II. The Divine Spark in Man

OCTOBER 14, 1996

Why We Must Colonize Mars

by Lyndon H. LaRouche, Jr.

LaRouche contributed this article as a member of the Scientific Advisory Board of 21st Century Science Associates. In 1985, he first proposed a great project to establish a science-city on Mars in the next 40 years that would create skilled jobs and an economic recovery, but its greatest benefit would be the beauty of discovering the ideas that make such a program possible.

My commitment to designing a new policy of Moon-Mars colonization for the United States, began during the early Spring of 1985, as I prepared the address I was assigned to deliver at a June 15-16, 1985 Schiller Institute Conference, dedicated to honor the memory of our recently deceased friend, veteran space pioneer Krafft Ehricke.[1]

At that time, it appeared to me that the appropriate way in which to remember Krafft as I had known him, was to ensure the furtherance of that goal which he had devoted so much to bring about: the use of our Moon as the industrial base from which to launch the future colonization of Mars. In light of my relevant special competencies as a physical economist, and my earlier work on what was then known as U.S. President Ronald Reagan's Strategic Defense Initiative (SDI),[2] I had something unique and important to offer on the subject of such a Mars-colonization project.

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"To say, that we could not afford a space-program at this time, is the opinion of a person who shows no comprehension of the world's present economic crisis. For the very reason that more and more of the world's people can no longer afford to eat, a Mars-colonization science-driver, economic-recovery program, is a far more urgent need of this planet, a far more practical undertaking, than it was back during 1985-1986, when I developed my initial proposals on this subject." Shown is Mars, as imaged by the Hubble Space Telescope.

Weeks later, exchanges with conference participants, during the discussion panel, led to my commitment to amplify my proposal. This, in turn, led to my

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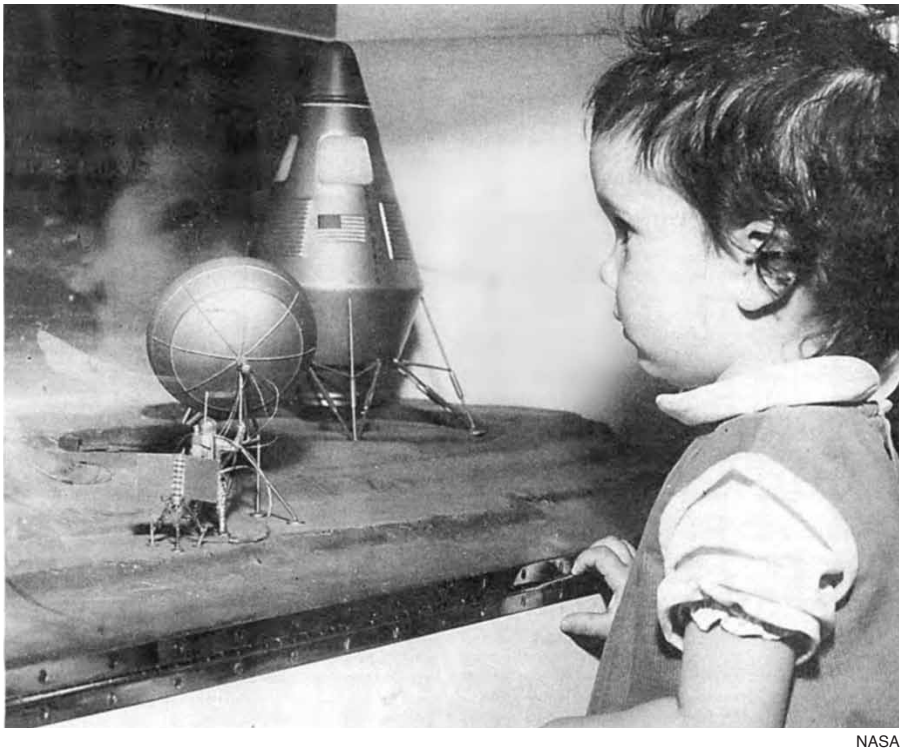
1. *Colonize Space! Open the Age of Reason*, Proceedings of the Krafft A. Ehricke Memorial Conference of June 1985. New Benjamin Franklin House, New York, NY. 1985. This international conference was convened in Reston, Virginia, June 15-16, 1985, co-sponsored jointly by the Fusion Energy Foundation and the Schiller Institute. Krafft Ehricke had died in December 1984.

2. The initial form of the SDI, as summarized in the approximately five-minute, relevant segment of President Reagan's nationwide televised address of March 23, 1983, was a policy which I had featured as part of my 1980 candidacy for the U.S. Presidential nomination of the Democratic Party. Later, during the twelve months beginning mid-February 1982, my proposal for a strategic ballistic missile defense, served as the principal talking-point of an exploratory "back-channel" chat with the Soviet government which I conducted on behalf of the Reagan Presidency. Apparently, the President liked what was reported to him from those "back channel" discussions; his televised announcement of March 23, 1983 echoed every principal policy-feature of the design that I had outlined to the Soviets, point by point. Later, the SDI underwent mutilating modifications, but it was the March 23, 1983 confirmation of my outlined policy which stuck in the Soviet mind.

February-March 1986 public submission of my design for a forty-year program leading to the colonization of Mars.[3] Much later, I updated that proposal in sundry ways, including a draft motion-picture script, *The Woman on Mars*, which I composed with the intent that it serve as a dramatic vehicle for documenting the successive stages leading into the opening of the first science-city colony on Mars, after forty preparatory years. An abbreviated version of that script was the basis for a half-hour television network broadcast, as part of my 1988 campaign for the Democratic Party's U.S. Presidential nomination.[4]



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A youngster contemplates a model of a nuclear-propelled Mars lander, at the Nuclear Rocket Development Station in Nevada in 1966, during a Science Youth Day.

All of this occurred against the backdrop of the "back-channel," exploratory discussions which I had conducted, during 1982 and early 1983, on behalf of our government, with a Soviet channel. The "Mars Colonization" policy was seen by me as a way of circumventing the effects of the stubborn Soviet rejection of President Reagan's offer of March 23, 1983.

As I had reported, both to the Soviet channel, and to the relevant officials in the U.S. National Security Council, my leading concerns in those discussions, were three: 1) the risk of thermonuclear war inherent in so-called "detente" agreements; 2) the accelerating decline of the world economy since 1970-71; and, 3) my judgment, as stated to both my Soviet and U.S. channels during February 1983, that the Soviet economy was currently headed for a collapse, approximately five years ahead.

The strategic objective built into my design for "strategic ballistic missile defense, based upon 'new physical principles'," was to realize the urgently needed, combined, global, economic and political benefits of a "science-driver" program. It was essential to reverse the ongoing, and, then, already far advanced trend, toward a worldwide physical-economic collapse, and to prevent, thus, the collapse into the kinds of cultural pessimism which would almost certainly produce new forms of fascism in the "West," and the probable degeneration of an economically collapsed, and demoralized Russia into a Dostoevskyian, "Third Rome" nightmare.

The hysterical rejection of the SDI, first from General Secretary Yuri Andropov, and, later, from the Gorbachev regime, prompted me to judge, in Spring 1985, that cooperation in a forty-year science-driver program to prepare the colonization of Mars, was the only visible alternative which might be proposed under those circumstances.

The Comecon system collapsed in about six years, not the five which I had foreseen in 1983. Not only have both the Comecon and the Soviet Union dissolved; since 1988, there have been sweeping changes in institutions throughout most of the world. The world is a far worse place, a more dangerous place, a vastly poorer place to live today, than in 1983, 1986, or 1989. As of

3. This was subsequently printed by the Fusion Energy Foundation, and was circulated, at a later time, at the event at which the Payne Commission presented its own proposal for a long-range Mars exploration project. A comparison, and contrast of the similarities and differences between the two designs, is a fruitful approach to understanding the policy issues such a long-range undertaking ought to provoke.

