

Nonlinear radiation: the true total war

by Lyndon H. LaRouche, Jr.

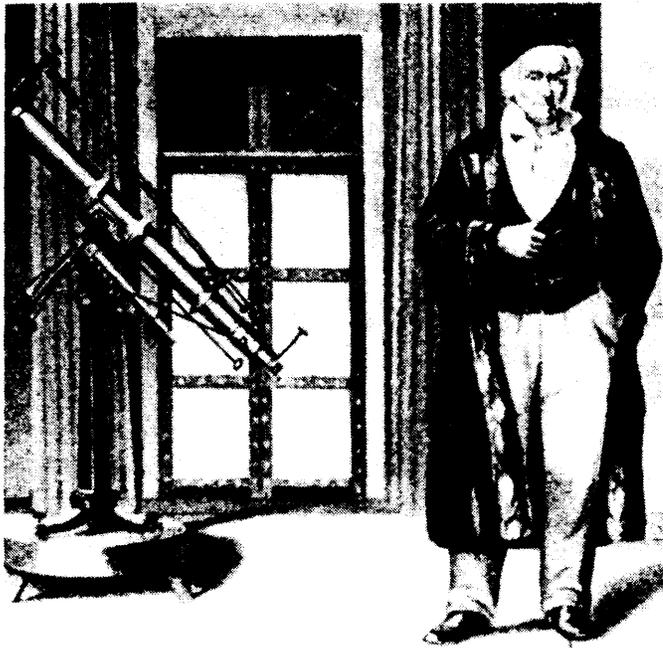
Remarks to a conference sponsored by Executive Intelligence Review in Munich, Federal Republic of Germany, on Sept. 3, 1987.

During the span of the coming four to five years, almost certainly, a technological revolution in warfare will have completed its first phase. It will be more awesome than that which exploded over Hiroshima and Nagasaki back in 1945. The full electromagnetic spectrum, from less than 10 Hertz into the gamma-ray region, will emerge as the arsenal which dominates the arenas of strategic and tactical conflict. The powers which first master this field, will have gained the potential military capability to dominate this planet.

This revolution in weaponry has already begun. On the basis of results of a laboratory test which I requested, I know that we in the West have the capability to construct, and to deploy for military functions, some kinds of working prototypes of such weapons of mass-killing on very short notice. I also know, that the Russian command's currently operational pre-war war-economy mobilization, known popularly as *perestroika*, has the prominently included aim, to build weapons for a new order of battle of Soviet forces, within as short a time as five years. This effort is focused substantially on the production and deployment of both strategic and tactical electromagnetic weapons of the new class.

Back during 1981 and 1982, while I was working on design of what became known later as the U.S. Strategic Defense Initiative, I anticipated that by the end of the 1990s, strategic weapons-systems would go beyond the level of the beam-weapons I proposed for strategic ballistic missile defense, into electromagnetic, strategic offensive capabilities. Electromagnetic-radiation weapons, more powerful killers than nuclear warheads, were seen as inevitable for as early as the end of this century, or only slightly later.

Two years later, by the first half of 1984, I had seen enough evidence to prove that the deployment of such weapons was in reach perhaps as soon as 10 years earlier than I had estimated during the time I had been working on the design of SDI. Today, I find wide agreement on the early feasibility, and strategic signifi-



From left: Karl Gauss, Johannes Kepler, G.W. Leibniz. The scientific tradition represented by these men formed the basis for LaRouche's understanding of the way in which the revolutionary new weapons now emerging accomplish their nonlinear effects.

cance of such weapons among relevant senior military specialists of several nations with which I have been in communication.

The exploration of technologies of electronic warfare has been under way since no later than the 1930s. This field has had increasing importance since the war-time development of radar, and has become more and more sophisticated with the development of more ingenious uses of increasingly powerful individual and coupled gyrotrons.

