary physical-economic factors needed, to sustain at least present levels of productivity of the labor-force, and also provide growth in net physical-economic rate of productivity.

This presents us with not only a required physical-economic standard of consumption of households, and of the capital factors of farming, industry, and so forth, but also a rather precise definition of optimal composition of the social division of labor within the economy as a whole. This composition is sometimes referred to as a *structure* of employment and investment, as the term “structure” has been employed under the title of “structural reform” of the economy. One might wisely think back to Alexander Hamilton’s December 1791 Report to the U.S. Congress, *On the Subject of Manufactures*, where the progressive development of structure of the division of labor between rural and urban economy is taken up. The included object of the general reform needed to deal with the present crisis, is to reverse the “structural reforms” introduced under that name, which were pushed during the 1970s and 1980s, to return to approximations of the structural composition of a better day in modern European political economy.

Although the corresponding structure of economic composition of a national economy, is sometimes regarded carelessly as a division between public and private sectors, in the real world, such a division of labor never need be seen in terms of iron-clad, fixed distinctions, but only as an effort at approximations.

A broad division between rural production of products of forest and farm, on the one side, and urban manufactures, on the other, as by Hamilton, illustrates the point. However, neither a division between urban and rural production, nor a strict division between public works and private enterprises in the maintenance and development of basic economic infrastructure, can be strictly defined in any general way. Some discussion of this and related matters is indispensable.

As I have repeatedly stressed in other locations, the indispensable role of government in the maintenance and development of basic economic infrastructure, is to be derived from the principle, that the moral right of government to rule is conditional upon its efficient commitment to what both Governor George W. Bush and Vice-President Al Gore have fanatically rejected, the constitutional obligation to promote the general welfare. However, this does not necessarily mean that this is a sector of the economy axiomatically relegated to government. It means that government is responsible to see that the job is done, and done properly, in a timely fashion. In all sane practice of the U.S. Government, this means that either the government or private enterprise may perform the function, *but*, that government

can never abandon its regulatory functions and duties respecting basic economic infrastructure as a whole.

Above all, whether the maintenance of infrastructure can be performed profitably, or not, is irrelevant. It must be done, in any case. If the private sector does not, government must.

Conversely, there is no section of private enterprise from which government is to be banned categorically. In U.S. history to date, government has often taken a leading role in sections of private enterprise, such as the operation of arsenals by the military, and related and similar responsibilities for leading in the fundamental and other research and development upon which technological progress of the nation as a whole depends absolutely.

The continuing, non-divestible duty of government, is to ensure that the necessary job is done. The distinct function left to the authority of private enterprise, is to undertake progress in areas which are not perceived by government to be in direct or implied mandatory assumption of responsibility by either government or existing forms of private enterprise. The responsibility of government to foster progress, is not also the right of government to prevent technological progress at the expense of private entrepreneurship. The government must meet the economic obligation which the private sector either fails to perform, or which is currently ill-suited to its role; however, private entrepreneurship is not to be restrained, on principle, from doing what the government is reluctant to undertake.

If those points are properly understood, the respective economic functions of government and private entrepreneurship shall get along rather well.

Thus, in any general definition of the structural composition of labor in a national economy, the matter of whether a function were performed by government or private entrepreneurs, is not a clearly predefined division in any general way. The division of labor on this account, varies with the circumstances. What remains consistent, from case to case, is the notion of what must be done, and how, not which must do it.

Thus, the division of labor, as represented by the structural composition of employment of the total labor-force, is primarily that among development and maintenance of basic economic infrastructure, production of primary and refined materials of production in general, household and related goods, capital goods, and scientific and technological progress as such. Overlapping that division is the division of labor within the organization of production and distribution of physical goods: such is the output side of the structural composition of the whole. The overlap among these, results in a set of ratios among categories of employed division of labor of the labor-force as a whole; such is the input side of the structural composition. The applicable general rule is, that, respecting both the output and input sides, the capital-intensity must increase, and that, also, the ration of the total

labor-force engaged in forced-draft forms of scientific and technological progress as such must increase relative to the employment of the labor-force as a whole.