4. *The Woman on Mars*, sponsored by LaRouche's presidential campaign committee, was broadcast on March 3, 1988.

the present moment of writing, the Managing Director of the International Monetary Fund, Michel Camdessus, has come around recently to agreement with at least one key element of my general economic forecast: that the international monetary system is gripped by a systemic crisis, centered in the banking system, which could collapse the entire system, in an implosive, reversed-leverage chain-reaction. He appears to agree with my estimate, that that chain-reaction collapse could break out at almost any moment.[5]

Today, most among our financial institutions are managed by the species of madmen which makes riverboat gamblers seem paragons of prudence and moral rectitude, by comparison. Our basic economic infrastructure, our ruined farms, our lost industries, our collapsing family standard of living, have been destroyed, as tribute to the fires of a monetarist Moloch. In the U.S.A., the net physical market-basket of consumption and output, per capita of labor-force, is approximately half what it was twenty-five years ago.[6] A similar situation prevails in today's Western Europe. In Eastern Europe, the territory of the former Soviet Union, and other regions of today's looted Third World, the physical realities of economic life are beyond mere desperation.[7]

To say, that we could not afford a space-program at this time, is the opinion of a person who shows no comprehension of the world's present economic crisis. For the very reason that more and more of the world's people can no longer afford to eat, a Mars-colonization science-driver, economic-recovery program, is a far more urgent need of this planet, a far more practical undertaking, than it was back during 1985-1986, when I developed my initial proposals on this subject.

Unfortunately, aging has overtaken all of the great space-pioneers of this century. Only among a minority of "Baby Boomers," and a larger ration of those of retirement age, does our population have as much as a faint recollection of the joy which surged through our population with the first landing of men on the Moon;

Stuart Lewis

"For the very reason that more and more of the world's people can no longer afford to eat, a Mars-colonization science-driver, economic-recovery program, is a far more urgent need of this planet, a far more practical undertaking, than it was back during 1985-1986, when I developed my initial proposals on this subject." Here, the author addresses the Krafft Ehricke Memorial Conference in June 1985. Helga Zepp-LaRouche is at left.

for many of our people, that was the next to last time the news broadcasts gave them good reason to be happy. Today's situation in space policy, is comparable to the state of affairs, that medical science and public sanitation had been, finally, successfully eradicated by today's insurance cartels, at the time history's greatest wave of pandemics had seized our planet. Virtually, we must teach the world the principles, purposes, and benefits of the almost-lost science of space exploration, all over again.

It is necessary to explain these functional connections: *What is the economic principle which defines a science-driver, space-exploration program as key to a successful near-term recovery from the presently deepening, global economic depression?* Let us name this topic, "The Christopher Columbus Principle of Economic Science." The usefulness of that choice of name for this principle, will be made clear below.

Commodities Do Not Produce Commodities

Until the terrible, destructive changes in U.S. policy-shaping, 1966-1979, ours had been a nation in which veterans of World War II could make a revolution in the agriculture of family-operated farms of be-

5. John Hoefle, "IMF Admits Global Banking Crisis Is Out of Control," *EIR*, Vol. 23, No. 41. Oct. 11, 1996, pp. 4-6; Mark Burdman, "G-7 Leaders Reach New 'Munich Pact' at Lyons Summit," *EIR*, Vol. 23, No. 29. July 19, 1996, pp. 14-31.

6. Christopher White, "NAM's 'Renaissance' of U.S. Industry: It Never Happened," *EIR*, Vol. 22, No. 16. April 14, 1995, pp. 12-19; Richard Freeman, "U.S. Consumer Market Basket Shrinks to the Crisis Point," *EIR*, Vol. 23, No. 39. Sept. 27, 1996, pp. 12-13.

7. "Russia, the U.S.A., and the Global Financial Crisis," *EIR*, Vol. 23, No. 23. May 31, 1996, pp. 4-65.

Ford Motor Company

Here, Ford Motor Company's giant Rouge industrial complex in Dearborn, Mich., which was once the largest concentration of manufacturing and assembly operations in the world. Iron ore, limestone, and coal were unloaded on the docks, smelted into iron, converted into steel, and within days, transformed into engines, frames, bodies, and parts—and finally, into completed automobiles.

tween 200 and 400 acres. It was time in which most of the labor-force was employed as either operatives or technologists in some branch of either production of physical goods, or in related employment as operatives or technologists in basic economic infrastructure. Most of the labor-force experienced wealth as the benefit of a productive process. In management, the production executive, with his engineering staff and subordinate line management, thought of products and productive processes in terms of investment in scientific and technological progress, and analyzed the management of pathways and inventories in terms of production-planning tools such as bills of materials and process-sheets. We were a productive-performance society.

Today, that sanity reigns no more.

Since about 1966, we have passed over, from an increasingly healthy and wealthy, production-oriented, "blue collar" society, to a decadent, self-bankrupted, consumption-oriented society of "casual attire" and hedonism: a pathetic, decadent "feel my pain" society, a society besotted with the mystiques of "midlife" and "midriff" crises.

One should be reminded of the decaying Roman slave-society of the Civil Wars and the Caesars, of parasitical mobs of those citizens who had been degraded into living on the scant rations of political hand-outs, of a decadent population of Imperial Rome, mobs and all, taking pleasure in the pre-electronic improvisation of our present-day TV entertainments, the Roman Circus Maximus. No person who graduated from university after 1968 ever experienced, during his or her adult life, a time during which the axiomatic assumptions of our nation's economic-policy-shaping were not insane. The thoughtful archeologist might slowly shake his head: He is reminded of dead cultures which had also mislaid the moral fitness to survive.

The added problem, in Europe as in the Americas, is that, during the recent ten years, most among those who entered the top-most positions of policy-shaping within the most influential governmental and private institutions, were drawn from the world's "Baby Boomer" generation. Therefore, except for a tiny minority of the exceptional among them, the policy-axioms which they regard as "mainstream" verities today, reflect the confines of their childhood, shared with such celebrated moral titans as "Howdy Doody," and with a subsequent adolescent and adult education and experience dating from approximately the middle of the 1960s.

The "Baby Boomers" in today's policy-shaping positions, are not to be blamed for inventing the "cultural paradigm-shift" of the 1966-1972 interval; they are chiefly victims of the 1962-1971 decade of aversive behavioral modification of almost an entire generation.[8] They, as victims of Tavistock Centre mass-conditioning, simply take those innovations for granted, on blind faith, as what they were conditioned to accept decades earlier. The axioms of the present economic policy-shaping are, thus, fairly described as the fashionable things which one should be overheard saying, to pro-

8. From the "Cuba Missiles Crisis" and political assassinations of President Kennedy, Malcolm X, Martin Luther King, and Bobby Kennedy, of the Vietnam War performed on nightly television, and of the August 1971 collapse of the Bretton Woods agreements.

mote one's career in politics, in a university post, in business, or, simply in those recreational settings in which self-important people foregather, ostensibly to be admired by others, but, most of all, by themselves.

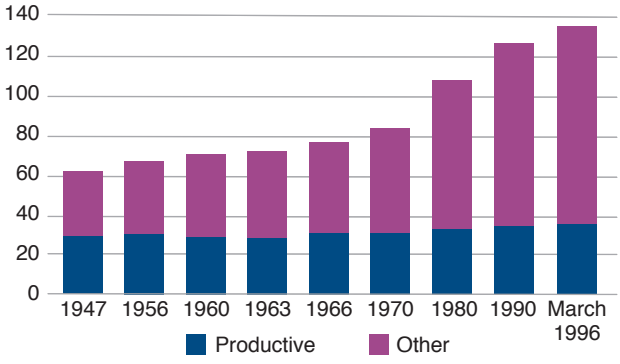
We who watched that process of behavioral conditioning of the Baby Boomers and others, during the past thirty-odd years, must help the leaders of that generation of victims, and of so-called "Generation X," to understand their own predicament. If we fail to do precisely that, those two generations, and more, are as self-doomed as Shakespeare's Hamlet, to come soon to a wretched end, and in a similar fashion. Within the limited specific purview of our subject here, the economics of space-exploration, we must assist today's "Baby Boomers" in understanding the axiomatic incompetence of their parents' generation on the subject of economic principles: the incompetence which is the axiomatic underpinning of so-called "mainstream" economic thinking today.

During the post-war interval, the proverbial "cutting edge" of economics and industrial-management professionalism, was represented by a mid-1950s factional controversy, between two mutually opposing factions in a newly encamped branch of economics teaching. This recent development in taught economics, was known as "systems analysis," or, "input-output analysis."