Until recently, most of the attention was concentrated on what were called the thermal effects, such as the destructive heating of targets irradiated with microwaves. It was only with great reluctance that Western nations recognized the importance of nonlinear electromagnetic effects, in which thermal effects have an almost irrelevant, or merely subsidiary role relative to the crucial effect produced.

My estimate is, that in the West, such nonlinear effects, such as electromagnetic solitons, began to be studied seriously from a military vantage-point, only during the early 1980s. Even today, much missionary work is needed to convince many working in the area of radio-frequency weapons, that the most significant effects are predominantly certain among the non-thermal effects of sometimes very complexly constructed, nonlinear forms of such radiation.

As a matter of emphasis, my own attention has been focused upon biological effects achieved with what conventional standards for thermal effects in electronic warfare would consider very low wattages per square-centimeter of target-area. Outside biology, some senior scientists are working on the harmonics of the periodic table, an area of fundamental

research essential to understanding better the design of weapons and tools designed for inorganic target-materials. I shall limit my observations today to the biological targeting.

My approach to the field

It is useful to indicate the route by which my interest was drawn into this area of technology. A brief description of that may help to make the subject more intelligible to those who are still perplexed by the topic of nonlinear effects.

My original work in the profession of economic science, initially during the 1948-52 period, was in refuting the doctrine of "information theory" associated with such names as Norbert Wiener and John von Neumann. I attacked this matter of controversy from the vantage-point of what Leibniz was first to define rigorously as "physical economy," the study of cause and effect relations between advances in technology and physical productivity of labor. In this aspect of economic science, our primary researches ignore the roles of money and prices.

My task was to show, that contrary to Wiener and von Neumann, the mental-creative processes which generate scientific revolutions and technological progress, as causes, have an implicitly measurable correlation with their effects, the increases in physical productivity of operatives obtained through advances in applied technology.

For elementary mathematical reasons, the transformations in economies caused by technological progress are intrinsically nonlinear. Similarly, if we restate scientific revolutions in the proper choice of mathematical representation, technological progress, as a product of the individual human

A short bibliography on RF weaponry

Executive Intelligence Review has published a number of articles about the technology and politics of radio frequency weaponry. Among them:

June 5, 1987: "The next Soviet 'Sputnik': strategic radio frequency assault weapons," by Lyndon La-Rouche.

June 12, 1987: "West must counter Soviet radio frequency weapons," by Jonathan Tennenbaum; and "Soviet strategic radio frequency and other assault weapons: a primer," by Warren J. Hamerman.

July 3, 1987: "The Russian lead in radio frequency weapons," by Robert Gallagher.

July 10, 1987: "How Russia's radio frequency weapons can kill," by Robert Gallagher.

July 24, 1987: "Pentagon ignoring Soviet scientific lead?"

September 4, 1987: "How radio frequency waves interact with living systems," by J. W. Frazer and J. E. Frazer.

brain, is also demonstrably nonlinear. If Riemannian physics is represented from the vantage-point Professor Riemann demanded, constructive or synthetic geometry, both of the nonlinear processes, creative mentation and effects of technological progress, can be given a unifying functional representation.

Thus, for nearly 40 years, because of the nature of my discoveries in economic science, I have had a special interest in identifying the form of the biological processes which are the substrate of human creative mentation. For that reason, I have been gripped by a passion to understand the relationship between the special biological processes associated with these brain functions and biological processes in general. To follow my own role in coordinating scientific inquiries into matters bearing upon the new weapons technology, one should know the methodological standpoint which has defined my approach to these investigations.

I have adopted the very strong form of investigative hypothesis, that such processes could not be understood adequately from the standpoint of molecular biology. Over the years, it has been my investigative hypothesis, that if the most characteristic feature of living processes, that which distinguishes them as living, rather than merely organic chemistries, were shown to be coherent with Riemannian

nonlinear electrodynamics, the desired, comprehensive biological foundation for exposing the ontology of human psycho-physical parallelism could be isolated.

