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FAS RESPONDS TO GROWING INFECTIOUS DISEASE PROBLEM WITH PROPOSED GLOBAL SURVEILLANCE AND RESPONSE PROGRAM

Editor's Note: From the work done by FAS in advancing and testing a verification protocol for the Biological Weapons Convention, and structuring incentives for compliance with the treaty, has come a new project. Directed by Stephen Morse and Barbara Hatch Rosenberg, this new effort is engaged in designing and promoting a global Program for Monitoring Emerging Diseases (ProMED) and is rapidly gaining international interest and participation. The genesis and progress of the project are the subject of this report.

The U.S. Institute of Medicine (IOM) issued a report last year entitled "Emerging Infections: Microbial Threats to Health in the United States." According to Nobel Laureate Joshua Lederberg, co-chair of the committee that produced the report, "perhaps [its] most important message [is] that infection knows no national boundaries, and we will pay dearly if we ignore the smoldering of infection anywhere At stake is a level of sickness and death many fold higher than that of the highly publicized accidents of industrial pollution. Yet we continue to neglect the most elementary precautions . . ." (*The Scientist*, 12 July 1993). The human race, he reminds us, has prevailed over all its challengers except the pathogenic microbes; in this context, mankind's survival is not assured.

The IOM report pointed out that the United States has no comprehensive national system for detecting outbreaks of infectious disease. (And until the FAS project began, there had been no recent effort to develop and implement a global program of surveillance for emerging diseases.)

Not Even AIDS Spurred Action

The emergence of AIDS should have made us more vigilant. Instead, we continue to see the spread in diverse parts of the world of previously unrecognized diseases like hemorrhagic fevers, as well as the resurgence of old scourges like tuberculosis and cholera in new forms. Just this year, several diseases—including the previously unknown and deadly hantavirus pulmonary syndrome first identified in the Four Corners region of the Southwest—emerged in the U.S. alone.

According to the World Bank's World Development

Report 1993, *Investing in Health*, we can expect an increasing number of drug-resistant disease strains, as well as the possible emergence of "new microbes as devastating as HIV and the inadvertent spread of biological agents developed for use in war."

FAS Responds With ProMED

In the evident need for a global program to recognize and respond to emerging disease outbreaks before they become pandemic, the FAS Biological Weapons Verification Project spotted a prime candidate for a cooperative program in which all parties to the Biological Weapons Convention could share and derive positive benefits, while at the same time strengthen the treaty. (*See page 5*).

The FAS project to establish a global program to monitor emerging disease was initiated in January 1993. First, a Steering Committee was formed under the chairmanship of Stephen Morse, a Rockefeller University virologist and member of the FAS Working Group on Biological Weapons Verification who helped organize the IOM study and chaired its Virus Task Force. (Morse's book, *Emerging Viruses*, published only five months ago, has already sold out its first printing.)

The project's major goal is to involve scientists from all regions of the world in designing the program and pressing for its establishment and necessary financial support.

To succeed, the program will have to involve substantial global collaboration in the field. By first building a constituency among influential scientists worldwide, the FAS project hopes to generate at the working level the political leverage that will later be needed to put the program in place. By contrast, a top-down effort at the World Health Assembly in 1968 never bore fruit, because there was no organized constituency to push for it when governments balked at funding a long-term, future-oriented preventive program.

The ProMED project got underway with an international conference co-sponsored by FAS and the World Health Organization (WHO) in Geneva on September 11 and 12. International organizations and national Missions to the United Nations in Geneva were invited to attend the open-

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ing plenary session, at which prominent international health specialists set forth current and anticipated infectious disease problems and the present status of the world's capabilities to deal with them.

Sixty Experts From Thirty-five Countries Participate

Sixty distinguished participants, mostly from the Eastern Hemisphere, formed ongoing working groups (Human Disease, Animal Disease, Plant Disease and National Development Issues) and began drafting plans for a global program. Since the conference, work continues by mail and telephone and electronic communications. Pro-tem reports have just been filed by the working groups.

