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## The Risk of Nuclear War In Europe

Lyndon H. LaRouche, Jr.

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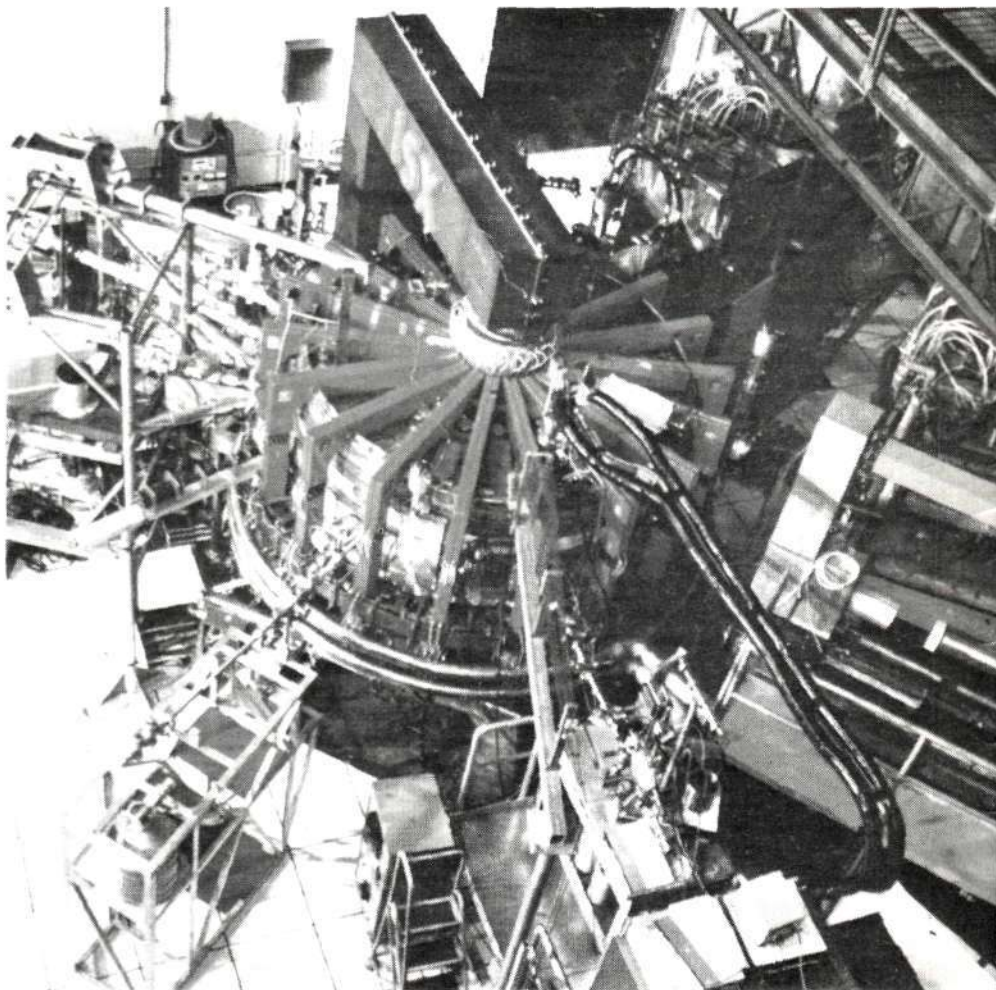
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# FUSION

SCIENCE • TECHNOLOGY • ECONOMICS • POLITICS

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## Features

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*Lyndon H. LaRouche, Jr.*

In the next five to seven years ahead, before the development of a full beam weapon defense by the United States and without a joint agreement by the East and West to dump the policies of Mutually Assured Destruction and Malthusian economics, we face the danger of a nuclear attack in which some but not all the enemy missiles are intercepted and destroyed. In this essay, LaRouche proposes a civil defense mobilization of the nation that will aim to save as much of the population as possible, given a limited or perhaps even accidental nuclear assault. Such a civil defense war plan involving active forces, reserves, and logistics, could be used not only to deal with all varieties of civilian catastrophes, but also to rejuvenate fundamental research into the nature of living processes.

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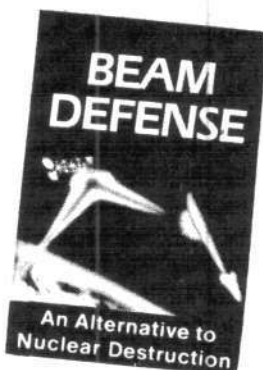
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#### Note to Libraries and Subscribers

We apologize for irregularity in our printing schedule this year, but we assure readers that the only pronuclear science magazine in the country intends to continue publishing! Because of financial difficulties, the FEF published only 4 issues of FUSION in 1983. The FEF will publish 4 issues in 1984, beginning with Vol. 6, No. 1, May-June 1984.

Subscribers who purchased a 10-issue subscription and those who purchased a 6-issue subscription will receive the number of issues they paid for.

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# The Risk of Nuclear War In Europe

by Lyndon H. LaRouche, Jr.

*This essay is devoted to the subject of the context for defining requirements for medical and related civil defense under both probable conditions of risk of nuclear and other warfare during an interval of perhaps five to seven years ahead, and also a capacity for dealing with catastrophes of other forms for which a similar kind of emergency capability is required.*

*Excepting a brief identification of the principles of defensive weapons based on new physical principles now being developed, I have limited the relevant theoretical points stressed to portions of the concluding, third part. These features of the third part will perhaps be of interest only to specialists; therefore I have located this material in the final section, so that the more general readership may limit itself, if it chooses to do so, to the first two.*

The author is a member of the board of directors of the Fusion Energy Foundation and is a candidate for the U.S. presidential nomination of the Democratic Party. He is also a contributing editor for the international news weekly *Executive Intelligence Review*.



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## HOW "NUCLEAR DETERRENCE" CREATED THE WAR DANGER

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The build-up toward the present risk of actual nuclear warfare in Europe began with an article written by Bertrand Russell, published in the October 1946 issue of the U.S. publication *The Bulletin of the Atomic Scientists*. This was the immediate postwar period during which Russell proposed mobilization for a "preventive nuclear war" against the Soviet Union. Russell proposed the creation of a "world government," to have a monopoly over the resources for conducting general warfare, including nuclear weapons. He proposed that either the Soviet government submit to this world government proposal, or that the Anglo-American powers conduct a "preventive nuclear attack" on the Soviet Union before the Soviet Union could develop its own nuclear weapons capability.

Russell's proposal led to adoption of an actual war plan to conduct such a preventive nuclear war, a war plan called "Operation Drop-Shot." This plan was based on the assumption of 1946-1947, that the Soviet Union would need 10 years before it could develop a deployable fission weapon (uranium, plutonium). Russell also founded an organization, the World Association of Parliamentarians for World Government (WAPWG), as a propaganda organization in support of his world government plan. In fact, the Soviet Union developed deployable fission weapons before the end of the 1940s, and developed a thermonuclear weapon during the same period as the United States. WAPWG's last important conference was held in 1955; "Operation Drop-Shot" was scrapped.

A new approach to world government was developed during the middle of the 1950s. The principal institution for this effort, from then to the present date, has been the Pugwash Conference. The Pugwash Conference has been a joint operation of the Soviet government, together with leading representatives of the U.S. "Eastern Establishment," as well as British and other spokesmen. From no later than the second Pugwash Conference, held in Quebec, Canada, during 1958, "back channel" negotiations between Soviet and "Eastern Establishment" representatives have successfully planned every future strategic doctrine of the U.S.A. and NATO up until President Ronald Reagan's change in long-range U.S. strategic doctrine by his announcement of March 23, 1983.

The initial formulation of U.S. and NATO "Nuclear Deterrence" policy was presented at the second, 1958, Pugwash Conference by Chicago University's Dr. Leo Szilard, in a keynote address entitled: "How to Live with the Bomb—and Survive." This was the address which earned Dr. Szilard his caricature as Dr. Strangelove in the celebrated film of the same name. The following leading points of Szilard's address are most notable.

(1) That arsenals of thermonuclear weapons should be used as weapons of ultimate terror, to create a situation of

assured mutual destruction, to a degree that neither power would risk the assured destruction of general warfare.

(2) That the maintenance of a general condition of peace might require "limited nuclear wars"—this, remember, was 1958!—as a way of relieving the strategic tensions.

(3) That if the Soviet Union suffered significantly in limited warfare, the United States should consent to Soviet thermonuclear attack on a selected U.S. city.

(4) That the United States and Soviet Union should redraw the political map of the world, dividing the world between satrapies of the two superpowers. (Actually, the Western proponents of this plan intended to create China as the center of a third "empire," including Japan, Southeast Asia, and part of the Asian subcontinent, in the Peking "sphere of influence," and also planned to undermine the "Eastern"—Soviet—empire through ethnic and religious insurrections spreading from Eastern Europe, through the Ukraine and the Caucasus, into Central Asia.) This is what Britain's Lord Peter Carrington proposes today as a "New Yalta" agreement.

(5) That Middle East petroleum crises must be projected, and that, ultimately, the entire Middle East would be destroyed.