It was clear, for the same reason, that the desired result could be found only along routes defined by optical biophysics, defining "optical" to signify some kind of Riemannian nonlinear electrodynamic functions within the bounds of all relevant portions of the electromagnetic spectrum.

My approach to biology defines the so-called elementary physical particles, including photons, electrons, positrons, and so forth, as discrete singularities akin to our so-called "solitons," in a Riemannian, electrodynamic physical space-time continuum. It follows, for reasons elaborated by the great Gauss in his reworking of Kepler's astrophysics, that the structure of the atom and of plasmas, and the characteristics of the periodic table, are determined by a Kepler-Gauss-Riemann kind of harmonic ordering within such a characteristically negentropic, nonlinear electrodynamic continuum.

This is not merely my strong investigative hypothesis; it is the standpoint from which nonlinear effects weapons must be understood, if our understanding is to become efficiently adequate.

This is a view of physics consistent with the elaboration of non-Euclidean geometry since Nicolaus of Cusa established the foundations of modern non-Euclidean geometry in 1440. This is the view flowing from the special kind of synthetic or constructive geometry, on which the elaboration of the Gauss-Riemann complex domain is explicitly premised, both in respect to mathematical methodology, and also ontology.

The fundamental question of physics posed by all nonlinear processes, especially from the vantage-point of electrodynamics, is a very elementary one. The elementary question of method is: How is it possible to provide an intelligible representation of the continuous process—a continuous manifold, by means of which an electrodynamic continuum must necessarily generate subsumed singularities of the sort which appear to define, as intelligible projections, the content of a discrete manifold? The attempt at intelligible representation of all true, continuously nonlinear processes, including the new weapons of electronic warfare, presents us with this same question of method.

To those who have traced the internal history of natural philosophy and modern science as a kind of continuing process of research into fundamental questions of method and ontology, the issues I have identified are as old as classical Greece, treated in exemplary fashion by such as Parmenides, Plato, and Archimedes. The most fundamental, persisting question, has been the problem of intelligible representation of an efficient principle of causation by which a true continuum, initially without discreteness, necessarily generates what, in effect, we recognize with our mental-visual apparatus as an efficient form of the discrete manifold.

Historically, modern science's ranks have been divided

between those, like Cusa, Leonardo da Vinci, Kepler, Leibniz, Gauss, and Riemann, who based their contributions on the insistence that this continuum issue was the primary fact confronted by investigations into method and ontology, and those opponents, such as Descartes and Kant, who insisted that notions such as "creation" and "life" were intrinsically incapable of intelligible representation by man. The characteristic difference between these two modern factions in science has been the preference for the standpoint of the methods of non-Euclidean, constructive geometry by the one, and the opposing preference for the more or less radically axiomatic-deductive methods of treatment of the discrete manifold, by the other. Such were the differences, in electrodynamics, between Riemann and Beltrami, on the one side, and Clausius, Kelvin, Helmholtz, and Maxwell, on the opposing side.

This controversy is the root of the difficulty experienced among numerous professionals, in their efforts to comprehend adequately the kinds of nonlinear phenomena confronting us in development and application of the revolutionary weapons now in progress. In the case of the nonlinear biological effects of such weapons, these issues are clear in the most immediate way. It was principally my application of this view of the matter to the issues of defining the ontological form of living processes, which equipped me to comprehend the manner in which the new weapons accomplish their nonlinear effects on biological and other targets.

During a fresh discussion of this continuing work, during 1983, one among my associates who had been working on mapping of visual functions of the brain, said to me: "Oh, I see what you mean. I know of the work of several people in that field." So, I experienced one of the happier periods of my life, by being brought, belatedly, into contact with some of the handful of specialists working in the field called "non-linear spectroscopy" of living processes. I brought some of these specialists into seminars which included senior plasma physicists, and a gifted astrophysicist doing some pioneer work on anomalous objects. The presentations, and exchanges around the table in a series of seminars, brought the area into clearer focus.