On the one side of the controversy, was (then) Harvard University Professor Wassily Leontief, a principal designer of the U.S. government's post-war National Income and Product. Opposing Leontief et al., was what Leontief himself aptly identified as the "ivory tower" school of Tjalling Koopmans' Operations Research Society.[9] The U.S. component of this "ivory tower" faction, was permeated with the influence of two devotees of Bertrand Russell, Norbert Wiener (of "information theory" notoriety), and John von Neumann's "systems analysis" dogmas. The mother of the doctrine, internationally, was what came to be known as the Cambridge (England) "Systems Analysis" mafia of such Bertrand Russell successors as Lord Kaldor and his associates.

Although the experimental standpoint of Leontief was much preferable to that of the "ivory tower" fanatics, there was a common axiomatic fallacy underlying both. This significance of this pervasive fallacy is put into sharper focus, if from a Cambridge vantage-point, by a small, 1960, book, of British economist Piero Sraffa, *The Production of Commodities by Means of Commodities*.[10] That fallacy is the most stubborn of the underlying, axiomatic morbidities governing virtually all currently "mainstream" economics opinion.

Productive Portion of U.S. Labor Force, 1947-1996



The proportion of the labor force that is engaged in productive labor (manufacturing, construction, farming, mining, public utilities, and transportation) has dropped precipitously since the end of World War II. ("Productive" signifies the direct alteration of nature through labor, in order to increase the rate of potential relative population density.) The rest of the labor force ("other") consists of "essential" workers in such fields as health, education, and useful engineering, but also "overhead" workers such as accountants, retail clerks, and lawyers, who are neither productive nor essential to the physical economy. Most new jobs today are in the overhead category.

Source: *Executive Intelligence Review*, Sept. 27, 1996, p. 14

To understand the axiomatic root of the incompetence of today's economics dogmas, it is indispensable, if not sufficient, to recognize the absurdity of studying an economic process from a consumerist, rather than productive standpoint. It is also necessary to recognize that today's popular monetarist illiteracy represents not only the "consumerist" lunacy, but also carries forward the crude errors of axiomatic assumption already embedded in the "input-output analysis" of the 1940s through 1970s. On the latter account, this writer has introduced the pedagogical imagery of the "Columbus Principle." We now quote the relevant pages from the preface to a new, Chinese-language edition of the writ-

9. See reference to this in Lyndon H. LaRouche, Jr., "Kenneth Arrow Runs Out of Ideas, but Not Words," *21st Century Science & Technology*, Vol. 8, No. 3. Fall 1995, pp. 34-53.

10. Piero Sraffa, *The Production of Commodities by Means of Commodities*, Cambridge University Press, 1960.

er's 1984 textbook in physical economy.[11]

> The analysis of economy from the standpoint of production, employs statistical tools such as bills of materials and process sheets. Each detail of the network of an economy's total production-cycle, from infrastructure to consumption of finished product, is mapped, as streams, into the junction-points where productive actions are performed. "Market-baskets" of required goods are accounted for, per capita of labor force, per unit of land-area, and per family household. Leibniz's approach to defining a necessary household market-basket, is employed throughout, both for household consumption and for each branch of agriculture, industry, and infrastructure.[12] Allowances are made for sundry forms of administration, in a similar way.
>
> This analysis of the production-stream, faces the economist with the challenge of discovering some notion of functional relationship between variation in the physical contents of these market-baskets and variation in the productive power of labor, per capita, as Leibniz demanded the necessary income of the household of the laborer be studied.[13] We must do this for every branch of production and infrastructure, in addition to study of the required market-baskets of family households.
>
> The immediate goal of such inquiries, is to determine the relationship between the expenditures and the variation in effective productive output of the society, per capita of the employed labor-force. No competent measurement of such a functional relationship can be made in money-prices; the correlation must be between physical inputs and physical productivity of labor. Only one exception to this rule should be permitted:

Decline in Production Levels for Goods in Producers' and Consumers' Market Baskets on a Per-Household Basis

(index 1967 = 1.000)	1967	1973	1979	1982	1990
CONSUMERS' MARKET BASKET					
Men's trousers	1.000	0.965	0.594	0.504	0.335
Men's shirts	1.000	0.644	0.486	0.343	0.165
Women's blouses	1.000	1.023	1.511	1.405	0.684
Women's dresses	1.000	0.597	0.503	0.339	0.279
Women's woollens	1.000	0.264	0.254	0.139	0.166
Refrigerators	1.000	1.247	0.935	0.703	0.932
Passenger cars	1.000	1.150	0.869	0.484	0.512
Tires	1.000	1.020	0.833	0.666	0.877
Radios	1.000	0.706	0.467	0.316	0.098
PRODUCERS' MARKET BASKET					
Metal-cutting machine tools	1.000	0.643	0.530	0.289	0.212
Metal-forming machine tools	1.000	0.854	0.730	0.404	0.406
Bulldozers	1.000	1.200	0.713	0.334	0.306
Graders and levellers	1.000	0.786	0.748	0.383	0.349
Pumps	1.000	1.140	0.541	0.424	0.506
Steel	1.000	1.029	0.821	0.416	0.487
INTERMEDIATE GOODS FOR EITHER MARKET BASKET					
Gravel and crushed stone	1.000	1.023	0.914	0.624	0.575
Clay	1.000	1.022	0.759	0.459	0.544
Bricks	1.000	0.999	0.850	0.451	0.598
Cement	1.000	1.045	0.911	0.632	0.689

In the United States, the production of physical market baskets has declined to about half of what it was in 1967. Today, the average working family must hold down three jobs to buy what a single job afforded in the 1950s and 1960s.

11. Lyndon H. LaRouche, Jr., *So, You Wish to Learn All About Economics?*, 2nd printing, EIR News Service, 1995. The quoted paragraphs are also published in "While Monetarism Dies," *EIR*, Vol. 23, No. 43. Oct. 25, 1996, pp. 10-19.
12. G. Leibniz, "Society and Economy,"1671. English translation by John Chambless, *Fidelio*, Vol. 1, No. 3, Fall, 1992, pp. 54-55.
13. Ibid.

the degree quantity and quality of education, health-care, and science and technology services affects the potential physical productive powers of labor, those expenditures must be included in the market-baskets of consumption by labor, by infrastructural facilities, by agriculture, and industry.

By those empirical means, we attempt to determine what portion of the consumption by a society corresponds to "energy of the system." We correlate that consumption with a certain level of potential productive output. We assume that any of the non-wasted output in excess of replacing that required consumption, is the "free energy" of the productive process. The economist must account for the role of reinvestment of some portion of that "free energy," both to expand the scale of the economy and its supporting infrastructure, and to increase the productivity of the productive process by emphasis on power-intensive, capital-intensive modes of investment in scientific and technological progress. The economist's goal, is to ensure that the ratio of "free energy" to "energy of the system" does not decline, even though the "energy of the system," *per capita,* is being increased.

The question is, how would changes in the patterns of consumption affect the potential productive powers of labor? How would changes affect the ratio of "free energy" to "energy of the system"?

The apparent cause for the failure of most attempts to understand the physical economy of an entire nation-state in those terms, is the error of assuming that we can measure the functional variation in relationship of input to output in such a way as to imply that we are measuring the "production of commodities by commodities," with the human individual serving only as vehicle for such functions. The unscientific character of Norbert Wiener's "information theory," and John von Neumann's attempts to apply his "systems analysis" to economic processes, is a related case. The work on input-output models by Professor Wassily Leontief, is useful, on condition we do not fall into the delusion, of assuming that, in such a configuration, we are studying the implied "production of commodities by commodities."

The source of increase of the productive powers of labor, is the quality of the typical newborn human individual, which sets all persons absolutely apart from, and above all lower forms of life. This distinction is most readily identified, in functional terms of reference, as that developable, but sovereign capability of each human individual mind, for making valid, revolutionary discoveries of physical principle. This applies both to experimentally valid original discoveries of principle, and to the student's reenactment of an original such act of discovery. The same principle of cognition central to fundamental scientific discovery, is the source of all of the masterworks of European Classical art-forms. The increase of the individual person's power over nature, in production and in design of products, is derived from the cultivation of those same cognitive powers from which we obtain advances in scientific and artistic knowledge.