It is to be emphasized that every strategic policy, including détente and arms control policies, of the United States and NATO was prenegotiated through, chiefly, Pugwash Conference channels, with full participation of Soviet representatives, often without the prior knowledge of the U.S. government, but with full knowledge of the Soviet government.

The Soviet government accepted these policies, in advance, as policies to be adopted by the United States and NATO, and also preaccepted these same policies as terms of agreement to be adopted in treaties between the United States and Soviet Union. However, the Soviet government never accepted these policies as Soviet military doctrine. Soviet military doctrine, from 1962 to the present date, has continued to be the doctrine laid down first in 1962 by Marshal V.D. Sokolovskiy's *Military Strategy*. Soviet military doctrine has been for a nuclear-war-winning policy based on Soviet priority in developed strategic antiballistic missile defenses based on beam weapons principles, as Sokolovskiy first wrote in 1962.

On the U.S. and NATO side, the assumption was made that after the initial salvos of strategic thermonuclear weapons, neither side would have the capability to conduct continuing general warfare on a significant scale. Therefore, Western conventional military capabilities in depth were gradually allowed to erode, while the Soviet forces maintained a high relative level of in-depth preparedness for continued war fighting *after initial thermonuclear salvos*. Since the West believed that conventional war fighting capabilities in depth were no longer needed, this was used to justify allowing a collapse of the economies of the West in the direction of becoming rubble heaps of "postindustrial society." Although the Soviets did exploit this to shift increasing ratios of resources to consumer goods production, their general commitment to development of in-depth

conventional war fighting capabilities in armored and naval forces remained relatively high, by comparison with the collapse of the West.

The United States and NATO, during the 1970s, responded to the relative weakening of European in-depth conventional capabilities by exploiting the 1958 Pugwash agreement with Soviet representatives to develop a "limited nuclear war" posture in Europe. This led to doctrines of "forward nuclear defense," whose ultimate result was the proposal demanded by Henry A. Kissinger, and backed by West German chancellor Helmut Schmidt in 1979, to deploy new model, thermonuclear "Euromissiles" in Western Europe. I strongly opposed this "double track" policy at that time and during the 1980 U.S. presidential election campaign, since strategic missiles placed within less than 10 minutes time-to-target from either superpower pushes *both superpowers* into a policy of full-scale thermonuclear "launch on warning." The 1979 "double track" policy committed both the United States and Soviet Union to a condition of "launch on warning" by approximately the end of 1983.

The result of the "double track" NATO decision of 1979, was that both superpowers were headed toward a 1962-style missile crisis showdown by the end of 1983, with no negotiating position acceptable to both sides. So, at the close of 1981, I devised a proposed new strategic doctrine for the purpose of creating a negotiable position between the two superpowers. This I first presented publicly during a two-day seminar in Washington, D.C. during February 1982, at which leading Soviet and U.S. representatives, among others, were in attendance to hear this proposal.

This proposal was intensively examined by relevant policy planning circles in the United States, such that leading elements of the proposal received public endorsement and support by Dr. Edward Teller beginning October 1982, and were publicly adopted in key part by President Reagan in his address of March 23, 1983.

The central technical feature of my 1982 proposal was that both superpowers were well advanced in capabilities for rapid development of a full-scale, strategic antiballistic missile defense system based on lasers and laserlike particle beam systems. Both superpowers had tested such capabilities, and had additional, more advanced capabilities in the laboratory stage.

*Additionally, development of such systems had been recognized and approved in the 1972 U.S.-Soviet ABM treaty. (Anyone who alleges that such systems violate the 1972 ABM treaty either has not read the treaty, or is lying.)*

If both superpowers would agree to parallel, if independent development and deployment of such ABM systems, thermonuclear ballistic missiles would be rendered technologically obsolete. If both agreed, then the policy of both would be a process of takedown of thermonuclear ballistic missile arsenals, as rapidly as ABM development permitted this. Under the umbrella of such a repudiation of a nuclear deterrence policy, a pullback of land-based ballistic missiles to the homeland of the power owning these missiles could be a first step toward drawback from the area of

launch on warning, and the 1983 missile crisis could be avoided.

Without referencing any classified technical information, it is reasonable to say that both powers could deploy a first-generation strategic ABM capability by about 1988, and could have significant ABM capability of such a type in place by 1985. The technology of target detection, target acquisition, and aiming presently exists, pending engineering refinements of a well-defined nature. Suitable laser systems either presently exist or have been proven on laboratory experiment scale before the end of 1981. There is no "music of the future" in such ABM technologies. A first-generation system by 1988 is a fair estimate, given a year plus or minus, for the results of an immediate launching of a full-scale development-and-deployment effort. This does not take into account special effects such as "electromagnetic pulse," which, according to published sources, are already anticipated in Soviet MIG-27 designs.

Unfortunately, beginning March 10, 1982, the Soviet Union has consistently refused such agreements. The first refusal was delivered, in the course of a keynote address by Soviet Patriarch Pimen, at a Moscow international peace conference of that date. This was in response to my own February 1982 outline of the projected U.S.-Soviet negotiating option. The Soviet KGB policy on this issue was affirmed by a Soviet-influenced declaration of the Vatican's Pontifical Academy of Sciences, during September 1982, approximately a month before Dr. Edward Teller's first public announcement of his support for such a change to U.S. strategic doctrine. The Soviet rejections of President Reagan's offer of March 23, 1983 and later for such negotiations, are well known.

Unless, and until the Soviet leadership accepts President Reagan's offer to shift strategic negotiations to such a new basis, both superpowers will continue to be at the threshold of launch on warning. *As long as a policy of nuclear deterrence remains in effect, neither superpower can accept relative inferiority in strategic deterrence capability.* With the Soviets deploying potentially 400 to 500 SS-20 thermonuclear warheads against Western Europe, plus new, shorter-range SS-21s, SS-22s, and SS-23s, either the two superpowers accept a "zero option" for superpower-owned, land-based thermonuclear missiles in Europe, or an intrinsically unnegotiable position persists. Agreement on parallel ABM system development would create the climate favorable to such a "zero option" agreement. *The United States is—and must continue to be—committed to a strategic umbrella over all of Western Europe, without any reservations; it cannot accept a posture of even appearing to abandon its European allies under any conditions.*

Meanwhile, the Soviet Union, which was slightly ahead of the United States in beam weapon ABM development at the beginning of this present year, is now accelerating the development of such systems—contrary to lies on this subject from Soviet sources. The United States has no choice but to overtake the Soviet Union in this area of development; we have no rational choice but to do that. If the Soviet leadership would accept the offer of negotiations made

by President Reagan, and echoed several times by U.S. Defense Secretary Caspar Weinberger after March 23, 1983, this race to develop ABM defense systems would be to everyone's advantage, to the advantage of the general peace.

No good is accomplished by seeking to list each and every real or imagined occasion the Soviet government or Atlantic Alliance has committed a foolish blunder in policy contributing to our arrival at this presently dangerous state of affairs. There have been too many, and in most of these instances there is no perceivable practical benefit to be gained from examining the matter in such detail. There is one consistent error throughout the strategic policy planning and negotiations of the recent 25 years as an entirety: the error which has led us to the brink of general thermonuclear war is the adoption of the Pugwash Conference's policy of nuclear deterrence. Unless we rid the world of the strategic doctrines associated with McGeorge Bundy, Robert S. McNamara, and Henry Kissinger, among many others, we shall probably have a general thermonuclear war during the period rather immediately before us.

There have been two classes of leading features of the Pugwash Conference process which have led us into the perimeter of general thermonuclear war.

First, the Pugwash doctrine of deterrence is based on the capable threat to obliterate the people of another nation if that nation should begin a general war, or, alternately, to obliterate the defending nation should it refuse to surrender peacefully. That policy could have no effect but to make the eruption of general, thermonuclear warfare increasingly probable, as the danger of such war has generally increased since 1964. The war itself would probably not erupt because either side actually wished such warfare, but because of strategic miscalculations by governments and military forces of either one or both sides; both sides threaten as a way of demanding much more than the other is willing to concede.

The entire military doctrine of nuclear deterrence is monstrous incompetence, in any case. The business of prearranged rules for fighting wars by both sides takes the world back to 18th-century "cabinet warfare" doctrines demolished in a single day by French forces at the Battle of Jena, a feudalistic military doctrine which the 18th century copied from the military policies which Wallenstein's campaigns demolished during the 1618-1648 Thirty Years War. In military science, those nations which insist on repeating terrible follies from the past—if they survive as nations at all—will probably live to regret such errors soon enough.

Second, the worst error was not military, but political. Bertrand Russell's object from the beginning of the postwar period was to establish a world empire, to eliminate the sovereign nation-state as an institution, and to create a system of regional satrapies and local semiautonomous sorts of religious and ethnic particularities, all modeled variously upon the Persian, Roman, Byzantine, Ottoman, and Austro-Hungarian empires. Russell had already stated his policy in 1921, in his *Problems of China*, and his collaborator H.G. Wells had laid out the doctrine in his own 1927 *Open Con-*

*spiracy*. WAPWG and Pugwash were essentially a Russell-Wells "open conspiracy." The difference between Russell's original, 1946, design and Pugwash, was essentially that where Russell had originally proposed a single, Anglo-Saxon ruled world empire, Pugwash proposed to divide a Malthusian world-federalist system of empire into an Eastern and Western division.