With that, I alerted some of the officials with whom I had been working, earlier, on the design of the SDI, and have been an active lobbyist for the cause of this line of research ever since. About the same time, our ongoing international seminars took up a study of this infection we call AIDS. We recognized very early, with help of information on some relevant aspects of cancer research, that biological research dedicated to uncovering a general cure for the AIDS infection would require heavy emphasis on this field of nonlinear spectroscopy.

Most of the participants in these seminars were stunned initially, to discover the very small wattages per square centimeter required to alter, or to kill tissue by appropriate applications of methods of nonlinear spectroscopy. Some of us also recognized that Soviet work, continuing today the pi-

oneering work of Vernadsky and Gurvitsch during the 1920s and 1930s, placed in Soviet hands a kind of potential set of super-weapons beyond the imagination of even most biologists and electronic-warfare specialists.

For reasons I shall not detail, during 1986 some of my associates and I were confronted with a major non-military problem in applied nonlinear spectroscopy, requiring the same electronic technology as these large-scale-effects weapons. We were confronted with the practical questions: What type of power-plant, what sorts of wave-guides, and what other specialized equipment available today, would we bring together to do the job? Given the kind of equipment available today, using the methods of work commonplace in advanced-weapons systems crash programs back during the 1950s and early 1960s, the package needed could be assembled within weeks, and could be packaged into a trailer truck or cargo aircraft.

We were faced with the fact, that the same package, configured as a weapon-system against large, targeted populations, could be produced and deployed during the same period of time. We thought also, that some of the equipment being used by Soviet Academician Velikhov could be most useful as part of such a weapons-system. We were confronted with the fact, that the world had already crossed the threshold into the next scientific revolution in warfare.

My associates and I continued our investigations along these lines. This overlapped one of my special projects in collaboration with *EIR*, strategic analysis of the shifting patterns of relative military capabilities of the Western and Moscow alliances.

Putting this technological knowledge today with my intelligence on relevant developments inside the Soviet Union, I realized why Marshal Nikolai Ogarkov and his Soviet general staff friends at the Voroshilov Academy were so eagerly prodding Secretary Mikhail Gorbachov into luring President Reagan into a "zero option" agreement.

If the Soviet government could reach an agreement which resulted in scrapping missile-systems Marshal Ogarkov now considers technologically obsolete, such as what we call the SS-20, Moscow could concentrate freed-up sectors of Soviet military capacity on both accelerated deployment of the Soviet version of the Strategic Defense Initiative, and also on rapid development and deployment of both strategic and tactical electromagnetic weapons of this revolutionary type.

A new Soviet order of battle?

Now that this background has been summarized, let us examine the strategic implications.

On the basis of a daily gridding and accumulation of evidence from Soviet sources, our best estimate today, is that Marshal Ogarkov's pre-war war-economy mobilization, called *perestroika*, is intended to reach its peak-levels of pre-war mobilization by about 1991. Let us suppose that *perestroika* slips a year or more beyond a 1991-92 target-date.

Seminar in Munich looks at radio-frequency weapons

The first of a series of *EIR*-sponsored seminars in West Germany on military applications of radio-frequency technologies, "Radio-Frequency Weapons—Feasibility and Strategic Significance," took place in the afternoon of Sept. 3 in Munich. The seminar focused on the technological and strategic threat posed by determined Soviet efforts to field tactical battlefield radio-frequency weapons employed by spetsnaz ("special forces") as early as 1991-92, and was addressed by American presidential candidate Lyndon LaRouche.

The more than 70 participants were almost exclusively professionals: active service West German military, some of whom represented units particularly relevant to the possible future formation of "special forces" within the West German armed forces; representatives of most of the world-famous larger military-related industries in the Munich area, as well as a number of more specialized electronics-physics firms; representatives of the West German intelligence community generally, in addition to technical military intelligence; and ranking representatives from the military community no longer on active duty.