We must think of products not as the cause of productivity of labor, but as the necessary circumstances of that productivity. Consider the case of Christopher Columbus' discovery of the Americas.[14]

Columbus' discovery of the Americas began toward the close of the Third Century B.C., with the estimate of the Earth's curvature by the celebrated member of the Platonic Academy at Athens, Eratosthenes. Employing Eratosthenes' and other ancient experiments as his guide, Paolo Toscanelli (A.D. 1397-1482), the leading astronomer of the Fifteenth Century, created the maps of the world which guided Columbus to his successful voyage.[15] Toscanelli's map had but one notable flaw; it was based upon a nearly

14. In rebuttal of those who insist that "Columbus could not have discovered America," because there were already inhabitants of the Americas thousands of years earlier than A.D. 1492, one might mention the case of the wise woman who set a trap by means of which to *discover* another woman in her husband's bed. Columbus' discovery of the Americas was accomplished by the same methods of astrophysics used to discover planets, moons, and asteroids of the Solar system.

15. Gustavo Uzielli, "Paolo Toscanelli, Amerigo Vespucci, e la scoperta d'America," in his book of essays, *Paolo del Pozzo Toscanelli, iniziatore della scoperta d'America*. Riccardo del solstizio d'estate del 1892. Florence, Italy, 1892.

accurate size of the Earth, as determined by astronomical observations of the Earth's curvature, but, it relied upon the highly exaggerated reports supplied by Venice, on the distances from Venice to China and Japan, placing Japan and the islands of the Indies in the middle of today's United States!

Columbus learned of Toscanelli's maps nearly two decades before his famous voyages of discovery. This included Columbus' access to the correspondence between Toscanelli and Lisbon's Fernão Martins, on the subject of exploration westward across the Atlantic Ocean for the Indies.[16] Columbus wrote to Toscanelli and became fully informed, in the last years of Toscanelli's life, of the collaboration which had been ongoing for decades before, and which had begun with the immediate Florentine circle of Nikolaus of Cusa during the years before the Council of Florence of 1439.[17]

Columbus added to this scientific knowledge, his experience and knowledge as a navigator for the Portuguese, knowledge of ocean currents and prevailing winds, which clearly implied the probable location of, and route toward land on the other side of the Atlantic. His use of Toscanelli's map, indicates that his original goal were the islands of the Pacific far to the South of Japan. Columbus' discovery of the Americas was, thus, a 'scientific discovery,' in the strictest meaning of experimental physics.

This example of Columbus' discovery is cited here to illustrate one of the most crucial principles of economic science, a principle apparently unknown to the popular economics doctrines of today's universities. The relevant question is: *Was the discovery of the Americas accomplished by the three ships Columbus commanded, or the sailors on those ships?* Reports of Columbus' difficulties in securing those ships, and the reluctance of the crew, illuminate the twofold fact: *It was Columbus, and he alone, who acted to effect the discovery of the Americas; but, he could not have succeeded without the ships and crew.*

It is not the means of production, or even labor as such, which produces those advances upon which progress in the condition of mankind is effected. It is the power of valid scientific and artistic discovery by the sovereign powers of the individual intellect, upon which all human progress depends. However, to advance, the discoverers, and their associates in labor, must be educated up to the level needed to make valid discoveries and put them into operation. Even those means will not succeed, unless the suitable tools and materials are provided to make effective the impulse of the creative individual intellect.

The ships did not cause the discovery of the Americas, but they were essential to that discovery. The material conditions of life do not generate human progress, but without such means to convey the work of the human intellect, progress is not possible. The point ought to be obvious, but most professed economists have been too fiercely gripped by the delusions demanded by their adopted ideologies, to recognize the right relations within the productive process.

The same word of caution must be applied to this textbook's treatment of the relations expressed in terms of the social division of physically productive labor. It is not the quantity of persons, or the amount of their labor-time employed, which generates productivity; it is the developed powers of the individual's human intellect, an intellectual power which could not be effective without associated development of basic economic infrastructure and means of production.

Thus, once we have accepted, as a matter of principle, the need for certain preconditions of production, we must concentrate upon the development of the quality of the individual person within society.

For example, the amount of time of the child freed for education, will affect the level of development of that child's knowledge and mental powers. To provide a suitable quality of education, even with the best teachers, would not be possible unless the economic standard of household life permitted the young to devote the

16. Ibid.

17. Paolo Emilio Taviani, *Christopher Columbus: The Grand Design*, Orbis Press, London); Ricardo Olvera, "The Discovery of the Americas and the Renaissance Scientific Project," *EIR*, Vol. 17, No. 40. Oct. 19, 1990, pp. 42-45.

NASA

Sail on, Columbus! Replicas of the Santa Maria, Niña, *and* Pinta *sail near the Space Shuttle* Endeavour*, as it awaits liftoff in May 1992, the year of the 500th anniversary of Columbus's voyage to the New World.*

Library of Congress

Christopher Columbus

greater portion of the many years of childhood and adolescence to such education. The health and longevity of the members of the households, is crucial for this. Those social relations and material conditions of family and community life, which are essential to the improved development of the individual personality's scientific and artistic powers, are essential material needs of the household and community, are essential features of the "energy of the system" required to perpetuate a specific, corresponding level of potential productive powers of labor.

Similarly, any society based upon a fixed productive technology, must decay into ruin from the accumulated effects of what we term "technological attrition." Without investment in scientific and technological progress, a society will degenerate. Yet, investment in scientific and technological progress requires increased investment in infrastructure, in improvements in nature, in water consumed per capita, in power consumed per capita, and in tools of production required per capita.

All survivable economies are characteristically "not entropic" in these terms: *The ratio of "free energy" to "energy of the system" must not decline, despite the imperative increase of the "energy of the system" through "reinvestment" of a portion of the "free energy" flow.* The source of that "not entropic" impulse, is nothing other than that which sets mankind absolutely apart from, and above all other known species in this universe: those creative powers of the individual human mind, by means of which valid, original discoveries of universal principle are discovered, and that mental act of discovery replicated, by reenactment, within the sovereign precincts of the mental processes of the student.

That "Columbus Principle" is the key to the stunning success of the U.S. 1940-1943 economic mobilization for war, under the leadership of President Franklin Delano Roosevelt. That is the source of Chase Econometrics' estimated $14.00 return to the U.S. economy, for each $1.00 spent by government on the Kennedy Apollo Project. Drive the rate of realization of scientific discoveries of principle to the limit, and mobilize the material, educational, and health resources needed, to enable modern "Christopher Columbuses" to succeed in their voyages of discovery beyond new frontiers.

That is the secret of all the great economic achievements of modern western European civilization. The relevant policy, is to promote the development of the mind of as many individual persons as possible, through a method of education consistent with the Christian-humanist models of the Brothers of the Common Life, Friedrich Schiller, and Schiller's fol-

lower Wilhelm von Humboldt. One must drive those developed mental capabilities toward their limits of achievement, through providing the appropriate choice of mission and means to bring about fundamental increases of mankind's power over nature, in man's per capita relationship to our universe, as *Genesis* 1:26-28 prescribes.

In the Wake of the Santa Maria

During the 1950s, Werner von Braun acknowledged Christopher Columbus's choice of three ships for the discovery of the Americas, as the appropriate model for mankind's future journey to Mars.[18] In 1986, this writer adopted von Braun's "Columbus Principle," and featured it, as such, within his own designs, that year and later, for a forty-year science-driver program, for preparing the colonization of Mars.

Yet, there is another crucial lesson to be adduced from the Columbus Principle, a point with which von Braun would have concurred, at least in substantial degree. How was it that the associates of Cardinal Nikolaus of Cusa came to propose that voyage to the Indies which Christopher Columbus adopted from the correspondence of Cusa's associates Paolo Toscanelli and Fernão Martins?[19] As Columbus' sponsor, the noble Queen Isabella insisted: it was not the search for gold and slaves, or other booty from distant places, which was the purpose of her government in sponsoring the exploration.[20] The purpose of space-exploration, is not conquering real estate or looting raw materials for Earth; it is making a change in the existing relationship between man and the universe, a change which is necessary for developing new principles essential to the improvement of life here on Earth.