This should require no further elaboration on the details of that matter; the principles should be implicitly clear. Only the implications of rising (physical) capital-intensity require a point of further clarification. Return to the example of the plumber, referenced above.

The characteristic feature of a successful economic process, is the increase of anti-entropy, as I have discussed this above. The sources of this anti-entropy, include living processes generally, with emphasis upon living processes of increasing equivalent of energy-flux-density per unit of scale and mass. Thus, we make the deserts bloom, and the forests prosper, for as simple a reason as that this is something worth doing for the general benefit of mankind. We increase the rate of anti-entropy in the activity of the labor-force as such, by scientific and cultural progress in the education and daily life of the population. We increase the anti-entropy reflected in the composition of production and related elements of the environment, to effect of raising the level of technology of the economy as a whole. The increase of the quantity of available energy, and of the available energy-flux-density, by methods including the reduction in the cost and price of producing such energy-supplies, is an example of this. The result of applying these priorities, is to elevate the relative anti-entropy of the manifold within which the activity of the individual actor is raised in the same sense that the plumber's productivity was increased by an enhanced work-environment even without any change in the level of technology and skill practiced by that plumber.

By setting an index-value of household consumption in terms of the existing social division of labor in a national economy, and assigning a price to the required income of that household, the analysis of the structure of employment and production in the economy as a whole indicates a value which can then be compared with the value calculated for another economy. This comparison of baskets of commodities so defined, when compared with a determined rate of physical-economic growth, provides an implied relative indexing of the output of each among the economies so compared.

By programming a feasible rate of growth into each such economy and its relations with the others, so analyzed, the comparative index-values are adjustable in a most appropriate way: to define index-values in terms of the rate of growth to be generated by trade among these economies. As more discussion along these lines will make clearer, the political and other feasibilities of such calculations are much greater than pessimists might imagine. Thus, through such discussions and negotiations, usable index-prices in terms of a basket of commodities can be set.

3. Prices as Set by a Global Mission

Take, as a case in point, the discussions of cooperation among a group of nations designated as “ASEAN Plus Three.” Look at such matters as the emerging plans for development of North Korea, as has been seen in the currently ongoing discussions between the representatives of the North and South. Take the respective adducible wish-lists for long-term capital-goods and related flows among Japan, Korea, China, and so on. Start from present capabilities and capacities, and a matching of what some among them wish to export, and others wish to import.

Then, extend that view to include the world at large. First to Eurasia generally [**Figure 7**], then the Middle East and Africa. Then assume that the U.S.A. will become what it is not presently, a willing partner in such cooperation, and also ending what has become lately a virtual war against what President Franklin Roosevelt had envisaged as its “Good Neighbors” among both the nations and their populations to the south.

Implicitly, what I have just said confronts us with an apparent paradox, the same kind of paradox addressed more than a half-millennium past, by Nicholas of Cusa’s *Concordantia Catholica*. This is the apparently paradoxical proposition, which argues, in effect, that the general interest of the world as a whole can not be satisfied except through promoting the perfect sovereignty of that type of modern nation-state typified in intent by the 1776 U.S. Declaration of Independence and Preamble of the Federal Constitution. The solution to the apparent paradox, a half-millennium ago, and even more emphatically today, is a comprehension of the fact, that the mission which must be the adopted, governing intent among nations, is a reflection of the same mission which the 1776 Declaration of Independence sets forth as the reason, wholly grounded in natural law, for that rebellion against the British monarchy which established the sovereignty of the U.S.A.

The tell-tale symptom of the required choice of world mission today, is that with which President Franklin Roosevelt confronted a thus-enraged and vengeful Prime Minister Winston Churchill, the remedying of the monstrous inequities created by the combined Portuguese, Dutch, British, and French colonial systems. This included remedying the similar abuses by Roosevelt’s principal immediate political enemy at home, the Wall Street which, by continuing tradition, still today, has adopted the ambition of becoming as brutish as the British monarchy itself—or even more so.

