A Science-Driver Program to End Russia's Depression

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Introduction

Imagine that the presently ruling establishments of the world's leading nations have abandoned a typically British, sinking, overaged ship, to find themselves in an also overaged, leaking, lifeboat, which is slowly settling ominously into the ocean waters. From his end of the boat, a leading Londoner points with majestically Victorian irrelevance toward the Russian passengers: "Can't you bunglers keep your end dry!"

Such, with rare exceptions, is the quality of opinion on the subject of Russia heard today from official thinkers and daily press of all ethnic persuasions. The very strong impression is, that all of them, like the sinking Londoner of our tale, are faced with some global reality which they wish so desperately to deny, that, for them, the thermonuclearly ominous crisis of Russia seems, by comparison, a comfortable afternoon's diversion.

The kernel of the issue of policy toward Russia, is the looming global financial collapse exploding at the center of traditional British geopolitical dogma concerning both Russia and Germany. The relevant circles have the crucial facts concerning the onrushing financial collapse lying before them, on the boardroom tables, so to speak. However, for them, like our Londoner of the sinking lifeboat, this is the Apocalypse which even the gods of Gaia's Delphic Pantheon might not survive. That Londoner is left with no form of denial of this which is plausible to himself, but to ape the fictional Mr. Micawber's threadbare optimism, "Something will turn up."

Although we are focused upon the subject of Russia, only charlatans could speak of the future of Russia without taking into account explicitly the factors which are of immediately decisive importance for each and all nations of this planet. Indeed, the present crisis within Russia (as of all of eastern Europe) is a relatively mild form of the catastrophe which is soon to strike down every nation upon this planet. The way we treat the problems of Russia today

is the mirror of the early to medium-term future of China, Japan, North America, and western Europe...

1. The Agenda for Financial Collapse

[The first part of Chapter 1 identifies the change in policymaking of the world's leading powers since the 1963–68 period, with the advent of the "post-industrial society" and the Aquarian counterculture—*ed.*]

Measuring this Change

Today, economies are viewed by two completely different species of professionals. The way in which one measures the changes in the economy, depends upon which of the two views one chooses.

One group of so-called economists looks at an economy as a kind of grand casino, in the sense that John von Neumann insisted all economies are no more than a form of game. Another view, in the tradition of Gottfried Leibniz, for example, sees productive labor as the essential physical basis for the possibility of continuing successful reproduction of both the human species and of the societies, such as nations, of which the human species as a whole is comprised.

This latter is perforce the view of at least the majority of today's people of Russia, a place where the possibility of continued survival is visibly at a premium. The operators and flunkeys of the grand casino economy denounce this Leibnizian view, calling this "populism"; they threaten to perform awful acts upon any political personality who shows signs of such "populist" tendencies in economic policy-shaping. Such casino operators and their flunkeys and threats put aside, the present collapse is putting a premium on economics of survival even among the OECD nations' populations.

As spouses have discovered, even the most delusional fanatic for television soap-operas, or all-day sports events, will cease to exist as a TV viewer, unless he enters the real world occasionally to eat, and also to apply himself to the means to bring about the state of eating.

This report is shamelessly committed to what the casino operators' economists and press deprecate as "the populist tendency" of Leibniz *et al.* This writer employs shamelessly the standard of "continuing successful reproduction" of the human species and nations as the basis for measuring performance of economies, and of economic policies. He is shamelessly disinterested in any biological dogma which speculates upon the possibly desirable attributes of species, but without any consideration for whether or not such attributes increase or lessen a species' expectation of survival as a species.

If one commands a reasonably good education in industrial engineering, or comparable knowledge and experience, to construct a reasonably good measurement of the changes in the economy is a relatively simple, if tedious undertaking. If one uses the following rules for organizing one's data, the result will be a better analysis than is available presently from any official or academic sources in North America or western Europe. The most essential thing to keep in mind throughout, is that what we are measuring, in reasonable approximation, is the qualification of mankind to continue to survive. For North America or western Europe, that signifies a standard of living and per capita physical productivity of the labor force of a no worse level of family existence than that which prevailed at about 1969 for North America, and a few years later for continental western Europe.

Rule 1: Convert all measurements into values per capita, per family household, and per square kilometer.

Rule 2: Reduce all forms of consumption to the relevant per capita content of market baskets: households' and producers' hard infrastructure (per square kilometer plus per capita), soft infrastructure (medical, education, science), and "other."

Rule 3: Express available labor force as determined by cultural and demographic characteristics of family households. For example: increased duration and quality of certain essential categories of scientific, Classical fine arts, language, and history education is an improvement in the potential productivity per capita of the society.

Rule 4: The term "productive labor" is restricted to a form of labor which is applied directly to the physical production, repair, and maintenance of agricultural, industrial, and infrastructural product. The only non-physical forms of employment which contribute to fostering productivity of useful physical labor are education, medical, and science. To the degree economic measurements reflect an implied function, these four are the only labor "variables" to be considered.

Rule 5: The controlling measurement to be made is an estimate of changes in *potential population-density*. Reduced to rule-of-thumb terms, this signifies those increases in average physical productivity of the labor force as a whole which have the combined effect of increasing the potential population-density as such, while allowing an increase in the physical standard of life in terms of physical consumption and lifetime potential productivity.

Our ability to adopt good general rules for analysis owes much to the fact that the global level of potential population-density has been increased more during the recent six centuries of European civilization's development and influence than during all of human existence prior to A.D. 1400.

The central feature of that recent six centuries' success on this account is the creation of a new conception of the economic and related functions of a sovereign nation-state, the founding of modern science, and the improvement in public sanitation reducing infant and child mortality-rates and increasing adult life-expectancies. There is a direct connection, from Nicholas of Cusa's founding of modern science approximately A.D. 1440, through such seminal figures as Luca Pacioli, Leonardo da Vinci, Johannes Kepler, Blaise Pascal, Christiaan Huygens, Gottfried Leibniz, *et al.* into the development of modern agro-industrial economy based upon Leibniz's design for use of heat-powered machinery, and upon U.S. Treasury Secretary Alexander Hamilton's prophetic description of the unfolding effects of applying Leibniz's design to establish an anti-British (anti-Adam Smith) American System of political-economy...

2. Designing a Recovery

The case of today's Russia reminds us, that designing a global economic recovery is far simpler than effecting the recovery of a national economy. Simply, there are no autarkies any longer—if indeed, they truly ever existed.

A quarter-century ago, when this writer was teaching a one-semester course in economics, a cup of coffee was still available for ten cents. Trace out some of the proof, that to provide that cup of coffee, served in that restaurant, in that cup, with that spoon, that sugar, that cream, and so on, at that price, one must have an existing network of product flows reaching several times around this planet: "the world-wide cup of coffee."