The primary benefit from space-exploration is the progress of the individual's human condition on Earth itself. This benefit arises from the "spill over," into the Earth's internal economy, of forced-draft breakthroughs in discovery and development of newly discovered principles. This occurs chiefly through the use of the designs of successful proof-of-principle experiments, as models for introducing new design principles into machine-tools and end-products of the productive process in general. In the jargon of the shrewd businessman: "We may lose a great deal of money in exploring space, but we get that back, many times over, from the by-products of the operation."

Then, during the mid-1980s, as now, this writer defined the scientific objectives of science-driver "crash programs" of economic development, in the following rule-of-thumb terms.

We begin, as Nikolaus of Cusa did, and Johannes Kepler, Gottfried Leibniz, Carl Gauss, Wilhelm Weber, and Bernhard Riemann after him.[21] We begin by emphasizing the distinction between the useful, but relatively defective formal mathematical physics, and experimental physics.[22]

In experimental physics, we repeatedly encounter paradoxes which threaten the authority of any established mathematical physics. The experimental validation of discovered solutions for those paradoxes, presents us with new physical principles. It was the kernel of Riemann's act of genius, in his 1854 habilitation

18. For a bibliography of von Braun's published writings on Mars, see Marsha Freeman, *How We Got to The Moon: The Story of the German Space Pioneers*, 21st Century Science Associates, Washington, D.C., 1993, pp. 352-353.

19. Nikolaus of Cusa, the author of the key work in the founding of the modern European nation-state, *Concordantia catholica* (A.D. 1433), and the founder of modern physical science, as in his *De docta ignorantia* (A.D. 1441). He contributed a decisive role in organizing the great ecumenical Council of Florence (A.D. 1439-1441). He was also a key figure in promoting a policy of ecumenicism among Christians, Jews, and Moslems (*De pace fidei*). Cusa designated his close collaborator Fernão Martins to be the executor of his estate. Martins returned to Portugal to assume church duties assigned him there. Thus, the correspondence between Toscanelli and Martins came into the orbit of Columbus' activities as a Portuguese navigator.

20. Isabella forbade the practice of slavery in the Americas. Unfortunately, she died in A.D. 1504, leaving leadership to persons more susceptible to the influence of the Venice which remained the world's leading slave-trading nation, until the trade was taken over by the Dutch and British India Companies. For Isabella, as for Cusa and his circle in Italy, the purpose of the voyages to the Indies was to evangelize, to win ecumenical allies against the enemy forces, against the tradition of oligarchical Babylon represented then by Venice and Venice's sometime partner, the Osman dynasty which had taken over the Byzantine Empire. Ethiopia and India were among the projected allies of European civilization against the continued threat from the tradition of Babylonian oligarchical culture.

21. On the relevance of Gauss's and Riemann's collaborator Wilhelm Weber, see the contributions by Jonathan Tennenbaum and Laurence Hecht to this issue [Fall 1996] of *21st Century Science & Technology*.

22. Lyndon H. LaRouche, Jr., "Leibniz from Riemann's Standpoint," *Fidelio*, Vol. 5, No. 3, Fall 1996. (G.F.) Bernhard Riemann, "*Über die Hypothesen, welche der Geometrie zu Grunde Liegen*" ("On the Hypotheses Which Underlie Geometry"), Bernard Riemann's *Gesammelte Mathematische Werke*, H. Weber, ed. (reprint of Stuttgart: Be. G. Teubner, 1902), Dover Publications, New York, 1953. Also reprinted by Sändig Verlag, Vaduz, Liechtenstein, pp. 272-287.

dissertation,[23] to recognize that such principles represent the new "dimensions" of a physical space-time geometry, whose addition creates, thus, a new (Platonic) hypothesis to rule over mathematical physics, a new physical space-time manifold, each such with its own characteristic "curvature." As Riemann apprehended the genius of Gauss's work, it is the experimental measurement of that "curvature" which satisfies Nikolaus of Cusa's prescription for experimental physics: *measurement*.[24]

The scientific method which must underlie all successful science-driver programs, such as space-exploration, is that of experimental physics, rather than formal mathematical physics. The practical essence of the matter, that which predetermines the relative economic success, or failure of the program, is a breaking of frontiers, repeatedly, forcing paradoxes to manifest themselves, and discovering and validating the new principles of experimental physics needed to overturn, repeatedly, any pre-existing mathematical physics. The relative "not entropy" to be gained from a science-driver program, is to be associated with the advantageous changes in the physical space-time curvature of the manifold represented by human technological practice.

It is the forcing of revolutionary discoveries in the domain of experimental physics, by successively, and successfully assaulting the seemingly impossible, which generates the success of (in this case) the space program, and also the gain in productive powers of labor derived as spill-over from the science-driver program.

It is from such revolutionary discoveries of seemingly impossible new principles, that the creative powers of the human mind are called most fully into play. It is from the characteristically "not entropic" creative processes of individual human cognition, and from no other cause or source, that "free energy" (e.g., true "profit") is generated within an economic process. If this were not so, the demographic characteristics of the human population would have been characterized, throughout all pre-history and history, by a secular shortening of life-expectancy, and a corresponding, "entropic," lowering of the potential relative population-density of every culture.[25] Therefore, for economic science, those who prefer to "play it safe," and urge us all to avoid technological progress, are rightly classed as social parasites, and, also, of course, heathenish opponents of *Genesis* 1:26-30.

Sail on, Columbus!

Why Choose Space-Exploration?

When we wish to be understood, in discussing modern, science-driver "crash programs," it is mandatory that we make mental reference to a number of clinical examples.

Included among available choices, would be: Filippo Brunelleschi's application of the catenary principle, to effect the feasible completion of the cupola for the Florence cathedral of Santa Maria del Fiore; the work of Leonardo da Vinci; the A.D. 1461-1483 transformation of France into the first modern nation-state and national economy, under Louis XI; the science-driver development program of France's Minister Jean-Baptiste Colbert; the work of Lazare Carnot, Gaspard Monge and their associates, both during the military crash-program of 1792-1794 and by the 1794-1814 École Polytechnique under Monge;[26] the wartime U.S. mobilizations under Presidents Abraham Lincoln and Franklin Delano Roosevelt; the Manhattan Project; and, the German-American U.S. Space Programs of the early 1950s and the 1960s. There are other examples, but the list given suffices for our purposes here.

In each of these cases, a local (e.g., Florence), regional, or national economy was mobilized, *as if to win a war*, around some set of tasks whose mastery required the mustering of what the great Gerhard Scharnhorst's protégé, Carl von Clausewitz, identified, in his *Vom Krieg* [*On War*],[27] by his use of the German term *Entschlossen-*

23. Ibid.

24. e.g., *De docta ignorantia*. Thus, it is a delusion to think that "statistics are science," or that extrapolating a "model" within the virtual reality of a digital computer system, is "doing science." A related delusion of the mathematical formalists, is today's generally accepted, but absurd assumption, partly the fault of Hermann Grassmann, of "linearization in the very small."

25. For example, it was the proto-Malthusian, "zero-technological growth" feature axiomatically underlying the Code of Diocletian, echoing the Babylonian model of oligarchism, which imposed upon Byzantium its subsequent, characteristic demographic and moral degeneration.

26. Until the 1815 takeover and gutting of the École by the Marquis Laplace and his protégé, the plagiarist Augustin Cauchy.

27. Clausewitz's works on warfare were published posthumously: originally, in a ten-volume edition. Berlin,1832-1837. The most relevant edition is the *Vom Krieg* published with an introduction by Alfred (Graf)

heit: To force successive breakthroughs in the form of valid discovery of new physical principles. The military language is appropriate, almost indispensable. The military-historical allusion is to the principle of the flank, as practiced with exemplary brilliance and success, during 1792-1794, by France's "Organizer of Victory," Lazare Carnot, and by Alexander the Great (Gaugamela), Hannibal (Cannae), and General William Tecumseh Sherman, the "Hammer" of General Ulysses Grant's "Anvil."[28]

The "principle of the flank," as exemplified famously by Alexander the Great, Hannibal at Cannae, as set forth by the soldier-scientist Carnot, executed with consummate brilliance by Sherman, and built into Schlieffen's famous design for crushing the anticipated, two-front aggression by Britain, France, Russia,[29] corresponds precisely to the state of mind required for a successful science-driver program, or the discovery of a Christopher Columbus.