The project will eventually publish a report detailing means for coordinating and extending existing efforts on disease monitoring, both public and private. The report will include the designation of appropriate sentinel facilities, plans for a communications network, recommendations for a response mechanism to provide assistance in controlling disease outbreaks, and a proposal for the organizational management, oversight and financial support of the global program.

WHO, with its international responsibility and recognition, will have to be at the nerve center of the program; participation of other international organizations will also be essential. The U.S. Centers for Disease Control and Prevention (CDC), as a major world repository of expertise, will have to play a central role in responding to disease outbreaks and controlling them. The United States could make a major contribution to the global program by recognizing the indispensable role of CDC and expanding its capacities appropriately.

Idea Strikes Chord

While organizing the Geneva conference, Stephen Morse and Barbara Rosenberg were inundated with requests to attend. From preliminary consultations with key experts in different regions and disciplines, word flew around the world. It was soon evident that FAS had tapped into a widespread flood of concern ready to sweep forth into action.

Conference space limitations were stretched to accommodate additional participants. Others had to be turned down. "Extras" showed up uninvited. Letters are still coming in from scientists and officials who heard about the conference and wish to be part of the ProMED process. Many of the conference participants have written congratulatory letters, and some are already conferring with their governments on ProMED.

ProMED seems to have taken off overnight. It enjoys strong support among scientists in the field and is beginning to be recognized on the political scene. The reason is clear: it responds to an urgent and widely felt need.

—Stephen S. Morse and Barbara Hatch Rosenberg

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Health Specialists from thirty-five countries gather at the John Knox Centre in Geneva for the first ProMED organizing conference. Barbara Rosenberg and Stephen Morse, fourth and fifth from the right in the first row, direct the FAS project.

THE CONTEMPORARY PROBLEM OF EMERGING DISEASES

The Institute of Medicine report on emerging infections was termed by *The New York Times* "a wake-up call to doctors, medical schools, government officials and the public to end complacency over infectious diseases." The report itself said "the next major infectious agent to emerge as a threat to health in the United States may, like HIV, be a pathogen that has not been previously recognized."

Although advances in sanitation and antibiotic development have until recently led many to believe that the plague of infectious diseases had been conquered, infectious disease is still the leading cause of death worldwide. Increasingly, the problem is extending from the less developed tropical areas to the industrial North. The future emergence of a lethal disease that spreads as readily as the common cold cannot be discounted.

In addition to AIDS—a global epidemic that sounded the alarm, a remarkable number of newly recognized or re-emerging diseases have turned up. In the United States these include the Four Corners outbreak, the "hamburger poisonings" caused by a pathogenic strain of *E. coli* in ground beef, and an epidemic of 370,000 infections with at least 50 deaths caused by cryptosporidium in the Milwaukee water supply this year.

Tuberculosis has re-emerged in a drug-resistant form and is becoming an increasingly serious problem in U.S.

ities. Not long ago, toxic shock syndrome appeared, genital herpes broke out unexpectedly, measles escalated and Lyme disease became a growing problem.

Cholera Spreading and Taking New Form

Cholera is spreading in South America for the first time in a century, with nearly a million cases reported and ten thousand dead. The pathogen has now invaded oysters and fish off the U.S. Gulf Coast; and suddenly, a new strain has turned up in India that evades the immunity of former cholera victims.

Dengue hemorrhagic fever, a newly emerging and much more dangerous form of dengue, broke out in Cuba some years ago and is now moving to Puerto Rico, Latin America, Australia and Asia. The Asian tiger mosquito, which can carry dengue fever and a number of other diseases, recently invaded the U.S. in used auto tires and is now found in eighteen states. These mosquitoes in Florida are carrying Eastern equine encephalomyelitis, a severe disease that has been rare in the United States. Yellow fever and Rift Valley fever are breaking out in new areas of Africa. A surge in malaria (100 million cases, 1 million deaths a year) has circled the globe, including cases of the most severe form in the New York area.