Since then, a storm of "free trade" and "deregulation" has virtually eliminated even the conception of national economic security. Every nation's reliance upon a vast catalog of imports represents not an advantageous, but a deadly interdependency. Perhaps, the collapse of that industry began the day the accounting office said, "It is cheaper to import, than to continue to make our own."

For Russia's economy to recover, it must trade, that it may secure what it must import in order to produce. Russia has but two large general categories of potential exports available to it for the immediately foreseeable future: the capacity of its scientific cadres to develop new technologies, and the related capital-intensive potentialities of its military-industrial and aerospace complexes. Respecting both trade and productive investments, the pivotal question is, for Russia and the world today, as for U.S. Treasury Secretary Alexander Hamilton in 1791: the crucial, irreplaceable role of scientific and technological progress for increasing the productive powers of labor.

Historically, there are numerous examples of the beneficial results of emphasizing capital-intensive, energy-intensive forms of investment in scientific and technological progress, and in correlated improvements of basic economic infrastructure. There are fifteenth-century examples: the recovery of France under Colbert; the early, if temporary eighteenth-century industrial development of Russia under the reforms which Leibniz supplied to Peter the Great; the United States' experience; the case of France under the guidance of Lazare Carnot and Monge's 1794–1814 Ecole Polytechnique; Germany under the combined impact of Friedrich List's American System of political-economy and of the Humboldt brothers' reforms in science and education; the policies of Russia under Czar Alexander II, Dmitri Mendeleyev, and Count Sergei Witte; and the Meiji restoration's economic revolution in Japan, based directly upon the advice of anti-free trade American System economists Henry C. Carey and his student E. Peshine Smith.

There are also the cases of wartime mobilizations and other economic "crash programs," of which latter the U.S. Kennedy "crash program" is outstanding.

From such lessons, and from the experience of the superior strains of industrial bankers and entrepreneurs who existed in North America and on the European continent up until the 1989 assassination of Deutsche Bank's Alfred Herrhausen, competent policy-shapers and industrial bankers and leaders have known—pragmatically—how to organize an economic recovery. The scientific principle which explains these models of success is, unfortunately, poorly understood.

The dangerous result of today's limited comprehension of the principles involved, is that in the exemplary case of Russia, the only route to a sustainable, non-inflationary economic recovery is a "science-driver" program. Ironically, the "science-driver" program presents economic development in its relatively purest, and most powerful form, but also in the aspect on which the present opinion of today's economists, bankers, industrialists, and political leaders is most poorly informed.

The technical issue is among the more sophisticated topics in present levels of mathematical physics. Therefore, although desperately compelling practical reasons demand that we must touch upon that issue, in this location we shall merely summarize that issue and its practical effect...

Technology enters the economy in the guises of a family of discoveries, each formally theorems of what was originally an axiomatic-revolutionary sort of discovery. In the original of these, and also the derived cases, the new technology first appears in the form of a design of experiment used to effect a demonstration of principled application. The refinement of

such experiments leads to the incorporation of derivatives of that experimental design, a derivation which is of the type of a machine-tool principle.

The transmission of knowledge of the scientific principle, and of tool or related designs derived from that principle, to the point of production, results in increases of productive powers of labor both in per-capita and per-square-kilometer terms, and in quality of product or analogous effect produced.

For educational purposes, some of the best demonstrations of this principle may be taken from the domain of military or space programs. The educational merit of such examples is that neither involves an end-product for producers' or households' consumption on earth; yet, the highest rates of growth have often been derived from what many would regard as exercises in economic waste. To produce the military or space-economy articles, the components of the program must be built, of course. The distinction of these components of a science-driver military or space program is that a relatively very large ration of the product requires use of new technologies, and that at a relatively high rate of technological obsolescence.

To produce this technology, it must be incorporated into the machine-tool sector, directly or implicitly, as new technology. From thence, the technology itself spills over into the economy in general; the result of this "spillover" is frequently extraordinarily high rates of increase of productivity, relatively speaking. For example, from the study of the effects of the Kennedy 1960s "crash program" for space, some have estimated that there was a return of about 14¢ to the U.S. economy for each penny spent on space projects; that conclusion is a plausible one.

The distinctive superiority in economic effects of such expenditures on ostensible waste, such as military or space-oriented science-driver programs, is that the rate at which scientific and technological progress is pushed through to realization is atypical of the modern industrial economy, even prior to the anti-scientific 1963–68 "cultural paradigm shift." Only under wartime conditions, or a related sort of national endeavor, such as a space-program, did twentieth-century businesses and bankers generally discover the motivation to undertake that which the nation needs most sorely, higher rates of scientific and technological progress.

From the end of the Great Depression, into the middle of the 1960s, it was the commonplace opinion expressed by most in the U.S. A. that wars were the most effective stimulant for economic prosperity. Closer examination of the facts shows that one did not require actual war-fighting to promote that desired effect; one merely had to mobilize the technological potential for war-winning—in case one might occur—and the high rates of

technological attrition inhering in such military procurement programs would have ensured the prosperity, without the bloodshed.

Since total war is not a pleasant state of affairs these days, the conclusion which might be adduced from this ironical set of contrasts, is that the most effective way to improve the income of the taxpayer is to spend much larger amounts of public funds on crash-program, science-driver forms of programs for exploration and colonization of space. Examine that proposition a bit more closely.

Why is it that some mathematical professionals become so unpleasant about the fact, that a straightforward mathematical description of those changes in structure which occur as concomitants of technology-driven increases in productivity should present a picture which is anomalous from the standpoint of a mathematics of non-living processes? Does life itself offend their professional sensibilities? Is it the thinking which generates scientific discoveries which offends them? Or is this reaction a result of years of positivistic conditioning in the classroom and later professional life, a conditioning to the delusion that a formal mathematical physics, were it sufficiently perfected in consistency, could explain everything?

The evidence toward which we have pointed here, shows that all valid fundamental discoveries have the form of absolute mathematical discontinuities, relative to a formalization of the prior state of generalized accepted knowledge. For reasons which ought to be clear after examining the work of Georg Cantor, for example, it is impossible to provide a formal mathematical model for valid axiomatic-revolutionary thinking in physical science.

The evidence is, that creative thinking of the type which generates valid axiomatic-revolutionary discoveries occurs only within the sovereign bounds of the individual person's thinking processes, that that thinking cannot be represented explicitly in any medium of communication. We communicate discoveries from one to another, as the scientist who died centuries ago evokes the mental experience of his original discovery from within a student following the principles of a Classical humanist form of secondary or post-secondary education. By presenting the other person with the paradox to be solved, if that other person has the prerequisite knowledge, we catalyze the activation of the relevant creative-mental processes in that person, and prompt him so to replicate the discovery we hoped to evoke within him.