European military professionals hardly ever contest that the sugar-coated packaging intended to sell the Russian-Soviet *perestroika* to the Western public as a policy for peace is pure subterfuge and disinformation, decorating the stage of today's so-called disarmament talks. But Michael Liebig, who manages the West German *EIR* news agency, gave substance to these justified suspicions by

tracing the role of Marshal Nikolai Ogarkov of KAL-007 infamy, and his numerous Red Army officer-progeny in formulating and carrying out the current Soviet technological-economic war mobilization (*perestroika*), which is aimed both at a Soviet strategic defense capability and "high-tech spetsnaz."

Neither the technologies for radio-frequency weapons against "soft targets" (human beings), nor the specific Soviet commitment to fielding these technologies, can be dismissed as "futuristic science fiction," Liebig pointed out—any more than the strategic conception and technologies, which *EIR* introduced into NATO debates at the beginning of the 1980s, which later become known as the SDI.

"In the combination of special forces units, whose quantitative and qualitative importance is dramatically increasing in the Russian armed forces as a whole, and such weapon systems on the basis of directed energy, there is a new, acute threat to our security, one which has been but meagerly realized up to now. We simply cannot afford to ignore this threat by high-tech spetsnaz," Liebig argued.

Soviet program an open secret

Jonathan Tennenbaum, an American scientist who directs the European Fusion Energy Foundation, dropped another bombshell by reviewing in detail, from the *open* Soviet literature, efforts extending back to the 1960s to fulfill Vernadsky's program of research and development. Vernadsky, the architect of the Soviet atom bomb project in the 1930s and 1940s, had predicted that the nation which gains control over emission of radiation over the entire electromagnetic spectrum would become the world's dominant industrial and military power.

While reports from the Soviet literature on radio-frequency radiation generation over broad spans of the electro-magnetic spectrum, wave-guides, and power genera-

That gives us in the West more time, but the logic of the situation remains essentially the same. Assume that the West's cutting of military and research and development budgets continues the downward trend currently in progress. What is the situation by 1992, or perhaps a few years later?

To situate the new weapons in the strategic equation, strategic analysis must take into account the interrelationship between two general features of an altered Soviet order of battle.

The present process of transformation in Soviet war-planning defines the first line of Soviet assault, over the medium-term, as the combination of paramilitary forces and active sympathizers of those forces recruited from among the pop-

ulations in Western nations.

In West Germany today, for example, we can fairly estimate the deployable, qualified paramilitary combat forces at about 10,000, of well-trained and other capable forces, coordinated by East bloc-trained paramilitary officers. The various concentric circles of less qualified sympathizers among potential riot-auxiliaries, saboteurs, and so forth, including such as Islamic and Kurdish residents, totals to a large multiple of the hard-core forces. Kindred situations exist, and are developing in other Western nations.

We must assume that this expanding capability, over the coming four to five years at present trends, combined with Soviet spetsnaz infiltrators, typifies the Soviets' first line of

tion, dropped to zero in about 1983, even in "civilian" areas of application, Dr. Tennenbaum pointed out that it is still possible now and then to find, for example, descriptions of medical experiments done to determine how to alleviate effects of radio-frequency radiation in humans with various forms of medication, medication administered both *before* and *after* exposure to radiation at various frequencies.

Tennenbaum demonstrated the incontestable orientation of Soviet research work toward the nonthermal and nonlinear effects of radio-frequency radiation. Thus, while continuous radiation in the millimeter ranges would hardly penetrate human tissue surrounding the lower base of the human brain, there is evidence that the Soviets have experimented with pulsed radiation in this range, employing "bundles" of pulses at carefully designed frequencies.