The last time in European history such a division of a world empire was proposed was during the fourth century B.C., in the famous letters to King Philip of Macedon from Rhodes. Since the Persian Empire had failed repeatedly to defeat the military system of Greece, the real rulers of the Persian Empire, called by such various names as Chaldeans or Phoenicians, proposed that King Philip conquer Greece piecemeal, with Persian-Phoenician help, and that the expanded Persian Empire be divided into an Eastern and Western division, separated by the Euphrates river. Philip died, and Alexander the Great destroyed both the Phoenician capital at Tyre and the Persian Empire as a whole. Harvard University's George Santayana said that *those who refuse to learn from history are condemned to repeat it*.

By proposing that the Soviet Union become part of a world empire system, and then also working to cheat on the proposed agreement, through internal Soviet Bloc upsurges, we fostered a situation in which it became clear that only one empire was ultimately going to rule the world. Given that prospect, the response from Moscow was: "Then, it shall be we who rule."

We encouraged Moscow's belief in such a possibility by destroying the economies of the OECD and developing nations from within the West, with the monetary agreements of 1968, 1971, 1972, and 1975, which created the present international financial crises, and with a post-1966 policy drift into the wrecked condition of postindustrial utopias.

It has been this slide toward a neo-Malthusian system of world empire, combined with nuclear deterrence, which has brought the nations into the perimeter of general thermonuclear warfare. Unless we change both the political and military doctrines imposed upon governments and international negotiations through the Pugwash Conference process, we shall probably have a general thermonuclear war at a more or less early date.

If we wish to end the danger of thermonuclear warfare, we must scrap and replace the doctrine of nuclear deterrence associated with Bundy, McNamara, Kissinger and so forth. We must also scrap the policies of neo-Malthusian world federalism, and return to a policy of inviolable sovereignty of nation-states and world trade cooperation in support of mutual advantages of technologically progressive increases of the productive powers of labor. Those who oppose such early changes are, whether they admit it to themselves or not, actually causing the early eruption of general thermonuclear warfare. *If the nations of the Atlantic Alliance firmly resolve, in unison, to scrap both nuclear deterrence and neo-Malthusian antitechnology policies, the Soviet leadership will almost certainly change its present*

policies, and become willing to negotiate seriously. Otherwise, the probability of thermonuclear warfare will increase.

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## WAR FIGHTING IN A MODIFIED REGIME

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Unless the changes in military and political policy indicated in the preceding section occur soon, and unless Moscow also negotiates on that basis, the war danger will persist in the years ahead. In that case, we must look closely at the period of five to seven years immediately ahead of us—until the period 1988-1990. Let us assume the case, that during this period, the Atlantic Alliance does adopt the changes in military and political doctrine we have indicated as required, but that the Soviet Union does not fully accept those terms of negotiations.

In that case, the Atlantic Alliance would be developing rapidly a strategic ABM defense system umbrella, such that a substantial percentage of ballistic missiles launched against these nations would be destroyed in flight—but not all. As such strategic ABM capabilities are increased, we enter into a middle range, in which nations would not be entirely destroyed by thermonuclear assault, but in which massive ratios of civilian and other casualties occur.

Under these conditions, especially during the early years of such a period under such conditions, a limited nuclear assault is not to be excluded. This requires a brief explanation of a technical point.

Under the condition that either or both superpower alliances are operating under a "launch on warning" regime, an unavoidable tendency for decentralized control over launching of thermonuclear arsenals develops. The decision to launch is extended to local commanders of military complexes perhaps equivalent to a corps, commanded perhaps by a flag officer of rank equal to lieutenant-general. This would tend to occur because of the possibility of damage to central military command and to communications channels. Admittedly, the corps area commander would be given very tight conditions for executing a launch on warning command, but by the very nature of things, a misjudgment could occur.

This is among the nightmares intrinsic to strategic deployments placing thermonuclear ballistic missiles of a superpower in land-based positions geographically in advance of its own homeland's territory. This is most emphatically the case if the missiles involved are highly accurate missiles, with "first strike" degrees of accuracy.

Once any thermonuclear salvo is launched, even by accident, the very conditions under which such an accident of that sort is likely must tend to be conditions of an unusually tense strategic situation. In this circumstance, an accidental salvo of any significant number of warheads tends to prompt commanders to see a grave strategic disadvantage in not turning an accidental into a general war. How-

ever, this problem is well known to both superpower alliances' commands, to the effect that some degree of safeguards will be considered, institutionalized, and improved in proportion to estimation of risk of an accidental salvo.

The problem will become more acute as the time-to-target is reduced, first by missiles such as the SS-20s, and worsened by deployment of SS-21s, SS-22s, SS-23s.

If we assume that the safeguards function under such conditions of accident, then the targeted nations of the isolated launch will suffer limited-scale effects of thermonuclear warfare. On the allied side, if the accidental launch involves ICBMs (intercontinental ballistic missiles) or SLBMs (submarine-launched ballistic missiles), the target would be the mainland United States. If medium- or short-range missiles, more probably nations of Western Europe.

Under the general strategic conditions specified for the period into 1988-1990, the dangers associated with thermonuclear capabilities must tend to be supplemented by growing danger of use of chemical and biological weapons systems. In the later category, one-time pandemics, which the victim does not communicate to others, are obviously the desired form of bacteriological warfare—if the word *desire* can be tolerated in such a case.

Unless superpower agreements based on the indicated proposed changes in military and political doctrines are effected, those forms of warfare we have indicated are leading items of risk during the five to seven years ahead.

Since the technology of strategic ABM defense systems has been chiefly either not reported, or vastly misrepresented in most of the news media, a few basic facts about such a defense system must be stated here.

### Physical Principles

With isolated exceptions, the central, distinguishing feature of the new array of strategic ABM defense systems is that they are based on *what the 1972 U.S.-Soviet ABM treaty permits* as ABM systems based on "new physical principles."

Although some aspects of these systems are explained by aid of the physics standpoint of James C. Maxwell, the physical principles involved are actually based on the mathematical physics of those whom Maxwell avowed to be his leading opponents in scientific method, the work on electrostatics of Gauss, Weber, and Riemann. Like the method of isentropic compression employed to detonate a thermonuclear bomb, lasers, coherent "particle beams," and other parts of the new ABM defense system repertoire, are derived from the electrostatics of Göttingen University professor (1854-1866) Bernhard Riemann, most emphatically Riemann's 1859 paper, "On the Propagation of Plane Air Waves of Finite Amplitude." Soviet literature refers to all of the physical systems of this repertoire as based on the principle of "Riemann waves."

The most common form of these principles of Riemannian electrostatics used in ABM defense systems of this new type are what are loosely described as "directed-energy beams." These are based on, chiefly, existing types of high-powered lasers (tens and hundreds of kilowatts ra-



diated power) or what are called "coherent particle beam radiation," which has hereditary similarities to laser systems in terms of basic principles involved.

To understand such a beam, imagine a spiral on the outer surface of a cylinder. Imagine that on your oscilloscope, this spiral in three-dimensional complex-domain space looks like a sine wave on the two-dimensional space of the oscilloscope's screen. To study how such a beam works, one begins with the most elementary variety of complex function. Imagine a cone, with an axis running from the tip of the cone (apex) through the center of its circular base. Now, imagine a point moving along that axis line, from the apex, toward the circular base. Imagine that a radius expands in length, such that as the point moves toward the circular base, the radius stretches to reach the surface of the cone. Now, imagine that the rate at which the radius stretches (and point advances) is in proportion to the rate at which the radius rotates around the axis line. The result will be a spiral on the outer surface of the cone, a self-similar, or logarithmic, spiral. This is the most elementary, conic form of an elementary complex function. Now, imagine that a cylinder is approximated by a very narrow cone. From this standpoint, Riemann's 1859 "On the Propagation of Plane Air Waves of Finite Amplitude" can be more or less easily understood against the background of Karl Gauss's determination of the general elliptic functions subsumed by his arithmetic-geometric mean. This work of Gauss, plus the work of Legendre in France, is the basis for Gauss's, Weber's, and Riemann's work on electrodynamics.

Such electrodynamic processes have these principled geometric features. The simple rotational-stretching-progressing action has the integral value represented by the self-similar, logarithmic spiral. This determines the values and equivalence of such fundamental transcendental numbers as  $\pi$ , the logarithmic base  $e$ , and trigonometric functions. The desired integral of the spiral—a second integral of the action—is a volume of the cone lying between two circles within the cone, in which each circle defines, respectively, the beginning and conclusion of one completed cycle (completed single rotation) of the spiral around the axis line. Any diagonal cut through the cone, from one circle to the other, defines an ellipse. The characteristics of this ellipse define a family of ellipses, determined by the geometric and arithmetic mean of the spiral displacement. That is the kernel of the theory of conical elliptic functions. That is the kernel of Gauss-Weber-Riemann electrodynamics.