The "not entropy" of the healthy economic process is a transformation caused by this sort of creative-mental transformation in the productive and related behavior of the society. In form, as "not entropy," this transformation has marked similarities to the similarly anomalous forms exhibited by living processes, most emphatically by evolutionary models of the biosphere. Who is to be blamed for showing that a human being's characteristic

behavior, the quality of creative thinking which does not occur in any animal species, is not that of any of the objects whose behavior our mathematicians may regard complacently as not-anomalous, such as a pot-bellied stove or a digital computer, perhaps?

Human society's effective self-organization has always been "task-oriented." In the case of great human achievement, that task-orientation is expressed as challenging the individual creative-mental powers of members of society to go to the outer limits of their developed capacity at that time. The lessons learned in that strenuous exercise become the knowledge available to be applied successfully to the society's more modest undertakings. To accomplish anything of importance, such as escaping from the economic effects of a general financial and monetary collapse, we must find the kind of task-orientation which challenges our creative-mental potentials to the limit, and that in the way whose effects are most appropriate for solving the problem confronting us.

Do not complain that the creative-mental processes, and their beneficial economic efforts, are mathematically anomalous, "not entropic." Learn how to provoke those processes, and drive them thus to the limits! required to produce the new qualities of scientific and technological capabilities for solving the problems confronting us.

One of the classical models for a "science-driver" type of economy is the collaboration between France's famous "author of victory," Lazare Carnot, and his former teacher, Gaspard Monge. The case in point is the 1794–1814 Ecole Polytechnique under Monge's direction and Monge's geometry-based curriculum for mass-producing the world's greatest body of scientists and engineers, mass-producing them in what were termed literally "brigades."

After 1814, LaPlace and Augustin Cauchy destroyed the program and quality of Monge's Ecole, and, as a result, dropped France rapidly from its centuries-long tradition of world leadership in science and technology. Monge and Carnot's work of the 1793–1814 interval was the French model used by Alexander von Humboldt to establish Germany's emerging world-leadership in science around Carl Gauss's Göttingen and the Humboldts' Berlin. Colbert had similar ideas during the seventeenth century, but the Monge Ecole, with its geometry-based brigades, the world's leading body of scientists and engineers at that time, is the preferred model of reference for every science-driver "crash program" since.

By science-driver programs, such as sometimes appear in preparations for war, or in space programs, society mobilizes its potential for conquering challenges at, or slightly beyond the outermost limits of existing human knowledge and practical capabilities. The solutions to such challenges developed by a highly motivated and closely integrated team of individualistic thinkers, produce new qualities of knowledge and practical capabilities. There

is no discovery, no development which we might not master in the course of a program for conducting space exploration and preparing colonization, which would not have, at every step of the process, some important application for improvement of life on Earth.

We require science-driver space programs, for example, as a more effective, less costly way of improving daily life on Earth than would be possible without spending the resources needed for such a space program. Think of a space program as Monge designed his Ecole Polytechnique, as a kind of super-university producing the world's greatest scientists and engineers in clumps deserving of the name "brigades."

Some years past, some very intelligent people in Japan thought in similar directions. They spoke of "knowledge-export" industry as a national-policy option. That is what a good, science-driver variety of space program is, a "knowledge-export" industry. The best way to utilize the combined space and military capabilities of Russia (for example), for the benefit of Russia and the world, is to create the kind of global science-driver space program whose technological "spillovers" will increase the general productive powers of labor on the planet at the greatest possible rate.

Keep the best human and work-place capabilities of Russia intact, at their highest level of technological performance. Assimilate that into a global science-driver program, together with similar capabilities of other nations. Provide low-cost credit and investment tax-credit assistance for each and every "spillover" which solves a crucial problem of the economy.

Recall the troublesome feature of the general constraint:

Let Output less Input = "free energy," and "Input = energy of the system." The general requirement for successful economy is then expressed, according to the preceding constraints, approximately as a rise of the ratio of "free energy" to "energy of the system," but subject to the restriction, that the "energy of the system," per capita and per square kilometer, must rise at the same time. The means for satisfying that constraint is the "not entropy" derived uniquely from the sovereign creative-mental powers of the individual human being. Anomalous? Certainly; we require as much of that anomaly as we might mobilize.

How It Works

To represent the type of physical-economic strategy which might be chosen to organize a recovery of an industrial economy, such as the Russian case today, we have employed as illustration the possible choice of a science-driver form of space program. We are not insisting that that is the only choice of strategy; but, for obvious practical reasons, it is one of the better choices actually available for immediate action. We have considered here, thus far,

the most general of the principled technological implications of such a choice. Let us show, briefly, how such a science-driver program affects the entire agro-industrial sector of the economy, and also the basic economic infrastructure upon whose development the productivity of the agro-industrial sector depends crucially.

Represent an economy by an input-output matrix of the general type associated with the work of Wassily Leontief. Think of this as a way of depicting the design of an industrial engineer's production model of combined bills of materials and process-sheets for a manufacturing enterprise to the analogous features of a national economy considered as if it were a single industrial enterprise. On the condition that we do not forget the inherent limitations of such a "model," such schematics have many valuable administrative uses, including the study of the implications of the type of science-driver "crash program" considered here.

Reduce this Leontief or analogous raw model to the form achieved by imposing the set of constraints identified above. Include in that, the stated "not-entropic" bounding requirement as stated statistically in terms of input-output ratios.

Apply this method of representation to the economy of Russia. State three cases in these terms:

Case 1: The economy of Russia as it operates today.

Case 2: The economy of Russia as it would appear if existing capacities, presently utilized, or not, were all put into operation through a directed supply of state credit for this purpose.

Case 3: A set of conjectural, but rationally selected states of the economy of Russia two or more years ahead. The principal restriction applied to all such choices is that the result projected must be a transformation effected in terms of the set of constraints indicated above. For that purpose, the key parameter on which our attention must be centrally focused is the key constraint, the statistical measurement of the ratio defining relative "not entropy" of the transformation.

Obviously, we would derive every choice of Case 3 from Case 2. The transition from Case 1 to Case 2 would imply an "Alexander Hamilton" variety of "protectionist" model of regulated economy using a vigorously protected system of state-generated credit used almost entirely for nothing but lending purposes, as indicated above for the "Hamiltonian "American System" model." The mobilization of the economy. from the disastrous state corresponding to Case 1, to the stabilized state of mobilization of selected existing, active and presently idled capacities, Case 2, is the launching-pad from which a feasible continuing recovery-process is deployed.

Focus upon the key constraint of this administrative model. the measure of relative "not entropy" in the statistical terms defined by the array of constraints listed (or another, fuller set of inequalities to the same general effect).

Into the transition from Case 2 to Case 3 introduce the science-driver, in this case the space program. For this purpose, only the costs, not the physical output of the science-driver, will be reflected in the matrices describing the successive states in the interval between our Case 2 and Case 3. We will treat this as we should treat military expenditures, as a cost to the economy. Apart from engineering functions of the military, our national accounting methods will not treat the military or analogous product as a good input to the Russian economy (in this case), except as it might be sold abroad in exchange for products which the non-military sector of the economy requires as a necessary component of the producers' or households' market baskets.