All of the "critical scientists" who claimed it would be impossible to beam laser light through the atmosphere to hit incoming ballistic missiles, have been refuted by the phenomenon of "self-induced transparency." Russian work is honing in on just this phenomenon, and applying it to biological organisms. (In the discussion period, several participants reemphasized this point, and argued that, in this area of physics, nonlinear spectroscopy, and optical biophysics, anyone who argues that nonlinear phenomenon *x*, or *y*, or *z*, is "impossible," is skating on very thin ice.)

Germany needs 'special forces'

For some of the more technically oriented participants, Gen. Jobst Rohkamm first sketched a number of interfaces between current state-of-the-art phased array radar, and communications monitoring and jamming equipment, and then, the more advanced applications of radio-frequency weapons which Tennenbaum had reviewed.

Brig. Gen. (ret.) Jobst Rohkamm until recently commanded the West German Armed Forces Signal Corps School in Feldafing near Munich.

He contrasted the apparent lack of a "perception of the threat" in the West with Soviet-Russian forced build-up of spetsnaz forces, amounting to a force of millions if the trained reservists are included in the calculations. He also drew upon the recently published book by Viktor Suvorov, *Spetsnaz, The Story Behind the Soviet SAS*. The perspectives and imperatives discussed by LaRouche and Tennenbaum, Rohkamm argued, cannot be dismissed as figments of the imagination by anyone who knows the ruthless brutality characteristic of Russian special forces. "This is precisely the mentality capable and determined to employ such fearsome weapons."

Given the German Wehrmacht's experience with Russian special forces in World War II, and given these current developments, the general argued, the current state of affairs in the West, particularly in the Federal Republic of Germany, makes a laughingstock of any defense mission: There are no designated special forces units in the armed forces of the Federal Republic of Germany, Rohkamm pointed out, making the Federal Republic an anomaly among all Western nations, and all nations in the heart of Europe.

Even those "deep reconnaissance" forces assigned for operations "behind enemy lines" "are given training and equipment to ensure that they are capable of nothing but reconnaissance," he said.

That state of affairs must be radically changed. General Rohkamm then held up to ridicule a graphic example of the defeatist mentality that would prevent such a change: a three-page fashion advertisement from a current West German magazine. The latest in fashion is pictured with the hammer and sickle embossed on the breast pocket of men's shirts and ladies' dresses!—*George Gregory*

assault in Western Europe.

The second line of Soviet assault will probably not be armored assault, but elements of Soviet regular units designed to interface with the combined local irregulars and spetsnaz infiltrators, including special airborne units of the sort now forward-based in Hungary. Armored units follow, not to lead the assault, but for occupying the terrain in the wake of the first and second lines of assault.

That is sufficient description to make the point summarized here. How does such an order of battle dovetail with the impact of the new class of strategic and tactical electromagnetic weapons?

This gives the Soviet strategists selections among three

crucial kinds of weapons which might be used by infiltrating spetsnaz forces for the purpose of destroying Soviet first-strike strategic objectives by means other than missile-launched nuclear warheads:

- 1) Pre-infiltrated, compact nuclear bombs, for hard targets.
- 2) Some selections from the repertoire of chemical-biological agents, for use deep in our interior.
- 3) Pre-infiltrated, electromagnetic strategic and tactical weaponry, for use against personnel and other vulnerable targets.

Since, in case of assault, Warsaw Pact forces intend to overrun and exploit Western Europe, the use of pre-infiltrated

nuclear and chemical-biological agents must be limited to targets for which no alternate effective means is available. Electromagnetic strategic and tactical weapons fill this hole in the Soviet war-planning problem.

With East bloc TIR trucks long circulating in the thousands, with impunity, throughout Western Europe, and by other rather obvious means, the infiltration of the three classes of weaponry assigned for use by infiltrated spetsnaz units presents Moscow with no great difficulty. The largest strategic electromagnetic system required for such use, could be conveyed in operational form in a trailer-truck rig, even at today's level of technology.