On this basis, in 1859, Riemann predicted that the attempt to overtake the speed of sound must produce an acoustical shock wave of the type earlier predicted for air by Leonardo da Vinci. This presumed that sound waves are caused by electromagnetic radiation in the following way. The compression of molecules in the proper form by the initial action propagates an electromagnetic field from that compression, which is transmitted to the molecules of the following area. So, this electromagnetic wave causes the air to become *self-transparent* to the transmission of the wave. However, the air molecules cannot be assembled for the

next compression wave faster than the average velocity of the molecules permits. Therefore, the rate of transmission of the electromagnetically propagated sound wave takes the form of a case of *retarded potential*. This matter of *retarded potential* is among the characteristic distinctions of Weber-Riemann electrodynamics. From this standpoint, it became clear that travel through air at velocities exceeding the speed of sound is feasible, but that the conditions of retarded potential would cause the production of a singularity in the behavior of the affected air medium. In air, this must assume the form of a shock-wave front.

This argument by Riemann was hotly rejected by James Maxwell, who rejected the notion of retarded potential, and created his well-known doctrine of the electromagnetic field in the effort to construct a mathematical system which would avoid encouraging the geometrical conceptions of Gauss and Riemann. The 1859 paper was specifically attacked by Lord Rayleigh, since Riemann's argument nullified gas-dynamical theories of the sort with which Rayleigh was associated. It was generally recognized by the turn of the present century, that either the physics typified by Maxwell and Rayleigh was correct, or the Gauss-Riemann approach to physics was uniquely the relatively correct one. Ludwig Prandtl and Adolf Busemann demonstrated conclusively that Riemann was correct for air waves. Erwin Schrödinger derived his treatment of the electron from Riemannian electrodynamics, the 1859 "On Propagation" included. Isentropic compression in plasmas corroborates Riemann's work. The generation of entities, such as so-called *solitons* in highly organized plasmas, is another illustration of the point.

This same Riemannian physics shows directly how and why a laser works. Experimental evidence shows that this also applies to so-called relativistic particle beams. The coherent characteristics of the two classes of coherent radiation, lasers and relativistic particle beams, recommend that the two classes of directed-energy beam phenomena be viewed under the common umbrella of a single electrodynamics, such that we assume some equivalence between the critical values of quanta and shortening of wavelength, as the root of the distinction between a continuous wave form, such as a laser, and the particle behavior ("wavicle" behavior) in the shorter wavelength portion of the spectrum above gamma ray radiation.

From the Riemannian standpoint in mathematics, all such beams are harmonically tuned, as one tunes an antenna to a selected broadcast frequency. When they are directed against a target, they "tune in" on the material of the target in a way consistent with the wavelength of the laserlike beam. This is called "self-focusing" of lasers and laserlike beams. So, if one imagines power measured in hundreds of kilowatts per square meter being concentrated within an area of 100 millionth or 1 billionth of a square centimeter, one has some sense of the power a laser or laserlike device represents as a weapon against objects such as flying ballistic missiles and warheads. Also, like a radio broadcast beam, by selecting wavelengths of lasers and laserlike beams which "tune out" the matter in the medium, such as air, through

which they are projected, it should not be difficult to understand how we can send a laser beam thousands of kilometers through the atmosphere, wasting very little energy on the air, and deliver the largest part of the power we transmit by the beam to a very small area of the flying target.

The primary effect of such a beam against a selected target is analogous to the shock produced by a sonic boom. This effect is most noticeable in the case of very short wavelength beams and particle beams. In the lower end of the electromagnetic spectrum, a laser beam boils away material very rapidly. In short wavelengths it has an immediately shattering effect on molecular structures, such that beams can be fired at targets like bullets, rather than having to dwell on a target for a tiny fraction of a second. It is for the latter reason that we prefer X-ray lasers and gamma ray lasers, or particle beams. Particle beams are most desirable for the heat-hardened nosecones descending to earth through the atmosphere.

The general method used for deploying a strategic ABM defense system using lasers and laserlike devices is this.

(1) We place several echelons of ABM systems in space, in earth-orbit (probably, at least for first-generation systems). These space-based systems will be preferably X-ray lasers, with target detection and aiming capabilities to place a beam within substantially less than a square meter, at 5,000 kilometers, on a target moving at more than 3 kilometers per second. Without looking into classified areas of work, we may say flatly that only engineering refinements are needed for the indicated target acquisition and aiming systems.

These first, space-based echelons of ABM defense, are assigned to destroy, if possible, nearly all ballistic missiles in their ascent phase, and to destroy more than 90 percent of a 5,000-missile launch before warheads could reenter the atmosphere.

Two sets of backup systems are required to deal with both incoming war heads from the stratosphere and lower flying missiles.

(2) A "point defense" system of high-powered lasers to supersede such rocket antimissile technologies as the Spartan-Sprint system. These are assigned to protect population centers, other major logistical targets, and military installations.

(3) A wide-ranging terminal defense system, preferably a particle beam system, to deal with the remainder of cases.

This implies also the development of an efficient antisubmarine warfare system to detect and destroy missile-launching submarines at the outbreak of hostilities.

The same principles required for strategic ABM systems are used for tactical defense systems, especially to defend ships, aircraft flights, armored units, and so forth against tactical missiles. The same principles are indicated for anti-tank warfare systems.

It is to be emphasized that many features of such ABM and related tactical systems already exist, such that some elements of the indicated system are immediately deployable. This is not "music of the future." What lies in the early future, over two to seven years ahead, is the development

and deployment of all of the required elements of a complete, first-generation set of strategic ABM systems and tactical systems.

It is a general principle, that the cost of destroying an average missile by means of such systems will be much less than the cost of producing and deploying a missile. Furthermore, since such beams travel at the speed of light, or, at least, at relativistic velocities, and since they concentrate more power than the sun and stars where they are "self-focused," defensive systems of this type have orders of magnitude greater firepower than all rocket systems. The advantage shifts from the nuclear offense to the antimissile defense by an order of magnitude.

Assuming that President Reagan's strategic doctrine is carried through promptly and energetically by the Alliance, the picture of shifting developments in the strategic equations over the coming two to seven years is broadly clear in general conception. We shall be moving, and at an accelerating rate, from the condition in which thermonuclear attack has overwhelming advantage, toward a point at which strategic defense has overwhelming advantage. It is the area between those two points which defines the nuclear features of a modified regime for war fighting possibilities.

#### Tasks of Civil Defense

The general requirements for civil defense of a population and nation against limited-scale nuclear assault are well known on two general grounds. The Hiroshima-Nagasaki studies, adjusted for known effects of thermonuclear bombardments, define the general task and the problem of casualties. If the assault is limited, a high percentage of the nation's population can be saved, but the probable number of casualties whose survival depends upon medical and related procedures is probably massive relative to the number killed or terminal casualties. We also know that a practicable civilian defense medical assistance system will be one modeled on military medical organizations.

We require adequate redundancy in a civilian defense medical system of a sort readily integrated into the military medical organization, matching the military table of medical organization in approximate ratios of paramedical, nursing, laboratory, and physicians staffing and function per casualty. Such ratios are built into the existing structure of medical procedures, which procedures cannot be modified readily.

Therefore, we must build redundancy into some part of the civilian medical practice. We require pools of medical professionals, occupied with necessary but reducible classes of duties, from which to mobilize the professional forces to be codeployed with trained reserves of paramedical civilian volunteer units. We also require redundancy in suitable emergency facilities and medical stores, maintained in ready-to-function condition. We require a profile of skills, training in procedures, and so forth, appropriate to the high ratio of burn cases and radioactive sickness cases expected—in which the deficiency is presently apparently relatively the worst.

Otherwise, although the Switzerland and Sweden models of civilian defense preparations may not be levels easily

reached, a reasonable approximation should be considered imperative.

This will be costly, and will therefore require expansion of the in-depth economic resources of economies, an increase in per capita physical output of state-of-the-art technology product in national economies, including build-up of redundancy in food stores, in energy production facilities and distribution grids, in transportation facilities, and categories of most sensitive industrial capacities.

In brief, a *civil defense war plan of active forces, reserves, and logistics*. This should be a system adapted not only to needs arising under possible conditions of war fighting in a modified nuclear war fighting regime, but as a resource for dealing with all reasonably foreseeable varieties of civilian catastrophes other than warfare.

The same view of the nuclear war fighting challenge must be extended to the similarities of biological warfare to the threatened resurgence of epidemics and perhaps even pandemics now that endemic potentials are arising from collapsing economies in both the industrialized and developing nations. We are presently on the outskirts of the kingdom ruled by the Four Horsemen of the Apocalypse, and seem to be marching toward the center of that unwholesome domain.

We require, urgently, broad-based advances in both fundamentals of internal medicine generally and biotechnology generally. Setting ourselves the targets of developing the methods and facilities needed for coping with the range of cases variously suggested by biological warfare and economically fostered eruptions of epidemics, pandemics, and pestilences.