The military, or space sector, insofar as its output is consumed for military purposes, or in space programs as such, is treated, for cost-accounting purposes, as if that entire sector of the economy were a pedagogical laboratory of a university. Itis treated as a purely "knowledge-export" sector of the national (and world) economy.

The proposed investigation is thus prepared to compare the costs of this "knowledge-export" sector with its beneficial impact upon the controlling ratio used to measure "not entropy." In the extreme, one could compare the economy without the cost of this science-driver, and therefore also without the benefit, to the same total economy with both those costs and benefits. The "not entropy" ratio would be controlling in determining the result of such a comparison.

To ensure that the reader understands adequately what is being done in such a study, it must be emphasized here that the modelling being used is essentially a "non-deterministic" one. That means, in practice, that once a new technology has been defined, the calculation of its general impact upon the economy Is a calculable proposition in engineering terms. Until the discovery is made, that engineering forecast is not possible. Until the technology is discovered, and translated into the form of a refined, fully instrumented proof-of-principle experiment, the coefficients for its application as a modification of our matrix remain only hazy generalizations of possible order of magnitude of benefits.

The causal factor driving the economy's increase of productivity is the creative-mental function responsible for generating valid axiomatic-revolutionary transformations in scientific and analogous forms of knowledge. By definition, for reasons stated classically by Leibniz, in his *Monadology*, by Bernhard Riemann, by Karl Weierstrass, and by Cantor, this causal factor cannot be expressed in the explicit terms of any generally accepted classroom

mathematics today. No such predictive mathematical construction may be employed successfully to calculate the results until after the discovery is made. In a sequence of discoveries A, B, C,...N, it is feasible to calculate, as if "deterministically," backwards, but not forward.

What can be known in advance is twofold: the direction in which to go, and the probable order of magnitude of the benefit to be realized from a foreseeable type of breakthrough into discovery. The mechanism by which the predictable and actual benefit of a discovery is achieved, is not through mathematical forecasting, but through the organism of a science-driver "crash program" as a social phenomenon. As a matter of pedagogy, let this social phenomenon be termed a "living, universal, non-linear, not-entropic theorem-lattice."

Look inside the mind of a model scientist, one whose mental development replicates in effect the Classical humanist model of geometry-based, pre-science and science education. Look at the task-oriented, science-driver functioning of a large team of such minds representing numerous branches of mathematics, physics, chemistry, biology, and so on. Consider the way in which such a team functions to generate axiomatic-revolutionary and related discoveries; consider the way those discoveries are translated into the quality of well-instrumented, proof-of-principle experimental designs from which machine-tool principles of design are extracted for industrial and analogous applications.

Compare this imagery with the 1793–1814 setting of the circles of the science-driver effort led by Lazare Carnot, the soldier-scientist leader in mastering principles of machine technology, who was also the "author of victory," and his former teacher and collaborator, the Gaspard Monge who turned out the greatest then-existing team of scientists and engineers in the world, in "brigades." This is the Lazare Carnot, who passed the remaining, post-Vienna Congress years of his life assisting Alexander von Humboldt in providing Monge's French science, which neo-Newtonians Laplace and Cauchy were purging from the institutions of France, a safe refuge in a Germany emerging as the world's leader in nineteenth- and early twentieth-century scientific progress.

Contrary to the variously stated and implicit dogmas of Bertrand Russell and other radical positivists, the sum-total of accumulated human scientific knowledge is not a formal-logical theorem-lattice in an imperfect process of perfection. The sum-total is the student's replication, explicitly, one at a time, of the great axiomatic-revolutionary and related discoveries of individual discoverers over approximately 2,500 years of known internal history of science, and implicitly over a vastly longer span of pre-history. The qualified scientist's mind is populated with such personally relived moments of discovery from the minds of hundreds, or even more, of discoverers before him. Any serious scientific discussion

is premised upon reference, often by name, to scores or more of such personal acquaintances from hundreds of years, or longer, earlier.

Real science is not formal-logical; it is very warm-blooded, highly personalized sharing of the most intimate of all moments of an individual scientist's private life, a moment of creative discovery, or replication of such discovery, of a valid axiomatic-revolutionary principle of natural science.

Potentially, therefore, the bringing together of a representative body of such scientists and engineers as a task-oriented team, is assembling a representative expression of the living body of science from hundreds of years before us, and in our time. It is a body of creative—axiomatic-revolutionary—activity; therefore:

Let this social phenomenon be termed a "living, universal, nonlinear, not-entropic theorem-lattice." If one subjects this body to the appropriate form of stress, the result is as if to drive the entire body of existing scientific knowledge to its outermost limits and beyond. The standard result of such appropriate science-driver stressing of such a representative task-force, is to accelerate the rate of production of scientific discovery, and derived technologies, to many times the rate of output otherwise possible.

If one mobilizes one's mind to become Plato comprehending the work of Georg Cantor up through 1897, as Cantor sought diligently to incorporate Plato's work into his own, the proper method for stressing such a science-driver taskforce is implicitly clarified. [In the fuller report], we considered the way in which the work of the collaborators, Plato, Theaetetus, and Eudoxus, is to be combined to generate three general principles of discovery in mathematics. Expand this conception to go beyond mere mathematics into mathematical physics, as Riemann proposed so famously.

The method of discovery is to drive the present mental and related physical capacities of the human species to its limits and slightly beyond. The effect is to stretch existing formal knowledge to beyond its limits, and also knowledgeable physical practice. Drive to beyond the present limits of smallness in microphysics as in mathematics, of largeness in astrophysics, and in the distinctions between living processes and typical forms of non-living ones: biophysics. Drive man's ability to subdue an environment to its present limits and slightly beyond.

By following one's nose through the maze of principles, so to speak, one arrives at the choice which best matches all of these goals: a science-driver program dedicated to the early exploration and colonization of nearby solar space.

If this stressful task-orientation is applied to a re presentative team, embracing existing scientific knowledge as a whole, rather than allowing work in one specialty to radiate into others, the results are accelerated accordingly. The relevant historical cases show that the work of decades is accomplished within as few as several years. The most direct way of pointing to the reason for this advantage, is to describe such a science-driver task-force as a social phenomenon, as a *"living, universal, non-linear, not-entropic theorem-lattice."* It is an assembly of those, the mind of each embodying his or her own "Academy of Athens" assembly of past discoverers, whose scope of accumulated knowledge aggregates to the form of a living theorem-lattice representing all scientific knowledge, but is also a vibrant mass of propensity for generating axiomatic-revolutionary transformations of that theorem-lattice, under appropriate forms of task-oriented stress. It is an organic process which reproduces the world's best-qualified scientists and engineers in "brigades."