Today, this global mission is centered in the requirement, that the technological level of the physical-economic manifold of the former victims of depredations by the British monarchy and its imitators, be brought up rapidly to the effect of a truly modern standard of living. This means not only large-scale infusions of the means required for technological progress, but a heavy emphasis upon extensive development of the basic economic infrastructure upon

which the effective use of improved technology depends absolutely. Such were the policies for post-war, post-colonial Africa, with which President Roosevelt alarmed both Churchill and “that bastard” Mountbatten, who accompanied Churchill on that occasion.³⁰ British-led genocide in Africa not only continues, that largely as a result of Roosevelt’s premature death, but “Rhodes Plan”-style rampage, aided by Secretary Madeleine Albright, is far worse today, and increasingly so, than during any part of the recent four decades.

This means, in practice, that the nations of Japan, the U.S.A., and western continental Europe, among others, must rapidly gear up for what shall become the greatest flow of technological progress into the so-called developing regions of Eurasia, Africa, and Central and South America ever even imagined. This transfer will occur chiefly in the form of medium-term to long-term credit. This will be made feasible by the establishment of a toughly maintained fixed-exchange-rate monetary system, and by long-term borrowing-costs in the order of approximately 1% simple interest, often with significant “grace” periods inserted. A relatively small portion of such export-activity shall occur through money-loans; most of the relevant trade will be accomplished through the medium of state-backed credits.

This means, that the leading edge of global cooperation among nations, during at least the quarter-century immediately ahead, must be emphasis upon a downstream flow of science and technology from the nations and sectors of national economies which represent the relatively most advanced machine-tool-design and related capabilities, in the form of infusions into all parts of the economy, and the world, in which the economy is functioning on a lower level. The assignment of a portion of total output and input to such transfers, will be the critical margin in determining the required price-equivalent in the form of an index over the period immediately ahead, and, with appropriate adjustments, for a quarter-century or so to come.

The basis for the amount of credit extended for this mission will be found in the allotment of a portion of the total produced output of capital-exporting nations. This allotment will take the form, in a relatively large degree, of the expansion of total capacity and output of the exporting nation, in a way not dissimilar on principle to U.S. credit to western Europe during the greater part of two post-1945 decades.

In practice, the administration of this shift in the composition of the division of labor in world production, will be premised upon long-term agreements among the nations involved in this mission. The feasibility of such administration lies largely in the fact, that a very large portion of the total medium-term to long-term credit extended for development, will be represented either by very large-scale, TVA-like projects in development of basic economic

³⁰ Such were the pro-genocide policies of the British Monarchy’s Field Marshal Montgomery, who among his other lovable qualities was, on account of his contributions to postponing available victories, beyond reasonable doubt, the worst leading military commander, on any side, during World War II.

infrastructure, or by capital investments in modern productive capacity which are generated as either direct by-products of, or other harvesting of the economic opportunities whose existence depends upon the great infrastructural projects.

Since the development and maintenance of the required division of labor, including the margin of growth intended, is a political decision respecting the composition of employment in the economy as a whole, no automatic price could be competently defined by a state-less “free trade” system. It is the decisions made by the sovereign nation-state, on such matters, which determine what the right price-setting should be, that by determining the social composition of employment, income, and so forth of the national society considered as a unified whole.

Thus, the common objectives of a group of cooperating nations, can not be served except as each participating nation makes an appropriate sovereign political commitment to the mission commonly adopted among the nations as a cooperating group. Since rational national decisions can be made only through participation of the citizenry according to a common principle, the promotion of the general welfare, and since cooperation among nations must be consistent with a notion of the general welfare of each and all as cooperating nations, the existence of the sovereign form of modern nation-state republic solves the paradox I have stated above.