Were it not better that war might be avoided, and all such emergency mobilization thus rendered unnecessary? Unfortunately, war is not avoided by a mystical contemplation of one's hesychastic navel while hyperventilating oneself with repeated utterances of the magical word *peace*. The attempt to outlaw or restrict weapons, or the effort to design a foolproof political design for peace, is merely exemplary of the means of policy by which Bertrand Russell and the Pugwash Conference process have led us to the brink of general thermonuclear warfare at the present time. Until the political causes for warfare are reduced, by means of action efficiently directed to precisely that root of the matter, the danger of war persists, and cannot be wished away, especially not by mass rallies presumably dedicated to that desire.

Quite the contrary. It is hesychasm of one sort or another which brings us closer to general warfare. Any mysticism associated with notions of blood and soil, such as that of the Russian novelist Dostoevsky, is implicitly a license of the believer, even almost a commandment, to impose the holy will of his particular choice of blood and soil upon those presumed to be of different blood. The rise of various sorts of "integrist" ethnic and religious-mystical cults, taking over governments of states, or exerting an increasingly powerful influence over an increasing number of governments, is a moral condition infecting mankind analogous to the conditions of Europe during the 14th century. The

cultural preconditions for generalized bloodshed, a blood-letting energized by irrational fanaticism, bodes ill for the wishful dreams of whoever would propose to compose the problem by negotiations of an ordinary sort.

Whenever man descends from rationally ordered forms of civilized life, into the irrational hedonism of his parodied infantile, suckling years, man turns himself into something more beast than man in respect of moral qualities, a condition on a mass scale etiologically akin to paranoid schizophrenia in the instance of the individual. The ancient pagan cult of Cybele-Dionysus is paradigmatic for mystical eruptions of the variety proliferating as growing political forces today.

This general state of degraded affairs has been promoted chiefly by the side effects of neo-Malthusian policies of practice. In turning away from technological progress, that is, emphasis on science, we have turned away from a society in which the practical value society places upon individual life is the power of each human individual to develop potentialities by means of which the power to produce and assimilate useful innovations in practice are accomplished. This neo-Malthusian policy of practice fostered by the Russell-Pugwash design, has in itself and by aid of its effects, promoted a deepening mood of cultural pessimism among populations, including those of industrialized nations. As Dr. Armin Mohler of the Siemens Stiftung has documented this point very well in his *Conservative Revolution*, such insurgency of Nietzschean and kindred forms of cultural pessimism leads lawfully to one consequence. The included feature of such a general consequence is an irrepressible drive toward war, and to who knows what additional obscenities besides.

This is the present, and generally worsening human condition. Until that condition is remedied substantially, the man who cries, "If only nations could agree, there would be peace," is a self-deluded fool. We must restore civilization and reason to hegemony, and attack the political causes of war accordingly, and then peace is achievable. Until that occurs, it is the business of the superpower alliances to enforce the condition of peace, with consent and support from leaders of developing nations; but until mystical irrationalism is defanged, and the political causes for war brought under control, war is the ugly reality which threatens us increasingly, day by day.

In the meantime, we must mobilize to defend as much of civilization as still remains, and by whatever means possible to preserve human lives.

This brings us to a matter which may appear speculative in part. It is, at its worst, a useful heurism for an important, included feature of the problem we have considered here.

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## THE DANGER OF BIOLOGICAL CATASTROPHE

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In March 1973, this reporter outlined a comprehensive study of the biosphere as a process, from the standpoint of

the application of Riemannian physics, to the study of that aspect of economic processes best described as "physical economy." A team of physicists, biologists, and other specialists working on that project presented, during the spring of 1974, its preliminary report on the predeterminable effects of economic collapse on the biosphere and also weather systems.

Over the period into 1977, this continuing work assembled some corroborated new insights into features of determination of the world's weather systems, and continued to examine the principal effects of economic collapse in promoting upsurges of epidemic disease, pestilences, sylvatics, and so forth. Since that period, progress of the work has inevitably slowed. The initial effort concentrated upon assembling established evidence; upon reaching more or less the level of frontiers in available relevant sources on indicated topics, the effort naturally ran out of major amounts of fuel of this sort.

Nonetheless, the study, including an intensive survey of available materials, showed that the processes already underway during the 1970s were pointing in the direction of preconditions for eruption of biological catastrophes like those leading into the pandemic of the 14th century in Europe.

Presently, austerity in forestry and agriculture is producing the preconditions for turning sickened portions of the biosphere into forcing media, tending to become foci for new eruptions of sylvatics spreading into less weakened but vulnerable sections of the biosphere. The preconditions for turning weakened portions of the world's livestock populations into foci for production of eruptions of animal epidemics is also notable, some perhaps spreading into human populations, others using wild fauna as part of the vector system for relaying the epidemics more generally. In large portions of black Africa today, the conditions are present for producing new eruptions of old and new varieties of epidemic disease.

This must be compared with effects of worsened nutrition and hygiene on immunological and other barriers to the spread of epidemic and perhaps even pandemic diseases of old and new varieties.

It continues in the obvious terms of reference.

The natural tendency among politically sensitive circles today is to treat each eruption of related problems as an isolated manifestation, with some specific causal factor. This one-at-a-time approach to biological problems which are either clearly or possibly caused by a more general deterioration in the man-biosphere relationship, is prompted in significant degree by awareness that proposals to attack such problems at their general source would require significant policy changes in matters of economics and so forth. The resulting spectacle is like that of fighting an outbreak of fires individually without noticing the evidence that a band of pyromaniacs is on the loose.

The volcanic eruptions of Mount St. Helen in the United States is estimated to have put more sulfur-based substances into the atmosphere than a decade or two of the world's industrial production. Sooner or later, the emis-

sions descend to earth with aid of rainfall. We hear screams against allegedly guilty industry as forests die. "Mother Nature's honor" is not to be impugned! Nor, do we hear it observed that the harvesting of forests, as in the case of any other monoculture, requires aid from our chemical industries to replace the depletion of essential trace elements and so forth.

A large area of rain forest in Brazil is stripped away, to make way for labor-intensive, crude agricultural monoculture, and to comply with demands to reduce imports of coal and petroleum from international agencies. The trees are carried away, and with them the essential mineral content of hectare after hectare of rain forest. A few seasons' cropping with crude monoculture, and the agriculture dies, threatening to turn the leached soil into laterite. As a result, the Brazil High shifts into the Atlantic, and the world's weather systems react in billiard ball fashion.

We reduce the animal protein consumption of the young, and see no connection, apparently, between that and the effect on immunological and brain development potentials. Malnourished cattle show increase in incidence of diseases; the vectors spread the increased density of the disease. Do we acknowledge the connection?

If it challenges a prevailing, accepted economic policy paradigm, we prefer not to see a connection between ultimate cause and ultimate consequence. We ignore, especially conditions in places which appear to be efficiently far away. Then, the pestilences and diseases from those places—perhaps Lhasa fever one day—creep across borders, unsuspected by the customs and immigration officials.

These are the general conditions of biological threat we face, even without considering the challenge of biological warfare. Yet, the connection between the quality of means needed to deal with the one source of challenge and the other is broadly obvious. Our defenses are alarmingly poor.

The question posed is: What broad-based approach is required to effect the greatest amount of breakthrough on this front with the most efficient concentration of efforts? I address this problem from the special vantage point of economist and policy influencer. What form does this policy problem take from the vantage point of the principles of "physical economy"?

#### Viewed in First Approximation

The standpoint of physical economy is summarily this.

Economic science was established by Gottfried Leibniz, beginning with his brief memorandum on the costs of labor, his 1671 *Society and Economy*. Leibniz's central point of reference was the study of the implications of the heat-powered machine, by means of which "one man may do the work of a hundred." From this study, he developed the notions of "work" and "power" employed in both economic science and thermodynamics since. From the same study, he also created the notion of "technology," translated as *polytechnique* in 18th-century France.

We begin by comparing the relative work accomplished by the same operative using different heat-powered ma-

chines and lacking such machines. This narrows our attention to the case in which two machines require the same amounts of coal (for example), but differ in the rate of work accomplished by the operative using each in turn. This phenomenon defines the area of proper usage of the term technology.

In mechanical action, technology is measured in respect to rotation: the use of rotation to alter direction of application of the power supplied, and to increase the energy flux density of the action in a manner which has an elementary conical interpretation. The same principle of rotation (least action) is elaborated for hydrodynamics generally, including electrodynamics, by the work of Gauss, Riemann, et al. Although we employ the same principled notions of work for work accomplished by chemical and biological processes, our analysis of the interior features of such processes, especially the matter of biophysics, remains most unsatisfactory.

Until this deficiency is remedied, we are obliged to approach the subject matter by circumscribing it, so to speak. In this discussion, we are looking at the matter not from the inside of biology, but from the standpoint of economic policy, including rigorously definable principles of technology applicable to this matter in a most obvious way. What we require is a policy of governments and other nonmedical institutions, which directs those institutions' efforts in the way most fruitful for tasks assigned to the medical and related specialists in general. We shall now examine the general area of internal medicine and related research practice as a problem in technology.