It is a fair estimate, that there are approximately 250 Soviet first-strike strategic targets in Western Europe. Heretofore, it has been the popular assumption that this requires a net of about 250, missile-deployed nuclear warheads hitting their targets, of the total warheads launched. Today, technologically, potentially, all of those targets could be neutralized by either pre-infiltrated, compact nuclear warheads, or strategic and tactical electromagnetic weapons, without the firing of a single Soviet missile.

For obvious reasons, it is doubtful that Moscow would entrust the use of such pre-infiltrated strategic weapons to paramilitary forces recruited from among Western European populations. Starting a covertly deployed, precisely coordinated assault requires highly compartmentalized control of disciplined units; this is a spetsnaz function. The local Soviet assets among trained paramilitaries and their auxiliary activists have a different assignment at the brink of war, essentially an escalated form of their pre-war functions of terror and disruption, and also a diversionary screen serving more or less unwittingly as logistical support for the infiltrated spetsnaz forces.

Compact nuclear bombs are an existing technology. The new electromagnetic weapons are, in some degree, at least, existing, deployable prototypes, but certainly not available yet in the quality and degree required for such missions.

Marshal Ogarkov and his general staff associates require several years or more of successful *perestroika*, and successful negotiation of a "zero option" agreement, to be adequately prepared to deploy the new order of battle for general assault. For obvious reasons, the deployment of the Soviet version of SDI, now in progress, must be essentially completed. Most probably, the kind of threat described is a medium-term threat. Nonetheless, if we consider the tasks we must complete during the five-odd years we can allow safely for this purpose, the time for us to begin is now.

Where we stand

Recent advances in relatively higher-temperature superconductors, mean much more efficient electrodes for devices such as gyrotrons, perhaps two orders of magnitude of increase of output. There are other, more sophisticated new kinds of devices, which I shall not discuss here. As for power

sources, in addition to conventional ones, there is the case of the very clever, truck-portable device developed by Soviet Academician Velikhov. With greater power supplied to complex, nonlinear electromagnetic beam-pulses, the needed wattage per square centimeter on target-area can be achieved at correspondingly greater distances, and over wider areas.

As electromagnetic agents of biological warfare, such weapons have potentially the killing power of a thermonuclear warhead, without any of the unwanted after-effects to trouble Soviet occupying forces. The tactical uses are obvious.

There are sublethal effects available within the repertoire as a whole, such as sleep-inducing effects. Or, the direct target might be an induced change in the environment, or an effect on vulnerable microorganisms on a large scale, and the physical possibility of global, electromagnetically induced effects.

Therefore, as I have said, whoever first controls the full range of the electromagnetic spectrum, and is able to produce specific, nonlinear effects by this means, has won the power to dominate the world. We had better move quickly, before it is too late.

It is the general rule in technology, that the technology which provides a weapon of greater mobility and firepower, is also the technology which supplies mankind a more powerful tool. Conversely, the technological principle of each more powerful tool, is also more or less readily applied as a superior weapon. The same is true of nonlinear spectroscopy.

This is the new biological science.

I have already mentioned the importance of this line of investigation for discovering a general cure for the AIDS infection. If we could master the spectroscopy of the full range of the mitotic process, from the existence of the parent cell, through to the formation of the distinct daughter cells, we would have the key to mastering AIDS. This might require 10 years of research along both those lines, and parallel molecular biology, before a cure were discovered; the sooner we take this seriously, the sooner the research is done.

Since, under presently prevailing public health policies, the group of closely related human-specific infections associated with the name human AIDS could potentially render the human species extinct within two generations or so, this line of combined biological research has properly the highest priority of any task facing governments or mankind generally. So, the picture of the matter is, that this new biological science, which will play at least an integral role in saving the human species from extinction, also bears upon the knowledge which enables us to destroy life with the least effort applied over the broadest area.

We dare not hold back the clock of science in this area. Whoever develops a cure for AIDS, or better cures for cancer, by help of this science, also possesses the most powerful weapon ever conceived. We had better master this science quickly, for every reason we might imagine.