The Example of Africa

For example, the development of Africa. I describe an anonymous case of a typical failure in design of the kinds of aid projects formerly given to sub-Sahara Africa.

A certain agency agreed to fund the installation of a meat-cannery in a certain African nation. The facility installed was of the most modern type, and well done. However, the project became a scandalous failure. The supply of the cattle for the work of the cannery was assigned to a region in which diseased wildlife roamed. The cannery virtually died for lack of non-disease-ridden cattle. There are also notorious cases of projects which, in effect, connected nowhere to nowhere, and a general practice of so-called “development,” in the spirit of “blankets-whisky-and-trinkets for the natives.” Among the most destructive co-factors in this general sort of travesty has been the effect of “environmental impact” studies in sabotaging precisely those kinds of large-scale infrastructural development upon which any effective “transfer of technology” depends unconditionally.

As any study of the growth of the North American economy since the early Seventeenth Century shows, successful development of a continent, such as Africa today, depends upon large-scale programs of development of basic economic infrastructure. This means large-scale water management, conquest of territory by dense transportation networks, and the

proliferation of new communities based upon those networks, and an accelerating growth in the production of power, with emphasis upon increasing energy-flux-density of the streams of power supplied.

This also requires efficient measures in public sanitation, and transforming the environment in ways to control dangerous infestations by diseases and pests. Without these priorities, talk of economic improvements in Africa are a cruel hoax. To promote “environmental” reasons for preventing such infrastructural development, were more honestly termed the intent to promote genocide.

The policy for development of Africa must be, first and foremost, the development of the needed basic economic infrastructure and the promotion of the improvement of the demographic characteristics, including life-expectancy, of households and the population as a whole. The insertion of technological progress in production into a setting defined by those objectives, should be the general rule governing development programs of groups of nations supplying the needed technological assistance.

In the case of Africa, very large systems of basic economic infrastructure are an unavoidable priority. The foremost objective for improvements in production, is the establishment of the preconditions for transforming Africa’s vast, all-too-fallow agricultural potential into a source of revenues from export into, notably, hungry, densely populated regions of Asia. The principal spines of that aspect of the development effort, will be represented by a skeletal structure of water-management, transportation, and power development in projects on a transcontinental scale. These transcontinental systems will be few in total number, and installed largely by outright grants-in-aid by joint efforts of relevant nations.

Typical are transport channels, including complexes of rail transport [**Figure 8**], power production and distribution, and water, across Africa from locations such as Dakar to Djibouti and Port Sudan. Large-scale water-management projects, including surplus water from the Congo region into the region of Lake Chad, will be typical. North-south transcontinental rail lines, as from Alexandria to Cape Town, are also typical. The use of port areas and large streams as the location of centers for combined, large-scale power production, industry, and so forth, is typical. These sorts of principal development projects provide the base-line for projects penetrating various parts of the continent more deeply.

The number of such projects of that scale, is few, but the impact on the continent as a whole, relatively maximal. The required amount of aid is easily defined as finite, and manageable on that account. This foreign aid will occupy a diminishing percentile of the total aid supplied, as the initial projects are used to build up the organized capabilities for an increasing portion of the effort completed by local governments, and groups of governments, using domestic

capabilities developed as a by-product of the large-scale foreign-backed undertakings in the form of grants-in-aid.

The most important impact of such infrastructural programs, will be in terms of the transformation of the productivity and conditions of life of Africa's rural population. The fact that improvements of the condition of agriculture address a vast and growing market in parts of Asia, ensures that Africa's improved agricultural potential will have the market needed to promote an upward course of evolution of conditions of life and the division of labor for Africa's population as a whole. It is under such conditions that Africa can develop its own internal development of a modern composition of division of labor.

The stunning fact of such development of Africa is, that, by North American and European standards, what might appear to be very little, can accomplish very much. What might seem but a little to us, in North America and western Europe, is relatively big for Africa today. The benefits of applying the relatively little represented, for example, by the indicated sorts of base-line transcontinental infrastructure programs, are thus relatively enormous as a percentile of the present levels of per-capita income and output within Africa at large.