In elementary thermodynamics, we begin by defining a subject matter as a thermodynamical process. We define a phase space; we isolate those kinds of changes in the process we shall treat as functionally significant, and define an "energy throughput" as that form of "energy" we consider as having efficient bearing on the variable, functional effects adopted for consideration. We then treat the total such energy throughput as implicitly divisible, as a matter of broad principle, into two categories of energy flow. The first, which we identify as the "energy of the system," is the portion of the heat-equivalent flow we presume to be required, as consumed by the process itself, merely to prevent the process from "running down." The traditional definition of running down was the image of the mainspring of a mechanical clock. We assume "frictional heat losses" or their equivalent to be part of the energy of the system. The residue of the heat-equivalent flow, if any at all, we treat as the "free energy" of the process.

In any rigorous treatment of fundamental questions, we define the process in sufficiently broad terms that the sources of heat-equivalent flows and the application of free energy are entirely accounted for as part of a single, functionally continuous thermodynamic process: a "closed thermodynamic process." We then examine the changes in the ratio of free energy (or, "negative free energy") to the energy of the system, under the condition that the behavior of the process is functionally continuous. If the value of the function is continuously negative or becoming negative,

we describe the process as "entropic." If the process is continuously positive in value, especially if the indicated ratio is increasing, we describe the process as "negentropic."

Living processes are characteristically *negentropic*, although not all negentropic processes are necessarily those ordinarily defined as "living processes."

In physical economy, we measure performance of economies as increase of *potential relative population-density*. Given a fixed level of technology of practice, what is the potential number of persons of society which can be self-sustained on an average square kilometer of land? Since land is variously improved or depleted in net effect, it must be the relative value of land at that point which is considered.

We examine such processes first in respect to population characteristics of average households (age intervals and so forth) to determine the potential productive labor force of a population of households of definable demographic characteristics. In examining the activity of the labor force, we begin with the percentage of the labor force as a whole required to produce the needed quantity of raw materials from agriculture, forestry, fishing, mining, and refining. As this raw material output is either directly consumed (food) by the population, or used as product consumed for production of other goods, there is a correspondence established between raw materials production and an average (per capita) market basket of combined consumer and capital goods output.

Since the cost of producing raw materials is related to the richness and accessibility of natural resources, technological progress is indispensable for maintaining a society's potential relative population-density even at a fixed level. Some forms of natural resources are depletable, at least in respect to the cost of production of raw materials associated with them. This rise in cost of raw materials means a fall in the output per capita, and therefore a fall in the potential relative population-density.

This decline requires, minimally, an increase in average productivity in the production of tangible output of goods as a whole. It requires, over the longer term, technological revolutions of the sort which redefine the meaning of the term *natural resources* in a general way to humanity's advantage.

It is therefore feasible to describe social processes thermodynamically. The levels of activity-throughput of production of tangible goods required to maintain a constant potential relative population-density, corresponds to the energy of the system. The remainder of the throughput, the "net operating profit" of society after deducting administration, services, and waste, is the free energy.

General increases in technological levels correlate with increases in the average number of kilowatt-hours equivalent of usable heat-equivalent both per square kilometer and per capita. Increases in energy supplies may not directly cause an advance in potential relative population-density, but the lack of such energy-supplies increase is a constraint which prevents technological progress, and

causes ultimately a collapse of the society if only a fixed level of energy throughput is supplied per capita and per square kilometer.

Therefore, let the energy flux density, both per square kilometer and per capita, be represented by the area of a circle. Let this be functionally related to potential relative population-density. Now substitute the latter measure for the first. The result of technological progress will then describe a series of concentric circles. These concentric circles then have an obvious determination as outcome of a conical complex function. The functional relationship which shows the relative efficiency of increased energy flux density, relative to increases in potential relative population-density, is the *technological function*. This discovery was made first by this reporter in 1952, and underlies the La-Rouche-Riemann method of economic forecasting. (It can be stated more elegantly by this reporter 30 years later, but the discovery remains the same.)

This solves an elementary problem of economic analysis. If we measured both the energy of the system and free energy of an economic process in scalar units of any kind, kilowatt-hours-equivalent included, the necessary conversion of free energy to increased per capita values of energy of the system, would determine a necessary, cyclical form of collapse of societies into an entropic degeneration. The "reinvestment" of output into an economy cannot be measured competently as the price of a quantity of goods (as a financial investment), or in any scalar terms of measure such as kilowatt-hours-equivalent. *What must be measured is the injection of technology.*

The thermodynamic function which describes an economic process undergoing successfully sustained technological progress is a thermodynamic form of function corresponding to negentropy. Technological progress and injection of "increased negentropy" are one and the same.

This was the basis for the 1973 project outline proposing correlation of economic processes (physical economy) with the processes of the biosphere. This broadly circumscribes the subject matter to be examined. Now, we must close in upon the subject area more tightly.

#### The Definition of "Negentropy"

This reporter's initial discoveries in economic science, of 1952, were the outgrowth of a four-year, rather energized determination to refute the Wiener-Shannon "information theory" dogma, and, most emphatically, Professor Norbert Wiener's insistence on describing negentropy from the standpoint of the statistical theory of heat of L. Boltzmann et al. In more recent years, this reporter was informed that Professor David Hilbert threw Wiener out of a Göttingen seminar because of Wiener's insistence upon introducing an incompetent mathematics to the discussions; the news fell upon sympathetic ears. Although this reporter resolved the issue to his own satisfaction, with assistance from the 1871-1883 work of Georg Cantor and the work of Riemann, the incompetent version of information and negentropy popularized by Wiener et al. at the close of the last world war is unfortunately pervasive today, and with destructive

effects in numerous known cases of important work. That the point being made be competently understood, it is therefore indispensable to identify the grounds on which we offer the definition of negentropy supplied here.

The first comprehension of the phenomenon we call negentropy today was derived from the rediscovery of the "isoperimetric theorem" by Cardinal Nicholas of Cusa during the middle of the 15th century. The first explicit definition of negentropy was provided by Luca Pacioli and Leonardo da Vinci, working from the reference point of Cusa's writings on scientific method. Pacioli and Cusa observed that the morphology of growth and function of living processes was distinctively characterized by self-similar harmonics congruent with the Golden Section. This was emphasized later by Johannes Kepler. If we extend the Golden Section into its proper location in physics, in the continuous (complex) domain, it takes the form of Gauss's determination of the arithmetic-geometric mean, the conception which underlies the mathematical physics of Bernhard Riemann.

The root of the discoveries was already set forth in Plato's *Timaeus*, whose contents were made famous in medieval Europe through the writings of St. Augustine. Unfortunately, the principles of geometry employed by Plato were not understood until Cusa's rediscovery of the isoperimetric principle. During approximately the second century B.C., in Egypt, classical Greek-Egyptian geometry had been savagely rewritten, reconstructed as a deductive lattice theory based upon axioms and postulates. From that standpoint, nothing essential of mathematical physics can be understood. The reading of the *Timaeus*, as understood by Cusa and his successors, is so indispensable to fundamental discoveries of European physics since, and to the subject of immediate concern here, that the often misunderstood point of the *Timaeus* must be summarily restated here.

Plato's Socrates, early in the dialogue, names God "the Composer," and directs the group's attention to what is knowable of that principled feature of the lawful way in which the universe is "composed." The internal development of the dialogue's content centers around three elements:

(1) The notion of the hypothesis of the higher hypothesis, which notion Plato had developed elsewhere.

(2) The principles of Graeco-Egyptian classical geometry, especially the isoperimetric principle, that circular rotation, as action, is the only self-evident existing form in the visible universe.

(3) The recent proof, supplied by a collaborator of Plato's working at the Cyrenaic Temple of Ammon, that in visible space, only five species of regular polyhedra could be constructed (the 4-, 6-, 8-, 12-, 20-sided figures, each constructed from a regular triangle, square, or pentagon).

Plato adduced two sweeping conclusions respecting the lawful composition of the universe from these three elements.

First, that the limited possibilities of construction in visible space showed that sense perceptions of visible space were a distorted reflection of the real universe. To use the

language of modern mathematical physics, the real, continuous manifold (of the complex domain) must be distorted in image to be fitted into the possible range of images of the discrete manifold (visible, or Euclidean, space). Visible space is like a distorting mirror everywhere embedded in the real universe, from the standpoint of our powers of direct sense perception.

Therefore, science depends upon the power to discover and prove what are the principles of distortion intrinsic to our geometrically bounded discrete manifold, by aid of which to discover the geometry of the unseen, real universe.

Second, Plato defined the bounding of visible space by embedded geometrical principles through inscribing the regular triangle, square, and pentagon within circles, and noting the musical-harmonical significance of the division of the circumference of the circle by the points of the inscribed polygon. Without knowing the isoperimetric principle and its pervasive implications for mathematical physics, this feature of Plato's *Timaeus* must appear inexplicable. It was therefore Cusa's rediscovery of the isoperimetric principle which set modern mathematical physics into motion, most notably with the work of Pacioli and da Vinci, and the work of William Gilbert, Johannes Kepler, and Gaspard Desargues at the turn of the 17th century.

Kepler's role is central. Kepler corrected the solar hypothesis of Cusa, and proved conclusively that the laws of astronomy (and gravitation) are determined by Plato's harmonic principles. The crushing proof was completed by Gauss. Kepler's construction of the laws of astronomy depends upon a method which requires the former existence of an exploded planet between Mars and Jupiter. Kepler insisted on the planet's former, exploded existence, and supplied the perihelial-aphelial harmonic ratios for that orbit. Gauss was first to discover that the newly discovered asteroid, Pallas, had the harmonic-orbital values given by Kepler earlier.