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Some Examples of Emerging Viruses and Factors in Their Emergence

Virus	Symptoms	Distribution	Natural Host	Probable Factors in Emergence
Influenza	Respiratory	Worldwide	Fowl (and pigs)	Integrated pig-duck farming
Seoul	Hemorrhagic fever with renal syndrome	Asia, Europe, U.S.	Rodent	Population density, urban rats
Rift Valley	Fever +/- hemorrhage	Africa	Mosquito	Dams, irrigation
Oropouche	Fever	Brazil, Trinidad, Panama	Midge	Cacao farming (vector breeds in hulls)
O'nyong-nyong	Arthritis, rash	Africa	Mosquito	Civil disruption
Yellow Fever	Fever, jaundice	Africa, South America	Mosquito, monkey	Storage of water in small vessels
Dengue	Fever +/- hemorrhage	Asia, South America Africa, Caribbean	Mosquito, Human/monkey	Increased urban population, factors favoring mosquito breeding
Rocio	Encephalitis	Brazil	Mosquito, birds	Ecological factors plus recombination of Ilcus virus with unknown virus
Junin	Fever, hemorrhage	South America	Rodent	Extension of farmlands favors host
Kyasanur Forest	Encephalitis	India	Tick, rodent	Deforestation

The sudden appearance of "mad cow disease" in England has been traced to scrapie, a sheep disease that has not before infected cows, raising concern that human infection through meat might be a present or future possibility. Ebola, Marburg and similar viruses—highly lethal and presently without cure or vaccine, have been found transmissible from monkeys to man. Ebola caused a scare when found recently in monkeys in a Washington, D.C. suburb.

Historically, the present picture is not entirely normal. The range of diseases endemic to a region has in the past been relatively stable. Stephen Morse's work has crystallized awareness of the reasons why diseases are emerging more rapidly in our time and why the situation can be expected to worsen in all parts of the world.

Societal and Environmental Changes Responsible

Environmental disruption, human population explosion, increased movement of people, technical advances, behavioral changes and wars—all result in new human contacts with animal and insect reservoirs of disease, as well as the creation of new ecological niches for disease agents and vectors such as mosquitoes or rats.

Increasing urbanization facilitates transmission of diseases. Transport of pathogens and vectors now takes place readily, even from remote regions, to new areas where immunological resistance has not developed, or where genetic recombinations can take place in nature, or where simultaneous infections can worsen the outcome. Climate change threatens to alter the ranges of pathogens and vectors; there are suggestions that this alteration is already underway.

Misuse of antibiotics is resulting in the emergence of resistant strains of a number of important pathogens. Su-

perimposed on all these factors is the potential for rapid genetic evolution of pathogens, exemplified by the influenza virus. The result can be evasion of immunity, acquisition of the ability to infect new hosts, or even transition from vector or direct contact to aerosol transmission (as is thought to have already occurred for some pathogens. As Nobel Laureate virologist Howard Temin has commented, the surprise is that there has been only *one* new pandemic.

The historian William McNeill, who has made a study of the remarkably important role that epidemics have played in human history, believes that the modern "conquest" of disease (which has made possible an enormous increase in human density) has set the stage for a new disease invasion—the high density ensuring rapid and widespread transmission. "The possibility of really drastic epidemiological disaster bringing to a halt the modern surge of population seems to me something we all should take very seriously," McNeill writes. (Chapter 3, *Emerging Diseases*.)

The problem is not restricted to human disease. Animal diseases, many of them potential human threats, are also emerging, as are crop threats due to plant disease. These simultaneously threaten the world economy, the food supply and ecological stability.

The Biological Weapons Connection

Most of the nations of the world are parties to the Biological Weapons Convention (BWC), which outlaws the possession of biological weapons (but not research on them). When the treaty was signed in 1972, verification was not considered necessary. But the rise of biotechnology, which has made biological weapons more accessible and possibly more dangerous, has prompted the treaty

parties to undertake a technical study of possible verification measures.