Reference this internal character of functioning organization of the science-driver *as an institution* to the transformation from Case 2 to Case 3, identified above.

The transfer of benefits of discovery and development, from inside the institution of the science-driver as such, into the productive sectors of the economy, occurs principally through two channels, the educational institutions and their corporate extensions, and the machine-tool sector. Whatever the benefit contributed by the science-driver, we may be certain that the economic realization of that benefit will be channelled through the machine-tool sector, and will result in a transformation of and burgeoning of that machine-tool sector.

However the benefit of that improvement within the machine-tool sector may be channelled downstream, into the producers' goods, households' goods, or infrastructure-development sector, is almost a matter of indifference to us as long as the channelling occurs. We require one very specific result: the kind of improvement in average productive powers of labor which will be reflected statistically in a "not entropic" improvement in the controlling ratio of analysis for our input-output matrix.

A science-driver-pivotted model of industrial economy is fairly described as based upon the transfer of "pure technological progress" from the science-driver institutions, through the machine-tool sector, into the economy as a whole.

A space-oriented science-driver institution will tend to yield certain directions in results. If we master, for example, the problems of establishing future "science city" colonies on Mars, a goal for several decades ahead, we have implicitly mastered earlier—during preparations for the implanting of such science cities—the challenge of building functional cities in the middle of the Sahara, Arabian Peninsula, or Gobi, or in the Arctic regions. We can foresee

the general direction of the cumulative changes in technology which will be presented to future generations. Nonetheless, in the shorter term, of a generation, it is the urgently wanted realization of improvements in the productive powers of labor which must be had, in whatever form of mixture the corresponding investment in applications may occur.

Industrial Reorganization for Recovery

The science- driver approach to economic recovery which has just been described here implies certain new institutional elements in the organization of a society's implementation of this science-driver mode of physical-economic recovery. Briefly, the leading features of this are as follows:

1) *Improvements in national income accounting*. In addition to monetary accounting, there must be physical-economic accounting, as the described use of the input-output matrices implies.

2) *The establishment of the science-driver institution* as a government-supported instrument for shaping national technology policy.

3) *A change in the policy-shaping functions of both government and the industries respecting investments*. Investment policies should be governed by a general environment of commitment to transfer of pure technological progress from the science-driver program through the machine-tool sector. This requires an increased emphasis upon scientifically trained industrial management personnel in the policy-shaping functions of government and industry.

4) *Increased emphasis upon scientific training of production management personnel*, and more emphasis upon the machine-tool components within industrial organizations.

5) *Meeting the need for greatly increased numbers of such governmental and industrial executives*, through a science-driver proliferation of scientists and engineers in "brigade" quantities. This signifies a general reversal of educational trends of the recent 30 years. It signifies a virtual cessation of support for the positivist "social sciences," most emphatically the destructive influence of existentialist indoctrination transmitted through such so-called professionals. It signifies a return to early through middle nineteenth-century standards of Classical humanist education, with a strengthening of emphasis in classical philology of that standard, languages, and history, but also an obligatory, constructive-geometry-based scientific competence among all university graduates, most emphatically among candidates for post-graduate degrees. Society must define its investment priorities for development

> of its citizens and labor force according to those tasks upon which the continued survival of society depends.

If society wishes to survive the presently onrushing global crisis, it can no longer afford the price of fostering the deconstructionist ideologies of a Jacques Derrida, of the so-called Frankfurt School, or positivist sociological dogmas generally...

3. Political Stability and Economic Recovery

[The beginning of Chapter 3 describes the author's "Oasis Plan" for Mideast economic development, and then addresses the prospects for reform, when the financial bubble bursts—*ed.*]

From Case 1 to Case 2

When the bubble bursts, if not earlier, relevant governments must act immediately to put, the old financial system quickly into bankruptcy reorganization, and to launch a new monetary system based upon state credit. To minimize the degree of "structural damage" to relevant institutions, governments must carry through the completion of these initial responses to a general collapse within no more delay than overnight.

Now, before the collapse, is the time for governments to inspect their inventories of lawful emergency standby powers, and to prepare, as secretly as prudence demands, the set of orders to be issued accomplishing the two first actions to be taken: Put the old system immediately into bankruptcy reorganization, and establish immediately a new monetary system based upon state credit—treasury currency-notes.

In the case of a government which, by law, cannot issue currency-notes of its treasury, other states which can do this must assist in ensuring a supply or credit, until the law can be changed to remedy the situation

In our preceding summary review of one set of the possible recovery measures which might be taken by Russia, the discussion was structured around the definition of three cases, Case 1, Case 2, and Case 3. The point of the bubble's bursting finds the productive resources in use (Case 1) significantly below the existing productive capacity (Case 2). The short-term objectives are the obvious ones: to halt the hemorrhaging at the existing Case 1 level, and, during the following short-term period, to rebuild utilization up as close to Case 2 as possible. During the medium term, within five years or less, economic recovery should aim at and realize a significant improvement beyond Case 2 level, Case 3. The broad definitions of these three successive cases are approximately as they were described in discussion of the setting for a science-driver recovery in Russia.

At the point of the bubble's onrushing collapse, the first concern of governments must be social, political, and structural stability. At that juncture, no financial institution commands effective credibility; government is the only economic institution which enjoys justifiable, residual credibility in these matters, and that chiefly because of the inherent political powers of government, rather than any popular admiration or lack of admiration for the personality of the incumbent.

Government could lose that credibility instantly, were some high-ranking official to issue a "Hooverish" declaration to the effect of "be calm, our statistics show that a recovery is under way, and should reach us very soon," or, "the government urges you to be calm and have faith in the democratic values of our free market system." Anything akin to the utterance of such disgusting banalities would be tantamount to a public act of political suicide by the government as a whole, if it did not incite an instant popular, and very bloody revolution.

Contrary to such follies, the government must step forth immediately, with a very clear statement of its commitment to specific forms of action. In the right spirit would be something whose content is to the following effect: "I shall be very brief. The crash has found your government prepared. Your government has just issued an emergency banking reorganization measure which we had carefully prepared for just such a possibility. This action orders that no banks will be allowed to close until their obligations to the families of their depositors are fully covered.... During the next hours the government will act to ensure that levels of employment do not fall below the levels before this financial crisis broke. During the next days we shall take additional measures which will launch the first steps toward a full-scale economic recovery. By tomorrow, we expect to begin releasing the addresses of special offices we are opening in each region of the country to keep the public informed of the measures we will be taking to get the recovery fully under way."

Illustrative of the quality of the requirements imposed upon government at such a juncture, is the manner in which Chancellor Helmut Kohl acted publicly in Berlin to ensure the reunification of Germany, speaking so before international television news cameras on the same day certain other prominent figures were conspicuously less heroic. In history's moments of crisis, the credibility of government depends upon the ability of leaders to present effective courses of action, as did President Charles de Gaulle when faced with a military insurrection against his government, with simplicity and relevance, and with quiet pungency and force.