As briefly as possible, the working points leading to the policy outline to be given are as follows.

Cusa's definition of circular action and Leibniz's statement of the principle of least action are one and the same. In other words, *circular action* is not based on the static image of the circle, but is defined as continuous action.

The first circular action creates a measureless circular area in formless, measureless space. There is no external notion of "planeness" associated with the circular surface; it itself defines *planeness*. The same action, repeated upon the circle, creates the "straight line," which is never defined except as the diameter of a corresponding circle, which divides the circle into two topologically matched halves. This creation of the line creates the first condition of measurement: a half rotation. Repeating the circular action upon the half circle creates the point, which is always defined in no other rigorous way but as the center of a corresponding circle, and is defined by that circle. In synthetic geometry, such as that of Professor Jacob Steiner, all possible constructions in visible space describe a hereditary series of constructions which depend upon nothing but the

circle and its determined principal singularities, the line and point.

No other geometrical form but circular action can provide such a starting point. Therefore, the circle is the only self-evident existence in geometry, and circular action (least action) is the only self-evident form of action in mathematical physics. Therefore, by the hereditary principle of synthetic geometry, all figures, possible and impossible to construct in visible space, are defined by hereditary principle of construction with respect only to the circle. All axioms, postulates, and deductive procedures are expelled as unscientific rubbish from geometry and mathematical physics. So, Plato referenced the matter of geometrical bounding principle of visible space to the relationship of the constructible solids most directly to the circle itself.

Additionally, of the five platonic solids, each is topologically derived from the 12-sided figure based upon the pentagon, and in such a manner that the Golden Section is characteristic throughout. The Golden Section is the dominant, characteristic principle of action and form of action in visible space.

Everything else in mathematical physics is derived from the synthetic-geometric construction of the conical function. All phenomena of the discrete manifold (visible space) are projections of conical action in a continuous manifold (complex functions) upon the three-space domain of the discrete manifold. The only topological invariance of projections from the continuous to discrete manifold is the equivalence of conical functions and their derivatives to circular action as the visible form. This is the root of the manifest harmonic ordering underlying the laws of astronomy (and gravitation): the harmonics of elementary conical functions, projected as harmonic forms of circular action seen in the visible domain.

Therefore, the universe as a whole is *negentropic*, but otherwise only living processes are *negentropic*. Although we have summarized—and thus greatly foreshortened the exposition of the matter—what we have reported are the conclusive fundamentals of geometrical principles and of the principles upon which mathematical comprehension of the universe depends. Therefore, the seeming paradox we have just cited is the heart of everything to be considered.

The statistical theory of heat is a mere description, which is never better than a sometimes useful description. It has no bearing upon the underlying features of physical lawfulness, since it is based upon axiomatic assumptions which are wildly extravagant and absurd from the standpoint of elementary fundamentals.

The indicated point is to discard every approach which depends upon assumptions of statistical mechanics, except as merely descriptive procedures, bearing upon biological processes. A notion of *negentropic* function as geometrically determined, in the elementary sense identified here, is required.

#### Man and Biosphere

If we consider the biosphere as a closed process, the general characteristics of the biosphere as a *negentropic*

process closely resemble those for an economic process. In general, every leading point we made respecting economic process has a corresponding feature in a biospherical process so defined.

However, this similarity in form subsumes a qualitative distinction.

Depending when we date the agricultural revolution, but no later than 10,000 years ago, during this interval mankind has effected a qualitative advance in potential relative population-density. In a hunting-and-gathering mode of existence, approximately 10 to 20 square kilometers are required to sustain an average individual life. Probably the life expectancy is significantly less than 20 years of age, and the culture correspondingly infantile and brutish. "Mother" cults, such as the Cybele-Dionysus cult, coincide with the leading features of such a culture. This indicates a maximum human population of the planet of about 10 million individuals. During the interval since the agricultural revolution, we have increased the human population potential by more than 2 orders of magnitude. With full deployment of nuclear and relativistic beam technologies, the potential population will reach tens of billions of individuals—more than 3 orders of magnitude of increase.

The cause of this increase in population potential is willful modification of human behavior—willful modification of culture. No plant or animal species could willfully increase its population potential by as much as 1 order of magnitude, even if we were to regard the adaptive potentials of such species as analogous to willful behavior. The self-development of the biosphere is of the same general form as that of human increases in potential relative population-density, but the human action is willful. How do we correlate what appears to be a physical cause-effect connection, the negentropic tendency for self-development of the biosphere generally, with the more rapid rate of such physical development caused by nothing but the creative-mental powers of mankind?

This requires a brief review of the hypothesis of the higher hypothesis and its physical significance.

In scientific work historically, efficient (fruitful) hypothesis occurs on three rigorously defined levels.

(1) *Simple hypothesis.* The experimental hypothesis developed for some class of phenomena is based on the assumption that the existing lattice structure of scientific knowledge, including that of the presumed specialized area into which the experimental phenomena are situated, is a correct view of the lawful composition of the universe. Consistency with that lattice work is the premise of experimental hypothesis design.

(2) *Higher hypothesis.* The experimental hypothesis tests whether or not one or more of the underlying axiomatic or postulational assumptions of the existing latticework of scientific knowledge is false, requiring a replacement assumption, or simply elimination of one or more existing assumptions. This constitutes, to greater or lesser degree, a scientific revolution, such that all or part of the existing latticework collapses and must be rebuilt on a new basis.

(3) *Hypothesis of the higher hypothesis.* To the degree

that an orderable succession of higher hypotheses (scientific revolutions) correlates with increase in per capita potential power over nature by society, it is implied that some common principle of discovery subsumes such a series of scientific revolutions (higher hypotheses). That common principle of discovery is defined as a hypothesis of the higher hypothesis.

Plato insisted that substantiality (primary ontological actuality) is congruent with the implied principle of universal action associated with a notion of the hypothesis of the higher hypothesis. In theology, Plato equated the idea sought by the hypothesis of the higher hypothesis with the universal Logos, as itself substantiality, consubstantial with the universal, living being of the universe (that is, classical Greek *hylozoic monism*). The Judaic monotheism of Philo of Alexandria, like that of the Gospel of St. John, Nicene Creed, St. Augustine's *filioque* interpolation, and so forth, is based on that Platonic notion of consubstantiality: Hence, Judeo-Christian theology is *Neoplatonic*. The Byzantine Christians, who defended man's perfection of efficient knowledge of the Logos to guide human practice in labor, like St. Augustine in the West, defended this against the monophysite *hesychasm* of the Gnostic mystics (who, to confuse matters, sometimes called themselves Neoplatonics). In modern physics, this principle is sometimes named the principle of *ontological transfiniteness*, the explicit standpoint of Bernhard Riemann.

To clarify the matter as to physics: A principle of the order of the hypothesis of the higher hypothesis is congruent with our elaboration of a single, original creative principle of action in the universe, defined by the characteristic features of its self-elaboration as a universe. *Negentropy* can be located as an active principle of action only in these terms of reference.

Otherwise, consider the following elementary point. The state of closure (circle) corresponding to a completed cycle of conic action is the second integral of the action. The potential surface equivalent to continuous closure in the continuous manifold generally, subsumes closure in the particular cases. This is the physical-geometric equivalent to the notion of a hypothesis of the higher hypothesis. We are saying, in asserting a principle of ontological transfiniteness, that efficient action is located primarily here, rather than in the elementary function of action integrated.

This is otherwise to say that the universe at any instant is defined in some way by an implicit number,  $N$ , such that the generation of a new singularity by negentropic action (as defined by the elliptic function) implicitly increases the number to  $N + 1$ . The functional relationship,  $(N + 1)/N$ , is the function corresponding to the new action upon the manifold as a whole. This relationship bounds the action in each case, such that all elementary action in the manifold has a relative boundary value reflecting that functional relationship  $(N + 1)/N$ .

This functional boundary value corresponds to the smallest efficient division of action of the sequence of elliptic functions defined by the Gauss arithmetic-geometric mean: the smallest interval of division of action permitted by the



functional relationship  $(N + 1)/N$ . In other words, the quantum boundary, a relativistic boundary—relative to  $(N + 1)/N$ —which must coincide with the shortest wavelength of continuous electromagnetic action which does not behave as a particle (“wavicle”).

Such a conception of the universe is indispensable for comprehension of *negentropy as an efficient principle of action*. The *principle of life* is the prime example of such an efficient, negentropic principle of action. Any other notion of life immediately introduces a dualistic mystification, such that scientific inquiry into the *living quality* of living processes is axiomatically prohibited.

In the instance of economic process, we indicated that the maintenance and increase of potential relative population-density is “injected” into the economy as an injection of a *magnitude of negentropy*. The same occurs in principle in the negentropic development of the biosphere. The experimental principles which characterize the method of Riemannian physics, beginning with Riemann’s 1854 “On the Hypotheses Which Underlie Geometry,” define the general approach to experimental and related observational designs suitable to define “livingness,” negentropy, as the primary subject of experiment—whereas statistical inference’s methodology axiomatically prohibits this.