Formal negotiations are expected to be set in motion next year. Adoption of a BWC Protocol on Verification is considered by many countries to be essential for the prevention of biological weapons proliferation.

Developing Countries Need Incentives

In the eyes of many developing countries, however, verification is costly, intrusive and does not address their most pressing problems. If an effective verification regime is to be adopted, there must be an incentive for such countries to participate.

Already, the BWC calls for international cooperation and the sharing of technology for public health and other peaceful purposes. Although this provision is the treaty's main attraction for many countries, it has never been implemented. The need for a verification regime makes it imperative to initiate without further delay a program in which nations can cooperate to provide positive benefits.

The Final Declaration adopted by the Third BWC Re-

view Conference in 1991 urged greater cooperation in international public health and disease control, the provision of training programs to developing countries, coordination of international and regional programs, and the pooling of information from national epidemiological surveillance and data reporting systems "with a view to improvements in the identification and timely reporting of significant outbreaks of human and animal diseases."



Stephen S. Morse

What was envisioned in the 1991 action was a cooperative program *outside* the Biological Weapons Convention in which the parties to the treaty could demonstrate their implementation of the Convention's provision on technical cooperation.

ProMED Represents Important Initiative

ProMED, proposed by the ongoing and highly successful BWC Verification Working Group as a positive incentive, embodies the sense of the Final Declaration. Following the September conference, several FAS BWC Verification and ProMED Steering Committee members remained in Geneva to speak at a forum for delegates to a conference of parties to the BWC, in session at that time. The delegates reacted favorably to the ProMED proposal, and FAS was urged to present a formal resolution at the UN General Assembly. ProMED will be included in a report the UN Secretary General is preparing on implementation of the peaceful cooperation provision of the BWC.

In working to recognize emerging diseases and abort the development of epidemics, the program being designed by the ProMED project would benefit both developing and developed nations—an essential criterion for any politically viable cooperative program. Because the pathogenic agents that cause many emerging diseases are considered to be likely candidates for development as biological weapons, it would be singularly appropriate to turn the technology and expertise required for their weaponization toward controlling them instead.

A global infectious disease monitoring program would also play a role in making it possible to detect, identify and control biological warfare events against a background of natural occurrences. A ProMED program would, therefore, have an exceedingly important deterrent effect.

The conjunction of public health needs and arms control exigencies has made this an opportune time to mount the ProMED initiative. In these straitened times, the double benefit should ultimately help to elicit financial support for the proposed global program.

—Barbara Rosenberg

Statement Unanimously Adopted By Conference on Global Monitoring

"Numerous recent episodes of emerging and re-emerging infections, including the global AIDS pandemic, the continuing spread of dengue viruses, the now-frequent appearance of previously unrecognized diseases such as hemorrhagic fevers, the resurgence of old scourges like tuberculosis and cholera in new forms, and the economic and environmental dangers of similar occurrences in plants and animals, attest to our continuing vulnerability to infectious diseases throughout the world. Many experts, both within and outside government, have warned of the need to improve capabilities for dealing with emerging infectious diseases.

The Conference recognizes the urgent need to expand and improve global monitoring of human, animal, and plant infectious diseases, for the purposes of early detection of, and response to emerging and re-emerging diseases, and for improvement of disease control.

The Conference charges the ProMED Steering Committee to take action to assure the design, promotion, and implementation of such a program, in consultation with appropriate international, national, and non-governmental agencies. The Conference further requests the full cooperation of the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the Office International des Epizooties (OIE), and other appropriate organizations to work with the ProMED Steering Committee to this end."

US-RUSSIAN AGREEMENT TO COOPERATE ON SPACE STATION: A CHAPTER 11 FILING TO REORGANIZE THE WORLD ORDER?

With the demise of the Soviet Union and the end of the Cold War the third phase of American grand strategy began. As each preceding phase was marked by a distinctive interplay between technology, geography and national interest, so too will this new one.