Social stability is to be secured by the means which government deploys to foster employment, while protecting those entitlements and savings of the ordinary citizens which the folly of private financial institutions has put in jeopardy. Political stability is fostered as

confidence in the government which has acted gently, without panic, with manifest foresight and a quietly firm hand, to control an otherwise terrifying emergency.

To manage the transition from Case 1 to Case 2, the government must rely chiefly upon two tools: methods of reorganization of financial institutions, and the establishment of a new system of currency and public credit. To move from Case 2 to Case 3, government must rely upon the science-driver methods of physical-economic recovery illustrated earlier in this section of our report. The first two measures must be set into motion no later than within days, even hours of the outbreak of the collapse-crisis. Consider these three steps, and then let us turn our attention to the issues of stable relations among states during the years following the collapse. Begin with the establishment of a new system of currency and public credit.

Currency and Credit

The soundest conceptions of creation and management of public credit were developed in North America, in the English colonies and later young United States, beginning with the mid-seventeenth-century Massachusetts Bay Colony's successful experiment with issuance of a paper currency for use within that colony itself. This practice was suppressed by the English Crown from the period of accession of William and Mary, 1688–89, until it was introduced most successfully under President George Washington's first administration, under the supervision of U.S. Treasury Secretary Alexander Hamilton. The use of this new system of currency and national banking, combined with the industrial policy detailed in Hamilton's Report to the U.S. Congress *On the Subject of Manufactures*, constitutes what Hamilton, John Quincy Adams, Henry Clay, the Careys, Friedrich List, President Abraham Lincoln, and U.S.A.-advised Meiji Restoration Japan knew as the anti-British "American System of political-economy."

It is arguably most important that that theme, "anti-British 'American System of political-economy,' " be stressed. The emergency measures which must be taken in the domain of currency and credit are contrary to every fashionable delusion which has been taught under the misleading title of "classical political economy" in virtually every university in the world during most of the century. Once the names "American System," Washington, Hamilton, John Quincy Adams, the Careys, Henry Clay, Friedrich List, and Abraham Lincoln are presented together, with key original official and other relevant literary sources identified, whoever continues to deny that evidence is readily discredited as a fraud. It is important that the methods to be employed in creating currency and credit not be mistaken for an untried, eccentric novelty. The citizen may be assured that the most powerful economy to appear on this planet was founded upon the stunningly successful employment of such principles.

Does that child in the candy store imagine, perhaps, that those few coins clutched in his hand can command those sweets to jump into his pocket? A childish delusion respecting money is strengthened as he discovers, perhaps later in life, what misery awaits the person who wanders through society undefended by these talismans. The policy-shaper be warned; if that fellow loses confidence in his money, he gains contempt for his government.

The new currency is placed on deposit with the government's choice of national bank. This amount of money, as public credit in the form of legal tender, is then loaned, either directly or through privately own lending institutions on prescribed terms, as secured loans, for prescribed categories of ventures chosen in the clear public interest. In a time when there is suddenly an acute shortage of lendable funds from other sources, the direction of flows of monetized public credit can concentrate available resources, and private initiative, wonderfully to those purposes which are chosen to serve best the general public interest.

Among the most useful means for accomplishing an economic recovery is to foster the efforts of public agencies and regulated, privately owned public utilities to remedy those shortages and urgently needed repairs of basic economic infrastructure which, not accidentally, show up prominently about the time of every major financial collapse. The use of such lendable national banking funds to foster loans to vendors with contracts issued by those national, regional, or local infrastructural agencies to assist important basic infrastructure programs, is among the chief conduits used to stimulate recovery and growth of the private sector under crisis conditions.

Such infrastructural undertakings belong to that sector of the economy as a whole in which government should play a predominant role, in contrast to agriculture, manufacturing, and reselling, for example. Also, such projects are relatively large, with readily defined, usually conspicuous purposes; they are more easily managed for purposes of loan administration. The greatest relative growth leverage can be transmitted to the private sector, through discounting of vendors' contracts, with the relatively least governmental meddling in that sector.

In every part of the world today, there are monstrous lacks of modern basic economic infrastructure in good repair. There is no region of the world whose economic potential is not crippled by want of reliable power supplies of the right quality and quantities. The needs for water management are massive throughout the planet. Most of the world has more or less crippling deficiencies in development of inland navigable waterways, and in modernized rail or equivalent systems for economical delivery of freight and passenger traffic. Most of the world's sanitation systems are greatly deficient. Vast amounts of improvements of this sort can be effected in every part of the world without including projects which have lower priority than "urgently required."

Power systems, magnetic-levitation transport systems, water management systems, modern sanitation systems, are prime customers for high-technology goods and services of private vendors. In any case, the percentile of the total labor force which a modern economy should employ in basic economic infrastructure is one of the larger chunks of total employment. Since this is chiefly a sector of the economy which is a responsibility of government, by its nature, large amounts of credit-stimulus can be absorbed in loans to this area and its private vendors.

To the degree, the method of lending concentrates a majority of the loans under progress-performance disbursement programs, the feared inflationary potential of large-scale lending of public credit is addressed effectively. The object is to increase tangible value in additional goods produced at least as rapidly as the money-supply is increased through such lending.

The role of reorganization of financial institutions is subsumed by this use of public credit to organize a recovery.

'Industrial Banking'

Under such a "Hamiltonian" form of recovery program, the functions which define the characteristics of banking are principally two: 1) the local administration of loans of public credit issued on behalf of the national banking institutions, and 2) the role of such loans of public credit in fostering the accumulation of resources of private credit.

Under the conditions of a general financial monetary collapse, the stability of both the physical economy and of financial and monetary life of nations rests upon a foundation of public credit made available through national banking. The reorganization of the battered system of banking, and also of other financial institutions which are essential in the realm of entitlements of households, depends upon the momentary stability and prospect of successful restructuring supplied by efficient flows of public credit. These are flows into the new volumes of physical investments which function, initially, to move the economy at large from the condition of Case 1 toward Case 2.

The flow of completed transition from credit to money is realized through completed sales in the private sector. The successful reorganization of those financial institutions depends upon converting such cumulative flows of public credit into new volumes of private deposits in the banking system. To prevent the former obligations of financial institutions from strangling the new baby in the old crib, we must provide the protection of bankruptcy-reorganization rules to the baby, up to the time the baby reaches maturity and can manage its own affairs fully.

The banks, in turn, both old and newly created for this purpose, must provide certain essential services in the national interest. The new role of these battered banks will be, largely, as local correspondents of national banking institutions; they will provide banking services to local customers on behalf of the national bank. The principal new revenues of these local banks will be earned partially through commissions for such banking services performed, and, gradually increasing, the participation of the bank's depositors in percentiles of certain classes of the local loan of public credit. That latter will be the most secure form, the most secure grade of private bank lending available under initial-recovery conditions.