If we can bring the epidemic disease problems of Africa under control, the economic potential of Africa, relatively small at first appearance, becomes enormous over the course of a generation. President Franklin Roosevelt would have been pleased.

The kinds of programs required, have been outlined by me and my associates, and also by others, in other published locations.

Central Eurasia and Space

Apart from Africa, the aspect of global development projects which requires additional comment at this point, is the case of the vast, underpopulated region of North and Central Asia, including the undeveloped regions of western China. The use of development corridors, based on the spine of high-speed rail and analogous forms of mass-transport systems, from western Europe to the Pacific, across Asia, is not only the most fruitful of the projects of development available now, but one which will have the greatest beneficial, revolutionary impact in changing the economic common practices of the world as a whole.

Efficient high-speed rail transport across the interior of Eurasia, as this should be superseded by magnetic-levitation-based systems, will change the economic geometry of the planet as a whole, by shifting weight from a sea-based, toward a land-based transport of freight. The gain in physical-space-time-effectiveness, implicit in the development of such transport systems, will be a leading consideration. Under the impact of that shift, the areas of the north and interior of Asia, which have been sparsely populated and weakly developed, will become

quickly a region of the greatest intensity of global change in patterns of infrastructure development and population.

There are two other leading implications of such a development, in addition to the impact of the new transport systems as such.

First, this region of Eurasia is abutted by three regions of the world's greatest concentrations of population: Europe, South Asia, and the coastal regions of Southeast and East Asia. The areas which will benefit greatly from Central Asia development, include the western regions of China, including its arid regions.

Second, this is an area of one of the world's greatest on-land concentrations of primary minerals, and thus an area well-suited for relevant processing and production facilities.

There is also a somewhat more distant objective to be reached, one with implications which reach far and high. Look at the area of tundra across northern Siberia. Not only is the economic conquest of tundra on the technological horizon at present, but the oncoming next great glaciation scheduled for the northern hemisphere of our planet, prompts our long-range thinking to developing policies intended to master the threat of the kind of approximately 100,000-year-long glaciation thus threatening the upper half of the U.S.A. and corresponding regions of the Eurasian land-mass. Although we are in the early millennium of the long-term cooling phase of this glacial cycle, there are reasons we should be attacking this challenge now, during the decades immediately ahead. This is complemented by the fact, that gaining manageable development of the tundra region means great economic gains in the relatively near-term.

Turn attention back, once more, to Plato's concerns about the long-term dangers to civilization from natural catastrophes, the kinds of catastrophes to which mankind has learned to adjust, somewhat, but lacks so far the means to prevent. Looking at the tundra areas of Eurasia and North America, should prompt us to consider the more general class of challenges which the oncoming schedule of glaciation only typifies.

Among serious thinkers, the progress of science and technology since Kepler and Gauss, has prompted increasing attention to the subject of the feasibility of managing the physical conditions of human life through development of physical systems of control over the environment—the biosphere—of the surface of our planet as a whole, and also of at least nearby regions of Solar space. Since all fundamental scientific progress depends upon breaking through limits, including the boundaries inhering in largeness and smallness, the exploration of nearby space reached the state, three decades ago, at which we demonstrated that expenditure in the development of space exploration provoked a return of as much as ten-to-one, or more in terms of increased productivity spilling over from scientific crash

programs into the technology of product and production, here, back on Earth. When we think of the development of power sources of successively increased energy-flux density, as from burning of wood and use of windmills, through coal, petroleum, nuclear fission, and on to thermonuclear fusion and evidence of the possibility of controlled matter-antimatter reactions down the line, intelligent people would no longer say that it is a mistake to undertake practical nearby steps in the direction of sometimes distant objectives. At least, no intelligent objection would be made merely on the basis of the evidence that reaching the goal might be distant.