The first phase spanned one and a half centuries, from the founding of the Republic to the Japanese attack on Pearl Harbor. Predicated on the splendid isolation of the North American continent, it sought to avoid entanglement in conflicts across the vast oceanic expanses.

The second phase spanned the half century from the attack on Pearl Harbor to the dissolution of the Soviet Union and focused on containing attempts at planetary hegemony, first by Nazi Germany and Imperial Japan, and then by the Soviet Union.

Cold War Spending Bankrupted USSR

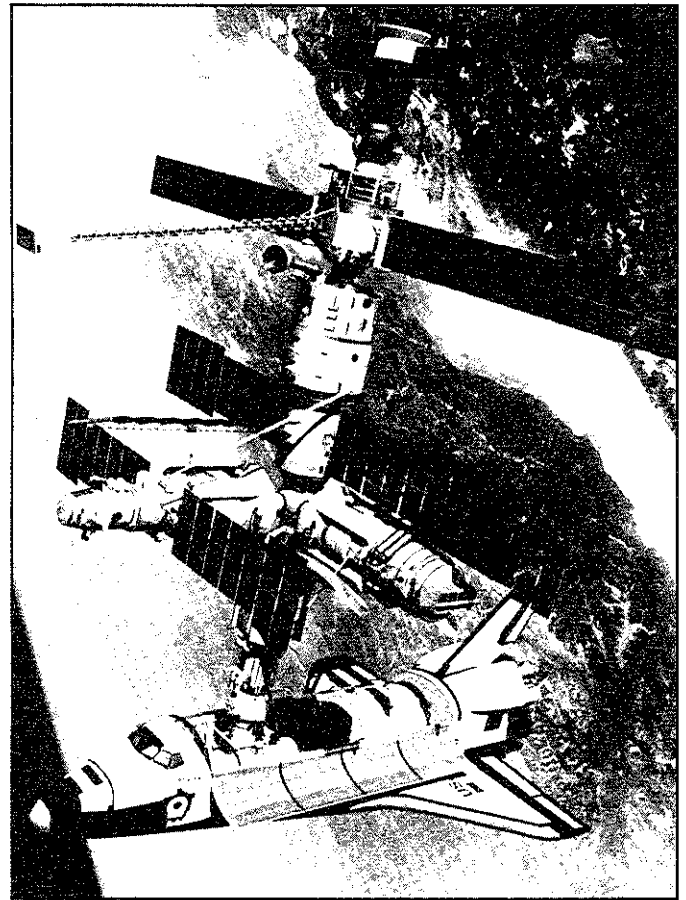
The Cold War was a contest of socio-economic systems, and the vastly greater resources of the Western democracies left little doubt as to the probable victor in this grand potlatch. The eventual bankruptcy of the Soviet Union was merely a matter of time. But President Eisenhower had also recognized the danger of bankrupting America in the process. Our present economic difficulties are the price of victory. Restoring American prosperity requires restoring the burden of military spending to the level that prevailed prior to the Cold War, about one percent of Gross Domestic Product.

The long-range bomber was the technological innovation that shattered the geo-political foundations of American isolation. The rocket was the defining artifact of the Cold War, both the nuclear tipped missiles of the arms race and the spacecraft of the space race.

Aerospace technology now has the potential to define the post-Cold War era. Space cooperation has the potential to redefine the relationship between America and Russia. And it may also provide a vehicle for redefining the world order.

FSU Complex Challenges Security

The aerospace complex of the fallen superpower continues to pose a significant, perhaps the most significant challenge, to our national security. The growing glut of conventional and unconventional arms on the world market can only be read as an omen of widespread proliferation of advanced weapons systems, especially by this once and, hopefully, never future adversary. Deprived of Cold War rationale, some elements of the complex remain leading opponents of reform. Institutions and personnel of the former Soviet aerospace complex are now searching for new outlets for their energies, including sales of advanced combat aircraft to Third World countries and emigration to these countries to work on emerging missile programs.



Technical rendition of the Space Shuttle Atlantis docked to the Kristall module of the Russian Mir Space Station, as configured for the joint U.S.-Russian mission scheduled for June 1995.