During the initial transition of the recovering economy, Case 1 toward Case 2, the details of circulation of public credit must be governed by reference to the relevant maps: the cross-gridded economic-geographical map and the input-output matrices.

Think of the productive features of localities of the economic geography as like the empty fuel tanks of a fleet of trucks. To make the trucking firm profitable again we require daily performance by each of those trucks, in all localities. To make this possible, adequate fuel must be supplied daily to each of these trucks. Initially, during the early part of the transition, public credit is the principal source, in some cases virtually the only source of that fuel. Fuel must be delivered daily to each of those tanks, but not spilled upon the ground.

To accomplish this purpose, two administrative hierarchies must exist in parallel, one public, the other private. Both have the same mandate: to fuel the empty tanks of idled productive and related capacity. The first is concerned with distributing the margins of work needed to keep trucks working busily and productively: national and local governmental contracts' administration. The second, the banking system, is to provide the financial servicing needed to purchase the fuel supplies.

The work of the two hierarchies is simplified by the fact that the principal margin of the ordinary new business being distributed as fuel—as contracts and credit—is being generated on capital-goods account as prime contracts for infrastructural repairs, maintenance, and development in such categories as: water development and management; general transportation such as magnetic levitation, friction rail, highway and bridge repair; power installations and distribution; sanitation systems; and needed medical facilities. The contracts awarded to private vendors, are the principal supply of added fuel available to keep each region of the nation above the economic breakeven level of input-output functioning.

National banking or regional subsidiaries of the national bank will plainly handle directly the banking agreements reached with the prime contractors of the principal public infrastructure projects. As a general rule, local private banks should provide the continuing ordinary banking services to all private contractors and sub-contractors. It must be the objective to

shift the composition of new lending to contractors and sub-contractors, to include increasing portions of private bank participating lending, together with participation of loans on public credit account.

The guaranteed protection to savings accounts and households' entitlements provided by private financial institutions should be managed by public guarantees constructed in view of the cumulative financial impact of the economic recovery program in progress.

Structural Objectives

At the same time that government and banking are occupied with the economic geography of filling the recovery's fuel tanks, there must be an accompanying thought to what shall be the division of employment of the labor force as a whole realized as one of the chief end-results of the recovery phase from Case 1 to Case 2. Most conspicuously, in what were formerly described as "western countries," both "north" and "south," the cumulatively economic-depressive effects of the 1963–68 "cultural paradigm shift" must be uprooted from the composition of employment and financial flows generally. The identified set of constraints to be applied to the chronological succession of input-output matrices comes prominently into play.

The power of credit is the power to nourish or starve the reproduction of the variously relatively desirable or undesirable components of economic life. On this point, the doctrine of "free trade" has exposed clearly in performance the hypocritical character of English history's most shameless betrayer of friends, John Locke. In place of the lying hypocrisy of free trade, a few clear principles respecting priorities will do.

Broadly, the set of constraints prescribed for models of physical-economic growth of national economy constitute an economic morality. They are a morality consistent, for example, with the Preamble to the U.S. Federal Constitution: "We the people of the United States, in Order to form a more perfect Union, establish Justice, ensure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity...."

Lord Shelburne's hired lackey, empiricist moral philosopher Adam Smith, explicitly abhorred a willful commitment to such notions as "to ourselves and our Posterity." Smith's 1776 "free trade" dogma was derived from the premises of his 1759 *The Theory of Moral Sentiments*:

> "Hunger, thirst, the passion which unites the two sexes, the love of pleasure, and the dread of pain, prompt us to apply these means for their own sakes, and without any

> consideration of their tendency to those beneficent ends which the great Director of nature intended to produce by them."

There is only one difference between Smith on this point and the famous British work plagiarized from the writings of the consummately wicked Venetian, Giammaria Ortes: Jeremy Bentham's *The Principles of Morals and Legislation*. In Bentham's famous essay "Offenses Against One's Self: Paederasty," he did not limit his empiricism to "two sexes."

Our attribution of economic morality to the set of constraints provided in this location, has nothing in common with British empiricism's positivistic notions of equity. There is nothing in Locke or Smith which distinguishes mankind from the horses and yahoos of Swift's *Gulliver's Travels*. Privately, in moments of candor, neither Adam Smith nor Bentham would claim that either of them, both followers of Mandeville and Ortes, had affinities for Christianity; in their published philosophies, they implicitly abjure also *Genesis* 1:26–28. They deny any divine spark of individual reason, any creative potential in the image of the Creator. Creative reason, as a source of increase of the productive powers of labor, does not exist for those radical empiricists, who abhor every effort to delimit the distinction between man and mere beast to the power of articulate speech.

Since we are simple economists, following stubbornly the road which the evidence presents to us, we are disposed to accept the "not entropic" ordering of evidence of individual human creative powers, wherever nature clearly shows that to us. We are willing, perhaps as nothing more pretentious than merely Socratic observers of natural events and their transformations, to accept the crucial proof that man is no beast by nature, and that his capacity for creative reason casts him in the mortal living image of the Creator. Were there no other source of authority on this matter, let the very stones speak this truth of natural law.

Thus, we build a science of physical economy upon this natural evidence, that the individual person is in the mortal living image of the Creator; we define the prime obligation of society to be the ordering of its affairs in a manner consistent with the expression of that natural-law principle of sanctity of human life. For us, that is the natural essence of public morality.

The economic morality which should inform the judgment of all in this matter of economic recovery is to be recognized as implicit in the following features of the input-output map provided above.

As did Gottfried Leibniz, in his early work on the science of physical economy, *Society and Economy*, we start with the relationship between the individual wage and the socially required condition of the family household. Our primary datum is not production, but the *changes* in input-output relationships effected through transformations from one matrix to its successor. Without this primary emphasis upon *change*, there can be no economic science. It is *change*

which defines the most characteristic feature of physical economy, the role of the creative-mental powers of individual persons in *the increase of the productive powers of labor*.

The set of constraints imposed upon the measurement of this change in the transformations, is ordered and subsumed by the requirement of "not entropy." This amounts to the requirement that the effect of supplying "not entropy" to the physical-economic process be realized as a "not entropic" result, a result which is a precondition for maintaining and enhancing the potential population-density of both that society and mankind as a whole.

From this vantage-point, it is scientifically meaningful and proper to state, that the policies of practice which have brought about the recent 30 years! slide into a general collapse have been not merely foolish, but also immoral, in the specific sense that we have just identified economic morality here. Among the most conspicuously immoral effects to be remedied by the recovery process, are obscenities which have developed cumulatively in the social division of labor: the wasteful employment, including unemployment in this, of rations of the labor force.