However, we need not limit our argument for such undertakings to such apologetic tones. What I have been emphasizing in the course of unfolding the theses presented here, is the evidence that fundamental scientific progress is not only always a source of benefit realizable in present time, but that it is precisely the optimistic outlook and creative activity associated with those kinds of long-range thinking, from which mankind is most likely to derive the cognitive and related benefits we might already begin to enjoy some not distant tomorrow morning.

For example: the fabulous Crab Nebula is a very distant and paradox-ridden astrophysical phenomenon. No one from Earth is likely to travel to that area in the foreseeable future. Despite that, a study of those paradoxes, now, and mastery of certain among the implications of that, may greatly benefit what we are able to do, soon, here, on Earth. Posing to ourselves any question which has a valid basis, on any subject, no matter how remote, teases the cockles of our cognitive powers, as nothing else can match the likelihood of a discovery which will be, in some way, of immediate benefit to mankind as a whole.

From the point of reference defined by measuring potential relative population-density both per capita and per square kilometer, the elementary form of work is not the production of physical products, but, rather, the production of the validated discovery of new universal physical principles. It is from the latter, that increased physical productivities spring. To control the well-spring, is to control the flow downstream.

Therefore, the production of such ideas, typically the universal physical principles and the indispensable complement of universal principles of a Classical artistic type, is the well-spring of economic growth and rising productivity. Thus, does the kind of foresight inhering in cognition, bring the future into the present. It is highly motivated science-driver programs, the discovery of universal, so-called universal physical principles, on which the economic and related policies of a truly sane society are based primarily.

In summary, the “structural” composition of income and employment, as can be determined rationally only by the governments of sovereign nation-states, is the basis upon which indexes and the design of monetary systems must be premised.

Once we have agreed on a general program of trade, relative to medium-term and long-term development of a cooperating ground of nations, the outline of long-term trends in structural composition of the composition of trade and division of labor, gives us a reasonably clear picture of what the structure of the costs and incomes of nationally economies will be over a significant period ahead.

Since what will happen as a result of such understandings, will be patterns of development and trade which conform to the structure based upon the long-term elements of agreements on credit and trade, what will tend to result, is a pattern which is determined by the agreements underlying the definition of the composition of a basket-of-commodities indexing agreement. The result may be better than that agreement has anticipated; if so, the choice of agreement has been shown to have been a prudent one. Otherwise, down the line, the indexes may be modified as developments warrant. The practical question is not whether the agreed indexes set the right price, but whether or not they represent a workable and reasonably fair agreement.

4. Culture as a Physical Cost of Labor

Now, briefly, some concluding remarks.

The most notable problem represented by the efforts to bring about the indicated form and degree of cooperation among the nations of Eurasia, in particular, is the implications of the differences in religious and other cultural heritages brought together in this way. The consequently required emphasis upon a “dialogue among cultures,” entails extensive labor among the representatives of these cultures, but that labor is to be appreciated as a blessing, not a burden. Plato and the Christian New Testament Apostles, for example, would agree on principles already set forth by them.

The strength within today’s globally extended European civilization, as distinct from the bloody pollution also accumulated therein, is a quality which, to the best of our present knowledge of the matter, originated with the ancient Greeks, as was best typified in that time by the Socratic dialogues of Plato. This contribution is the establishment of two interdependent principles, the principle of the idea and the principle of knowable truthfulness. All of the good ever contributed by European culture, came chiefly from that source. Any representative of that legacy will demonstrate that fact, by being prepared to regard any dialogue among cultures as the occasion for subjecting all assumed points of doctrine to the tests appropriate for defining ideas and truthfulness.

The economic task confronting a presently self-imperilled world civilization, is to shift the focus away from the Hobbesian notion of conflict among persons and nations, to a policy of

cooperation rooted in commitment to promotion of the general welfare of all persons within nations, and the welfare among perfectly sovereign nation-states. As I have emphasized repeatedly in this present report, the required progress, and the agreements on which such progress depends, depends upon qualities of cooperation rooted precisely in those notions of ideas and of knowable truthfulness.