A weaker force may, sometimes, annihilate a more powerful one, by concentrating sudden and relentless waves of attacks upon a well-selected, predetermined "flank" of the opposing, superior force. The selection of such a point, or coordinated points of focussed attacks, requires the same qualities of intellect which must be summoned for driving through an apparent paradox to the validated discovery of a new physical principle. Scientist Carnot's dispatched commands to the various parts of the French military under him, during 1792-1794, illustrate the connection; the making and execution of such strokes, whether in warfare, or in science, may appear to subordinates as a terrifying spectacle of sheer, remorseless will by their commander. Once the commitment is made, one must not flinch, nor permit subordinates to waver. Whether in military command, or science, this is the meaning of Clausewitz's use of the term *Entschlossenheit* in *Vom Krieg*.

No soldier, or other professional should wish ever to serve in combat under a commander who lacked this quality, nor face a crisis under a scientific or political leader who lacked the same quality.

Once that qualifying requirement is adopted for a science-driver enterprise, the question may be posed: *Among all the choices of science-driver programs which might be devised, why choose space-exploration?*

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von Schlieffen. Berlin, 1905.

28. Alfred (Graf) von Schlieffen, *Cannae*. Berlin, 1905, *passim.* Dino di Paoli, "Carnot's Grand Strategy for Political Victory," *EIR*, Vol. 23, No. 38. September 20, 1996. Pages 14-29.

29. The point made here on the Schlieffen Plan, is of such prime relevance, that we could not fairly detour around the implied controversy. Lest some credulous reader have been duped by sundry British, French, Russian, and Woodrow Wilson administration liars, on the subject of the cause of World War I, the following facts should be listed. World War I was caused by no other agency than the British monarchy, specifically Albert Edward, as Prince of Wales, and as King Edward VII. In the eyes of the British Prince and his "Club of the Isles" cronies and lackeys, the *casus belli* of the matter was a strategy for destroying the British Empire devised by U.S. President Abraham Lincoln.

Lincoln's war-plan, which he would have executed, had the British not arranged Lincoln's assassination by its agent Booth, had three features. 1) The U.S. occupation of Canada, from which London had deployed its forces in the 1776-1783 War of U.S. Independence, the 1812-1815 war, and the Civil War of the United States against the treasonous British agents who had created Britain's slave-owner ally, the Confederate States of America. 2) The execution of Ericsson's design for a U.S. fleet of ocean-going Monitors, to blockade the British ports, and bring London to its knees. 3) As proposed by Henry Carey during the late 1860s, the creation of a system of transcontinental railways across Eurasia, from the Atlantic coast of a post-Napoleon III France, to the Pacific and Indian oceans.

It must be remembered, that during the period from the outbreak of the U.S. Civil War, until the 1901 assassination of U.S. President William McKinley, the Russia of Czar Alexander II, of Dmitri Mendeleyev, and Minister Count Sergei Witte, was the leading ally of the United States against the U.S.'s deadly foes, both the British Empire and Napoleon III's France. Also most notable, are the alliance between the so-called "Lazzaroni" and other circles of Benjamin Franklin's great-grandson, Alexander Dallas Bache, and the circles of Gauss, Humboldt, Siemens, and Emil Rathenau, in Germany. The British monarchy chose to see the cooperation among France, Germany, and Russia, around the transcontinental railway projects, as a *casus belli*. The plan to unleash a war in Europe which would permanently destroy such cooperation, was named the British "geopolitics" of the Prince of Wales, Halford Mackinder, Milner, et al. The Prince of Wales/Edward VII revived the former alliance with London's puppet, Napoleon III's France, over the period 1898-1904, as the so-called *Entente Cordiale*.

Through the Russian Revolution of 1905-1907, Witte's influence was ruined, and Russia's Pan-Slav factions lured into the anti-Germany alliance with Edward VII's *Entente Cordiale*. It was Russia's late-July 1914 general mobilization for military assault on Germany, which pushed a peace-seeking Germany to declare war on August 1, 1914: moving to crush the French and British forces in the west, before bracing to meet the main body of Russia's military aggression from the east. Had Chief of the German General Staff, Helmut von Moltke, not altered the Schlieffen Plan, Germany would have crushed France and the British Expeditionary Force in the initial flanking assault, Russia would have had no option but to make peace, and neither the prolonged World War I, nor World War II would have happened.

In short, the doctrine of "exclusive German war-guilt" concocted by Woodrow Wilson's Secretary of State, Robert Lansing, is a fraud, from beginning to end. Schlieffen's morally untainted grasp of the principle must not be overlooked in the attempt to identify the principles for design of successful science-driver programs.

For our mission here, we must view science, not from the ivory-tower vantage-point of today's generally accepted classroom standpoint of formal mathematical physics, but, rather, from the standpoint of experimental physics, as this distinction, already stressed by the founder of modern science, Nikolaus of Cusa, was emphasized in a new, and most profound discovery, by Bernhard Riemann.[30]

Look, then, at experimental physics. Look at it from the standpoint we have outlined up to this point. Bear in mind our reference to Riemann's devastating proof against a mathematical-formalist approach to mathematical physics. Bear in mind, that the present writer and Riemann base themselves upon the scientific method inhering in Plato's method of hypothesis. Bear in mind the approach to Leibniz's specification for a "hypermathematical" method of Analysis Situs, as this writer has presented the case for the science of physical economy.[31] Under those explicit and implied conditions, the "map" of human knowledge (science), is constructed as follows.

Stuart Lewis

" 'Human knowledge' must be understood to signify nothing other than validation of man's discovery of those principles of change, by means of which man can, or cannot, cause the universe to bend to man's will." Above, children constructing a sundial in a class on solar astronomy.

1. *"Human knowledge," or "knowledge,"[32] must be understood to signify nothing other than validation of man's discovery of those principles of change, by means of which man can, or can not, cause the universe to bend to man's will.* The conception of objects as fixed objects *per se*, is not knowledge; only the validated principles of change affecting designated objects, permits one to speak truthfully of "knowledge of" an object.

2. *"Knowledge" can be acquired by no other means than metaphor. "Metaphor" references the existence of that quality of paradox, in which an undeniable event mocks stubbornly an implicitly referenced system of belief. The only solution to such a paradox, is the generation of an appropriate new system of belief by means of the sovereign cognitive processes of the individual's mind. The experimental, or equivalent validation of that generated new conception, establishes that conception as enjoying the authority of a physical principle. The reconstruction of the old system of belief in a way which coheres with the validation of the newly discovered principle, constitutes "knowledge," then so acquired, and enjoyed, by that individual's mind.*[33]

30. *op. cit.* Riemann emphasizes this near the outset of his 1854 habilitation dissertation, and restates the point, summarily, in his close. For reason of the extreme relevance of the points to be developed, immediately hereinafter, we excerpt these references at some modest length. From pp. 272-273: *... Es wird daraus hervorgehen, dass eine mehrfach ausgedehnte Grösse verschiedener Massverhältnisse fähig ist und der Raum also nur einen besonderen Fall einer dreifach ausgedehnten Grösse bildet. Hiervon aber ist eine nothwendige Folge, dass die Sätze der Geometrie sich nicht aus allgemeinen Grössenbegriffen ableiten lassen, sondern dass diejenigen Eigenschaften, durch welche sich der Raum von anderen denkbaren dreifach ausgedehnten Grössen unterscheidet, nur aus der Erfahrung entnommen werden können. ... Diese Thatsachen sind wie alle Thatsachen nicht nothwendig, sondern nur von empirische Gewissheit, sie sind Hypothesen; man kann also ihre Wahrscheinlichkeit, welche innerhalb der Grenzen der Beobachtung allerdings sehr gross ist, untersuchen und hienach über die Zulässigkeit ihrer Ausdehnung jenseits der Grenzen der Beobachtung, sowohl nach der Seite des Unmessbargrossen, als nach der Seite des Unmessbarkleinen urtheilen.* Riemann returns our attention to this crucial portion of his opening argument, in the closing sentence of this dissertation (p. 286): *Es führt dies hinüber in das Gebiet einer andern Wissenschaft, in das Gebiet der Physik, welches wohl die Natur der heutigen Veranlassung nicht zu betreten erlaubt.*

31. On the role of Analysis Situs in physical economy, see Lyndon H. LaRouche, Jr., "While Monetarism Dies," *EIR*, Vol. 23, No. 43, Oct. 25, 1996, pp. 10-19.