Initial American responses to this new challenge mirrored the evolution of American policies toward Germany at the end of the Second World War. Following the precedent of the Morgenthau Plan, which called for the "pastoralization" of Germany through the elimination of its industry, the Bush Administration prohibited any dealings with the Russian aerospace industry that might in any way sustain a continued military production capability. Such a Carthaginian peace-policy was ultimately abandoned with respect to Germany, and was ill conceived with respect to Russia. While the Russian aerospace complex may atrophy, it will not disappear.

The second element of the Bush Administration's policy toward the former Soviet aerospace complex was patterned on Operation Paperclip, which transferred to the United States advanced German weapon capabilities, such as the V-2 rocket. The only exceptions to the Morgenthau Plan for Russia were based on the one-time acquisition of

unique Russian technologies, primarily related to the Strategic Defense Initiative. But this policy of plunder invited growing hostility toward America.

Clinton Policy Echoes Marshall Plan

Fortunately, American policy toward Russia and the other former Soviet republics, has now finally embraced the post-World War II precedent that ultimately proved most successful—the Marshall Plan.

The Clinton Administration appears to understand that initiatives to stabilize the former Soviet nuclear weapons complex must be matched by a parallel policy to stabilize the former Soviet aerospace complex, which is much larger in size and more varied in scope. In the absence of such initiatives, the aerospace complex will remain a major threat to stability both in the former Soviet states, and to the rest of the world—a breeding-ground for hostility to democratic reform and a spawning-pool for missile proliferation.

Dollar/Ruble Ratio Adds Impetus

Given the current exchange rate of the Ruble, modest expenditures by America could have a major impact today and be a long-term source of stability, as was the Marshall Plan. A broad-based program of cooperation in space and other areas offers the prospect of mitigating these threats to stability and facilitating the entry of Russia and the CIS republics into the Western community.

When he met with Boris Yeltsin in April, Bill Clinton reached a tentative agreement to explore options for building a space station with the Russians—a project that would dignify their accomplishments and engage their energies. It is also a project that would give a clearer direction for America's faltering space effort while reducing its cost, further the cause of reform in Russia and discourage missile proliferation.

With commendable boldness, President Clinton, Vice President Gore, and NASA Administrator Dan Goldin have, in a matter of months, negotiated the merger of the Russian Mir space station program with the Freedom space station project of America, Europe, Japan and Canada. From the twin perspectives of national security policy and space policy, this is an historic achievement.

Merger Constrains BM Proliferation

The space station merger marks the Clinton Administration's major innovation in national security policy with respect to Russia. The merger was explicitly predicated on Russian compliance with international norms constraining ballistic missile proliferation—a policy of engagement that will create institutional interests in Russia to observe these norms.

More importantly, however, the joining of the Russian and American piloted spaceflight efforts represents a unique and highly visible exemplar of the new partnership between these former adversaries. During the Cold War, the space race represented a continuing reminder of the bipolar competition. Space achievements epitomized na-

tional aspirations and identities in both countries. There is no more effective vehicle for demonstrating the fundamental change in the relationship between America and Russia than cooperation in human space flight.

Space Station Merger Is Milestone

Unifying the Russian and American space station projects will rank with Kennedy's decision to send Americans to the Moon as a milestone in space policy. Conceived in the Reagan Administration as a means of demonstrating the superiority and solidarity of the Western Alliance, Space Station Freedom was bereft of apparent rationale with the end of the Cold War.

Under the Bush Administration, space advocates sought to justify the project on scientific and commercial grounds, with declining success. Absent the reinvigorated geo-political rationale of cooperation with Russia, the cancellation of the space station was just a matter of time. And the likelihood of a repetition of the Challenger accident pre-empted the demise of space exploration more generally.

These valuable lessons have broader applicability. Just as space cooperation has redefined the relationship between Russia and America, it can also help define the post-Cold War world order more generally.