The ATP/GIK therapy case is exemplary. However, in these and other instances where we examine the apparent negentropy of cell function in terms of energy-transport/energy-flux-density-of-process terms, it is necessary to reformulate the experimental questions, to the effect that efficient negentropy, not statistically described negentropy, is the experimental subject matter.

One of the principal areas of medical and related research required as a basis for such inquiries is *generalized fundamental research* into matters bearing upon diseases of aging of cells. *The test of the practical-theoretical mastery of the negentropy of living processes, is the manifest power to halt, if not even to partially reverse such aging*. Until we can do so, we can not profess that we have achieved a practical-theoretical, efficient comprehension of *life*.

In attacking this kind of problem in research, we sought to consider ourselves aided by phenomena adduced from study of both physical-economic processes and both negentropic and entropic shifts effected in the biosphere. The underlying laws observable in the large in economic and biosphere processes must necessarily be expressions of the same lawful principles operating within the cell process in the small.

For example, if we observe declines in economies or large areas of the biosphere, and if we measure the effect of these declines by the yardstick of negentropy flux density, rather than merely energy flux density, the Four Horsemen of the Apocalypse appear not as causes of the degeneration witnessed, but the lawful products of the actual degeneration. These, including diseases and pestilences attacking plant, animal, and human life, appear as the means by which the biosphere adapts to a reduced level of negen-

tropy flux density, rather than the degraded state being caused by these afflictions.

In some way, in some sense, the same principles must apply to diseases of aging and related forms of disease. In some fashion, there must be a causal state of lowering of negentropy flux density of essential process functions, which causes the diseases of aging, rather than the reverse causal relationship. This conclusion is not based directly on medical evidence, of course, but is based on demonstrated universal laws of the universe in which living processes occur.

We must rid scientific discussions, and policies of governmental and other relevant institutions, of the last vestige of the popularized delusion that a natural equilibrium state of “nature” exists. Properly directed, the natural benefit of technological progress, and increases of energy flux density per square kilometer, is to add “artificial energy input” to the biosphere, thus freeing the biosphere of the limits of 0.2 kilowatts per square meter power supply from solar radiation, and so raising the negentropy flux density of the biosphere. The “natural” state of the biosphere is not a miserable wilderness, but a garden developed, maintained, and constantly improved by mankind.

This maintenance of the environment requires increase of the productive powers of labor through injection of negentropy in the form of advances in technology, advances which require increase of the energy flux density per square kilometer and per capita. If we refuse to meet that requirement, we beckon invitation to the Four Horsemen of the Apocalypse, as we have done with 15 years of increasing neo-Malthusian practice. This indicated policy of progress is the general precondition for health and longevity.

Meanwhile, who yet can be certain what we have or have not set into motion in diseases of plant, animal, and human life, by the recent years’ degradation of the biosphere through economic degradation?

We require, *comprehensive research protocols* covering diseases of aging generally, and all cases of incidence of afflictions, including terminal cases of afflictions associated with this. Insofar as laboratory work can assist to this effect, we must introduce leading, fundamental research into this area, in which the principle of life as an adducible direct subject of experimental work is emphasized: *life as such as expressing negentropy-flux-density-centered processes*.

This research serves as a baseline of reference for appropriate directions in biotechnology.

The correlated social function of such research protocols, is to combat diseases of aging, to the combined effect of increasing longevity and quality of functioning of aging and other individual persons. The research and associated internal medicine in this area of medical and related practice increases our general ability to cope with the broadest range of problems, and is also an area of expanded medical practice with which to build up a reservoir of reserve medical capabilities available to be mobilized to cope with catastrophes.

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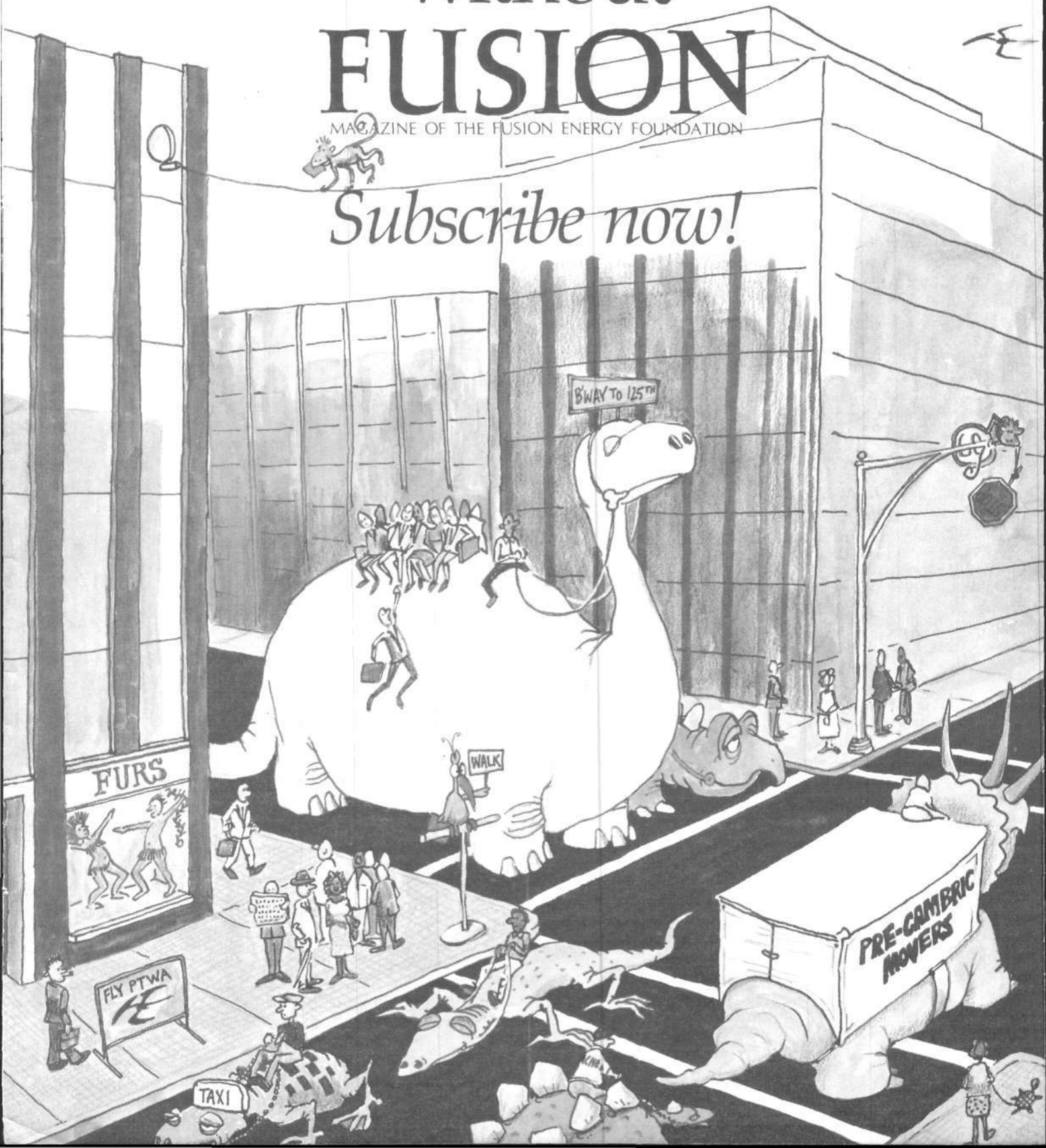
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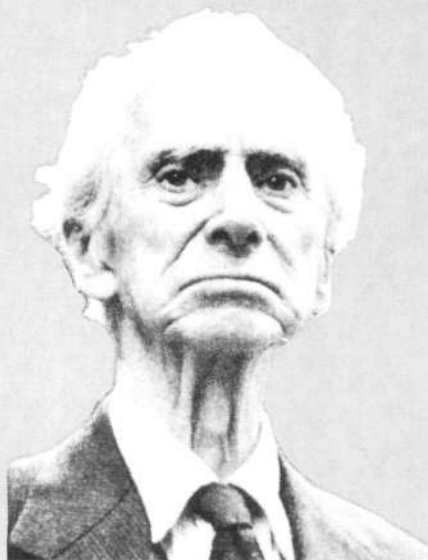
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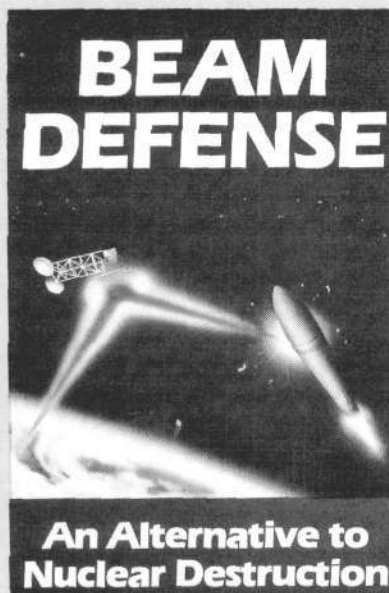
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