32. Of all known species subsumed by eternity, only the human species is capable of knowledge. Hence, the strictly admissible use of "knowledge" to signify "human knowledge."

33. The resulting knowledge occurs in the form of a new hypothesis, as Riemann describes this for physics. This use of Plato's principle of hypothesis, is the common foundation of all of the scientific work of both the present writer and Riemann.

3. *The authority of such "knowledge," is located, ultimately, in the demonstration of the efficiency of the new system of belief, respecting a society's, or mankind's ability to command the universe to such effect that the characteristic*[34] *productivity, potential relative population-density, and other demographic features of the human species' existence, are improved.*

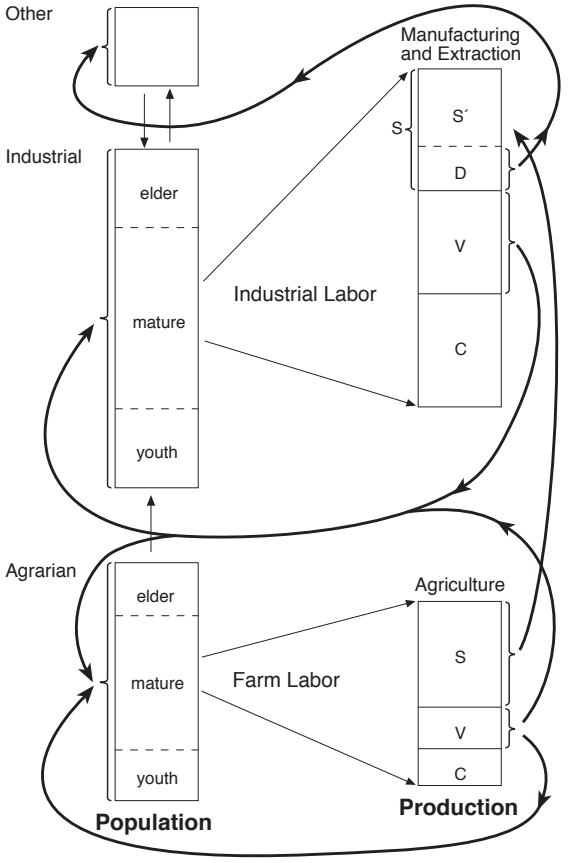
4. *Such knowledge, as qualified by the "Great Experiment" of advancement in the characteristics of the existence of the human species within the universe at large, constitutes knowledge of what is termed "Natural Law."* Other names for "Natural Law" are "Reason" (as used by Johannes Kepler, for example) and "necessary and sufficient reason" (G. Leibniz).

5. The principles of knowledge are equally efficient for, and equally represented by physical science and the production of masterworks in Classical forms of art.[35]

With these definitions and implications in view, one may then proceed to construct a cohering map of the knowledge to be derived from the directed progress of experimental physics. This map defines the terrain on which science-driver forces deploy their relevant flanking operations. Retrace the steps which this writer followed in his initial, 1985-1986 design of a forty-year development for the initial colonization of Mars.

Already, in the "Plan of the Investigation," at the beginning of his 1854 habilitation dissertation, Riemann defined the entire domain of experimental physics as divided among three, mutually distinct sub-domains. In contemporary English-language usage, these are: A.) *Astrophysics*, B.) *Microphysics*, and, the residue of the evidence, relations whose effects may be observed directly within the domain of the senses, C.) *Macrophysics*. In each of these domains, we are presented with three distinct species of phenomena: 1.) Ostensibly non-living processes, including so-called "organic" ones; 2.) Living processes, which are ostensibly not capable of cognition (all species below the level of man); and, 3) The cognitive processes we have repeatedly referenced here. Thus, all science is represented by the transitions associated, in experimental practice, with all existing permutations of combinations from among nine cells defined by three rows and three columns.

The Ratio of the Economy's 'Free Energy' to Its 'Energy of the System' Must Not Decline



The economist's goal, is to ensure that the ratio of "free energy" to "energy of the system" does not decline, even though the "energy of the system," per capita, is being increased. In this diagram of the physical-economic process, the vertical bars represent 100 percent of population (left) and of production (right). Free energy is represented by S′. C represents capital goods consumed by the production process, including the physical infrastructure of physical-goods production. V represents the portion of total physical-goods output required by all households from which industrial and agricultural labor comes. S is gross operating profit of the entire agro-industrial process of the economy, from which D, total overhead expense, must be deducted.

Source: Lyndon H. LaRouche, Jr., 1995. "Non·Newtonian Mathematics for Economists," *Fidelio*, Vol. 4, No. 4 (Winter), pp. 4, 14.

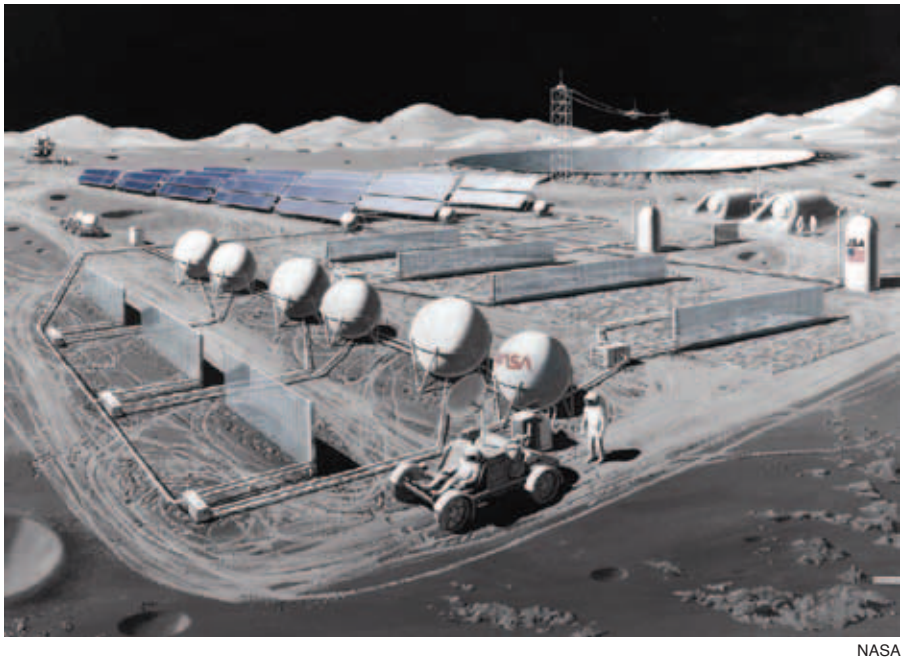
However, all of the knowledge we are able to acquire by these means, belongs to the domain of cognition. It is our cognition of the "Great Experiment," human development itself, which subsumes the knowl-

34. "Characteristic" in the sense of "curvature" of a specific physical-space-time manifold.

35. See Lyndon H. LaRouche, Jr., "The Essential Role of 'Time-Reversal' in Mathematical Economics," *EIR*, Vol. 23, No. 41. Oct. 11, 1996, pp. 19-43.

edge we possess of each cell, and of the relations associated with all actual transitions corresponding to possible permutations of combinations from among the nine cells. All of our presumed knowledge of the lawful design of our universe is limited to the knowledge we acquire from the vantage-point of no other means than the *cognition* of the "Great Experiment."

At the highest level of physical science, scientific knowledge is none among its subsumed specialties; at that superior level, where the name of "science" properly reposes, it is the discernible transitions which link each and all among the cells, not the internal features of any one cell, which represent the ingredients of scientific knowledge. It is the transition which subsumes and thus unifies those many transitions, which supply the word "science" a specific ontological content.



NASA

"By working in space, and on Earth, simultaneously, for these coordinated breakthroughs in discovery of new principles of astrophysics, microphysics, and biology, by the time . . . we establish the first science-city colony on Mars, we shall have revolutionized science and economy on Earth, each many times over." Shown, an artist's depiction of a manned radio telescope installation, recessed in the lunar surface.

Yet, any persisting paradox within any part of that unfolding tableau, challenges any hypothesis associated with scientific knowledge in general: whether the challenge arises from biological microphysics, as an astrophysical anomaly, or any other permutation assembled from among the nine cells.