This is immediately to be observed in physical economy as such. Scientific ideas, as Riemann's 1854 dissertation aids greatly in defining the notion of universal physical principles, are indispensable for the kind of progress now so desperately wanted. Yet, without those insights into the cognitive process, which only a Classical-humanist approach to artistic composition and performance provides, the transmission of scientific ideas will be difficult, and therefore deficient, and cooperation around such ideas will be in jeopardy.

Take, as an example of the implied problems, the issue of defining law in a way which not only crosses national and religious borders, but does so in nothing but a cognitively rational way.

There are certain relevant examples which help to define the structure of the problem so posed. The case of Nicholas of Cusa's dialogue, *De Pace Fidei*, is a leading example, as are the similar approaches to ecumenicism by Germany's Gotthold Lessing and Moses Mendelssohn. These writings, as they apply immediately to ecumenical relations among Christianity, Islam, and Judaism, are exemplary of both the nature of the more general problem, and the solution. Most important is the emphasis upon which differences should be resolved, and which should be politely left alone. We must agree upon what we may, and leave in peace what we presently can not. What applies to the relations among the different currents of Christianity, Islam, and Judaism, provides a sense of the way in which to approach relations among believers generally.

That said, focus upon those aspects of an ecumenical dialogue which must be addressed in common on account of urgent kinds of physical-economic and related matters.

A quarter-century, sometimes much longer, is required to transform a newborn baby into a qualified young professional. So, in dialogue among cultures, a certain sensibility to that fact is required. Urgent issues for resolution should be only those which by nature bear directly upon the physical-economic viability of the individual nation, or the possibility of physical-economic cooperation among nations. These kinds of issues fall under a common title, the notion of the essential nature of the human individual, as opposed to the nature of lower forms of life. These latter conceptions form the body of what should be regarded as natural law, as distinct from dogmas of revealed religions as such, and as distinct from the notions of customary or purely positive law.

A dialogue devoted to the implications of what is provably a truthful conception of human nature, is therefore to be regarded as congruent with what is otherwise recognizable as general public and higher education of the young of any, and, hopefully, every nation. Yet, since a dialogue among cultures, is to engage the populations represented in a suitably general way, the requirements of the dialogue itself must be reflected in the latter forms of education generally found in each nation.

This does not require that every nation have precisely the same educational program. It requires that within the education programs of the nations, there must be a common, ecumenical element, by aid of which the cultural specificities of each nation may be rendered intelligible to that of the other, even if there is not complete agreement on the relevant topics.

The relevant problem inside the U.S. today, is that the prevailing standards of public and general education, have degenerated during recent decades, to the degree that much of that education is intrinsically untruthful by self-definition, and otherwise monstrously corrupted relative to standards of two or more decades ago. Notably, one of the topical areas in which education there is at its relative worst, is the matter of both general notions of human nature, and of what physical science ought to imply. Much of this moral and cultural degeneration in the U.S. has been a by-product of that “post-industrial” utopianism which has played a leading political role in fostering the self-destruction of the U.S. economy. Unless this is changed, recovery of the U.S. economy will be virtually impossible; the nation would be as doomed as the fabled Sodom and Gomorrah. On the other hand, it is clearly a leading responsibility of education to reverse precisely that trend in cultural conditioning.

More broadly, the most urgent topics of a dialogue of cultures, presently, is to promote those notions of human nature and mission without which the avoidance of a planet-wide new dark age would not be possible. Those topics are what has been reflected in this report. Those notions of physical-economy, and of the notions of human nature and truthful knowledge upon which successful cooperation in economic development among nations were made feasible.

The conception of relative prices, or indexes, should be defined from that point of view. The object again, is not the folly of seeking a perfect price, but a good price, one consistent with the mission-objectives to be agreed upon.