Other Opportunities For Cooperation

The precedent set by the U.S.-Russian agreement must be extended more widely. A place for other former Soviet republics, notably Ukraine and Kazakhstan, must be found in the unified space station program. The emerging space capabilities of China and India, as well as other smaller countries, must also be engaged in cooperative projects, perhaps the human exploration of the Moon or Mars.

Such cooperation may play a central role in the emerging global economy, which is marked by supra-national institutions such as the General Agreement on Trade and Tariffs (GATT), whose decisions increasingly influence the daily lives of billions. But this migration of political power to international agencies has not been accompanied by an analogous migration of political legitimacy.

The global economy is increasingly administered by faceless corporate and government bureaucrats, apparently accountable in only the most tenuous fashion to politically legitimate public representatives. There are no popularly elected representatives at the United Nations; nor is the issue of such elections even on the political agenda. And the experience of the European Community, in which the Community Parliament exercises only the vaguest oversight on the Community's institutions, suggests that legitimate popular participation in international decision-making will be long delayed.

Thus, for the foreseeable future, there will be a substantial and growing deficiency in the legitimacy of precisely those international institutions which will exercise a growing influence on the course of world events. This legitimization crisis, which has fed public uneasiness with the NAFTA agreement, will become evermore acute as the

world community struggles with global challenges of populations, resources and environmental control in the new millennium.

In a world increasingly defined by perceptions created by the mass media, international space cooperation is a unique means for asserting the existence of a global community that shares common interests and aspirations. No other undertaking has more potential for alleviating the legitimization crisis of emerging international institutions.

Just as the pyramids of Egypt and Mexico, the ziggurats of Mesopotamia, the cathedrals of medieval Europe had both symbolic and pragmatic components, so too will global space cooperation make a concrete contribution to the demilitarization of the world order. During the Cold War, nuclear-tipped ballistic missiles were the exemplar of the Soviet-American military competition. This example inspired a host of other countries to acquire similar trappings of power.

New Status Symbol Possible

The initiative of America and Russia to beat swords into ploughshares can transfer the mantle of power from missiles to spaceships. Increasingly, contributions to human spaceflight, not stockpiles of missiles, would be regarded as the indication of standing in the world community. Following the US-Russian precedent, civil space cooperation could provide incentives for reducing or eliminating destabilizing missile programs.

Just as the competition in rockets in arms race and space race defined the Cold War, cooperation in space exploration and development may become a defining activity of the coming millennium. And the third phase of American grand strategy may find its center neither in isolationism nor in alliances against threats, but in applications of pooled genius to peaceful aspirations. —John E. Pike

FAS SPONSORS BERS AND OCHOA DIE

Two FAS Sponsors, both of whom opposed nuclear arms and were life-long supporters of open societies in which scientists throughout the world could work freely, recently died within days of each other.

Lipman Bers, 79, died in New York on October 29. Severo Ochoa, 88, died in Madrid on November 1.

Bers, a professor of mathematics, was widely known for founding the National Academy of Sciences' Committee on Human Rights. He was instrumental in obtaining exit visas for dissident Soviet mathematicians in the early Seventies and was a highly vocal supporter of Andrei Sakharov's crusade for freedom of speech and association in Russia.

In 1985 he received New York City's Mayor's Award of Honor for Science and Technology for, among other things, his special encouragement to women mathematicians. A teacher of mathematics for over forty years, Bers was known internationally for his work on mathematical analysis and geometry.

Ochoa, Nobel Laureate in biochemistry, was an opponent of nuclear testing and believed that an open society is vital to science. He shared the Nobel Prize in 1959 with Arthur Kornberg (also a FAS Sponsor) for their discoveries of enzyme-catalysts.

At that time, Ochoa's enzyme was thought capable of synthesizing the vital life substance RNA but is now known to degrade RNA, causing the natural reaction of the substance to run in reverse,

Trained in medicine, Ochoa eschewed the role of a practicing physician for that of researcher, working in Spain, Germany, England and the U.S. He retired in 1986 to Spain.

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