Among all sources of such paradoxes, a handful of questions are crucial for science as a whole. What is the transition which, in an instant of dying, represents the transition from the generative characteristic distinction of a living process, to that of all non-living ones? What is the transition from a merely living process, to the control of the actions of a living process by a process of cognition? How were the planets of our Solar System, with their chemical composition, and other distinctions, generated by the shedding of rotation from our much-younger, faster-rotating Sun? What are the principles by which our astrophysical universe continues to be generated? How are the transitions of the astrophysical domain to be reconciled, functionally, with the characteristic microphysical distinctions among non-living, living, and cognitive processes?

The central question is: What are the experimentally demonstrated absurdities of our presently established systems of established scientific belief, in each niche of our map of permutations, especially the most notable niches? What additional absurdities of this type might we succeed in evoking? Instead of taking on these issues, one at time, why not organize a coordinated project, in which we attack several among the most crucial such paradoxical flanks, as a single, integrated campaign? That is the standpoint which defines the distinction between ordinary scientific research, and a science-driver approach of the type illustrated by the Manhattan Project or a space-exploration program.

Since the most fruitful form of science-driver project available, is one which includes microphysics under a regime of astrophysical revolutions, one which involves a living, cognitive process—man—exploring the astrophysical domain, the most profitable of all science-driver projects, is a long-term, manned space-exploration program.

For example: Merely taking human beings off the surface of Earth, and putting them into the stratosphere, and higher, begins the process of driving the capabili-

ties of the human being, as a living, and as a cognitive process, to its limits of adaptability and performance. A round-trip journey from geostationary Earth-orbit to the Moon, and back, could become almost a mere weekend jaunt, when compared with the stresses of flight to Mars-orbit: for example, continuously powered flight, is necessary—"a whole new kettle of fish."

Why send man to Mars at all? There are several absolutely irrefutable objections to any argument that man ought not be preparing to colonize Mars right now.

The first objection, is the well-known apothegm: "It is there." History shows us, that whatever it might be nearly impossible to achieve, it precisely what mankind must commit itself to achieving, if the human species is to survive. Often, we have discovered why it was imperative that we attempt the seemingly near-impossible, only after we have achieved it.

The second objection might remind us of the recent proposal, that computer management might control the medical judgments of physicians, or that nurses might be replaced by "technicians" whose training, from welfare rolls to hospital assignments, might be accomplished with a few weeks training in simple routines. No linearized device, or training, can substitute for the cognitive powers of the individual mind of a professional. The computer that controls the physician's decisions on care, will be guilty of malpractice much of the time, perhaps most of the time, often fatally. The replacement of nurses by unskilled "technicians," also means an assured increase in morbidity rates in hospitals. The same is true in all scientific work. The tool is no replacement for human cognitive powers, but never more than a useful aid to irreplaceable, human cognition by the trained professional.

The "Christopher Columbus Principle of Physical Economy," properly governs competence in both voyages of discovery, of all kinds, and in the functions of irreplaceable human cognitive powers of professionally trained judgment.

To set up space-laboratories which can probe a far fuller spectrum, than is possible from near-Earth orbit, and with far greater resolving power, we must go as far from our noisy Sun as possible. Men must go into solar orbits far from any planet, to construct "radiotelescopes" of enormous aperture, to focus upon all of the most anomalous astrophysical objects. There must be space laboratories similarly constructed and situated. This requires a "science city" built up, as far from Earth as is practicable. Given the inherent limitations of future thermonuclear fusion, pending "fuels" of superior power-to-mass ratios, Mars is the available, usable object within reach, on which to construct a "science city" colony under an artificial environment: a kind of "Los Alamos in Space," ultimately capable of supporting about a quarter-millions or more scientists and support personnel.

The general mission assignment, is to drive astrophysics, microphysics, biological science, and human knowledge, to far beyond their presently foreseeable limits for the coming century. By working in space, and on Earth, simultaneously, for these coordinated breakthroughs in discovery of new principles of astrophysics, microphysics, and biology, by the time, approximately forty years hence, we establish the first science-city colony on Mars, we shall have revolutionized science and economy on Earth, each many times over.

The Tavistock Papers

During the middle of the 1960s, a representative of the British Imperial psychological-warfare agency, the London Tavistock Centre,[36] conducted a study of the psychological effects of President Kennedy's *Apollo* program upon the U.S. population. The mid-1960s Tavistock report complained, that the U.S. space program was inspiring an excess of rationality and optimism within the U.S. population, and argued, successfully, that, for this reason, the space-program must be cut back sharply. The following year, the U.S. government collapsed the Apollo program, to the degree that the initial manned Moon landing could be completed on schedule, but little more after that. For this, and also other reasons, the rationality and optimism of the U.S. population has subsequently withered to a degree which the Tavistock Centre must consider gratifying.

Those who can still remember the United States of

36. The origins and character of the London Tavistock Centre, was the subject of an intensive, task-force study, done under the present writer's direction, during the early through middle 1970s. The first reports, under the title of "The Tavistock Grin," occupied two successive editions of *The Campaigner* monthly, April and May 1974. The present Tavistock Centre, the London Tavistock Clinic, was established under the direction of the head of the British psychological-warfare program, one Brigadier Dr. John Rawlings Rees, the man who supervised the brainwashing, in captivity, of Nazi Deputy *Führer* and Tibetan mystic, Rudolf Hess. Later, the Clinic was enveloped by the larger institution built up around it, the Tavistock Centre where the British foreign intelligence trained its subsequently self-avowed agent of influence, Henry A. Kissinger.

thirty years or so ago, could supply the wistful observation, that the general availability of skilled employment, by aid of which we might once again have entire communities in which single-income-earner families raise children under normal conditions, does tend to foster a degree of happiness which is virtually lacking in eighty percent or more of our population today.

The writer and most readers might agree, that if a population enjoys a standard of community and family life consonant with the argument which Leibniz made in his 1671 *Society & Economy*, this would mean a society less violent, less perverse, less fearful, less hate-brimming, and much less unhappy, than is characteristic of most of our population today. A science-driver program which targetted the establishment of a science-city colony on Mars, beginning about forty years hence, would enable us to meet those standards of community and family life once again. That means less unhappiness, but it does not assure happiness; the moral benefit of a science-driver Mars program comes from a different quarter than the undeniably considerable material benefits such a program would generate.

Man is not a beast, unless he chooses to degrade himself into beastliness. Man and woman are creatures which *Genesis* prescribes to be "made in the image of God," to rule the universe accordingly. The experimental evidence supplied to our powers of Reason confirms *Genesis* on this account. Such, not the beastly creature of Thomas Hobbes' and John Locke's rants, is the true nature of men and women. We are essentially creatures of ideas, of knowledge. When our minds are employed in the manner our true nature prescribes, and we are acting according to those principles of Reason, we are capable of great contentment in the simple fact of being our true selves. When we men and women discover our true nature, and act accordingly, we act with great passion, but also a serene contentment, the contentment of certainty that we are living lives of a quality which triumphs over death.

Yet, when we follow Hobbes, Locke, Mandeville, Hume, Bentham, and Mill, we are never happy. For us, then, jaded pleasures guide us to expanding frontiers of perversity, like Oscar Wilde's fabled Dorian Gray. There is no happiness, no contentment, but only momentary excitements, each banging and flashing like fireworks, before the old boredom returns, more insatiable than before.

The happiness which was deplored by the referenced Tavistock report on the Apollo program's effects, can be traced to a joyful sense of participation in a society of which the future must admire. It is a sense of living in a world brightened each morning by beautiful, and also powerful ideas. It is a society, in which a child, asked, "What are you going to be when you grow up," responds with eyes filled with the happiness of a big little person's optimism.

The material benefits great programs afford, are necessary; but, it is the beauty of discovering those ideas which make such programs possible, which is the true inspiration of entire peoples. Sail on, Columbus! Discover, once again, the secret of being human for those you leave behind.

President Kennedy addresses a crowd of 35,000 at Rice University in Houston, during his tour of U.S. space installations.

"The mid-1960s Tavistock report complained, that the U.S. space program was inspiring an excess of rationality and optimism within the U.S. population, and argued, successfully, that, ,for this reason the space-program must be cut back sharply."