This includes excess employment in sales and administrative functions, employment in the service and production of sin *per se*, and unwholesome Bureaucratic encrustations generally. The percentiles of national labor forces employed in more productive, rather than less productive, and in the combined categories of agriculture, manufacturing, basic physical infrastructure, medicine, education, science, and technology, must be increased at the expense of the excessive and unwholesome aggregations which have piled up within the categories of sales, administration, bureaucracy, unemployment, and sin.

The principal method for accomplishing this effect, under recovery conditions, is to prevent the continued subsidy of these undesirable conditions. This can be accomplished chiefly by such means as denying use of such sources of subsidies as public credit, or tax concessions. Such means, which are essentially within the competencies of the recovery program, will be effective, at least to the degree of greatly reducing the extent and role of these undesirable elements. Such specifications on changes in composition of employment of the labor force should be incorporated in the specifications to be realized as part of the Case 2 target.

At a time no later than the point of the collapse, government must act to implement a general reorganization in bankruptcy of all classes of relevant institutions. The emphasis here has been on the role of the banks in the recovery process, for obvious practical reasons.

From Case 2 to Case 3

At the moment, the question of peace or destruction of the Middle East as a whole, hangs upon the possibilities for an early launching of infrastructure-building measures of the type

discussed earlier here under the rubric of "The Oasis Plan." Similarly, under the strategic conditions of global financial collapse, the political stability of international relations will be conditional on cooperation in global science-driver projects of the type which absorb and maintain the levels of capital-intense, power-dense, high-technology sectors of the military-aerospace sectors of national economies. The principal features of such science-driver projects are, in general respects, those indicated for the possible application to a Russia case.

The progression from the short- and medium-term goals, of the transition from Case 1 to Case 2 conditions, into the overlapping, but longer-range goals of the transition to Case 3, confronts us with certain most notable problems of longer-range global economic foresight. The principal general problem of this type is the anomalous approach to infrastructure development which must dominate economic development of the so-called developing sector, the largest part of this planet. The second problem to be included among the most significant in such a special list, is the implications of the fact that the world's most populous sector, the virtual center of gravity of future global economy, is the combined littoral of the Pacific and Indian oceans' basin.

To project the transition to Case 3 conditions, we should begin by adopting a benchmark for comparisons to be made. This report recommends that the interval 1967–69 be adopted for this purpose.

During this proposed benchmark interval, there was a crossover between the upward trends in economy promoted by the postwar initiatives which the earliest 1960s associated with the names of de Gaulle, Adenauer, and Kennedy, in contrast to the contrary, depressive impact of the deconstructionist policy-trends introduced over the 1964–67 interval. Consequently, in effect, because of the indicated lag factor, the 1967–69 interval appears the best reference point, respecting economic conditions existing, for identifying the statistical picture of the pre-downturn world economy's leading sectors taken as a whole.

With reference to policies for the developing sector as a whole, we should reference that benchmark period with respect to both industry and agriculture, on the one side, and basic infrastructure, on the other. The heart of the anomaly is this: To effect successful investments in industries of the United States-western Europe 1967–69 technology levels, or better, the developing nation must possess development of basic economic infrastructure at levels of United States-western Europe 1967–69, or better. The economic development of developing sector nations should be ordered with that constraint in view.

In some aspects, what should be done in these cases, is to proceed as one would not attempt to do in building a very tall building: Begin construction from the top down and the foundation simultaneously. For these nations, Case 3 is a point at which a necessary density

of water-management, mass transport, power, communications, and sanitation are provided, plus schools, science and technology development, and medical research and care. At that point, there must also exist, some very advanced industries, absorbing highly trained professional and labor cadres, including the expandable nucleus of a modern machine-tool sector.

We must eliminate the delusion, that the success of a developing nation lies in its ability to attract foreign investment through cheap labor, and so forth. Success might be better measured in the ability of nationals to develop such an industry in their own nation without holding the living standard down to "Third World" levels. That depends upon preconditions such as infrastructural development, educated skills of labor, and so forth. If a "competitive" technological quality of these preconditions does not exist, then a resulting loss of efficiency must be compensated by such ruses as lower wages, and so on. Those "competitive offsets" in arbitrarily reduced elements of cost mean that the national economy's internal market will be forever out of balance with respect to a healthy form of a nation which has adequately developed infrastructure.

Also, on the subject of developing nations, the essence of an economy is its ability to continue to develop its productive powers of labor. The development of the interface between science and the advanced machine-tool sector is key to this. Thus, we must place priority on the existence of sufficient advanced industries to require such a machine-tool sector, and to provide employment using advanced scientific skills in those sectors to which an advanced machine-tool sector is a regular vendor.

On the subject of the Pacific-Indian oceans' littoral—perhaps better termed, for convenience, the "Great Basin"—a few typical points are sufficient illustration for our purposes here.

As the productive powers of labor are increased, per capita, the center of gravity of the world's economy shifts very rapidly into the Great Basin. This appears on our personal computer screens in such forms *as ocean freight* statistics. Some people in Japan are looking ahead, with development of a series of models of ships employing magnetohydrodynamic drives, powered, obviously, by nuclear plants. Higher speeds mean higher stresses on hulls, which opens additional branches of large-scale applications technologies. In the higher population-densities of the Asia and Southeast Asia land-masses, and also the numerous-islanded nations, our approach to transportation must differ from the recent three-quarter-century trends in automotorized North America: a heavy emphasis upon water-borne ocean, coastal, and inland-waterways bulk freight, and a much heavier emphasis upon modern rails (meaning also magnetic levitation) than is found even in western Europe.

Dispense with David Ricardo's silly, misleading sophistry, "comparative advantage." Rather, use science and development to adapt to mastery of the conditions imposed upon us.

The growth of population, and this century's prolonged technological underdevelopment of our planet as a whole, has imposed some tight constraints upon our required performance globally during the coming half-century or so. We have in sight, technologically, a comfortable accommodation of about 25 billions persons on this planet of ours, as we move into the first, token-like, pioneering phases of colonization of nearby Mars. Yet, to meet the needs of some very populous parts of the world, especially in the Great Basin region, we must effect some rather spectacular, although eminently feasible leaps in applied science. For this purpose, we require international science-driver programs, in addition to national ones.

Since man in the late Hermann Oberth's twentieth century has found himself at last, technologically, at the point of beginning the exploration and initial steps of colonization of nearby space, we have reached thus a junction-point in our history, economic history and otherwise. We have reached the point of the late Krafft Ehricke's Extra-Terrestrial Imperative, at which the emerging technology of space and the emerging technology of Earth have become interchangeable. This author therefore votes for the space science-driver as the best choice of umbrella-project.

In any case, however the vote turns out, we must have the science-driver projects for this planet's future. Those science-drivers are the key to the planet's physical-economic security. They are also something like what "The Oasis Plan" is for the Middle East: the active common interest upon which foundation planetary political stability is premised in practice...