

PHYSICS and SOCIETY

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PHYSICS AND SOCIETY *Editor: John Dowling*

PHYSICS AND SOCIETY is a quarterly newsletter of the Forum on Physics and Society, a division of The American Physical Society. The newsletter is distributed free to members of the Forum. It presents news of the Forum and of the American Physical Society and provides a medium for Forum members to exchange ideas. PHYSICS AND SOCIETY also presents articles and letters on the scientific and economic health of the physics community: on the relations of physics and the physics community to government and to society, and the social responsibilities of scientists. Contributions should be sent to the Editor: John Dowling, Physics Department, Mansfield State College, Mansfield, PA 16933, 717-662-4275.

PHYSICS AND SOCIETY is also distributed free to physics libraries upon request. Such requests and requests for other information should be sent to the editor.

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News of the Forum: The following items were discussed at the Executive Committee Meeting on 29 April 1980 at the Washington Meeting.

Forum Elections APS plans to distribute ballots for Forum Officers in early September. The Forum Executive Committee prepared questions on issues of interest to the Forum for Forum candidates to answer. The responses of Forum candidates to these questions will be published in a special election issue of "Physics and Society." This newsletter will be in Forum members hands by mid-September. Please hold your ballots until you have had a chance to read the candidates' responses.

Future Forum Sessions The Forum has three, two, and three sessions available for the New York (Jan., 1981), Phoenix (March, 1981) and Baltimore (April, 1981) meetings. Many potential sessions have been suggested, e.g., technology assessment, nuclear wastes, nuclear proliferation, energy conservation, SALT verification, Freedom/Human Rights - definitely planned for January - see Parmentola's article in this issue, coal, unusual professions for physicists, solar energy, low-level radiation, visible scientists, breeder reactors, university physics in the 1980s, exponential growth or steady state, Federal priorities for basic research, elementary and secondary science education, helium conservation, MX versus SUMS concepts, underdeveloped countries, solar satellites, etc. If you would like to contribute to or organize a session contact Ken Ford, President's Office, New Mexico Institute of Mining and Technology, Socorro, NM 87801, 505-835-5508. Ken plans to finalize the January, 1981 meeting by late August.

Treasurer's Report There is \$1353 in an awards endowment account, \$3800 in an operating account. Four newsletters and a yearly ballot are the major expense items.

Newsletter It should contain items of direct relevance to the Forum, e.g., minutes of APS Council Meetings, session reports, news of the Forum, etc. 31 letters (a very high 1.1% reader response) from Forum Newsletter readers commented on the computer format. Overall these were 4 pro and 27 con the computer look. A few typical responses were as

follows. Anonymous: "An abomination to read. Go back to regular printing and convert your computer to electronic games." One returned the whole newsletter and wrote on it "utterly terrible." Many of the 31 offered constructive criticisms. Michael Fisher of Cornell: "If you want the newsletter actually read I feel you must find another method." Terry Carlton of Oberlin: "If maintaining such communications among members were not so important, it would scarcely matter how effectively it were done." The Editor thanks all those who troubled to write, especially those who commented favorably on the content, if not the format of the newsletter.

Arms Race Resolution A suggestion was made to have a Forum session on the question: "should the APS Council support a statement on the arms race such as that adopted by the AAAS?" (See Science 207, 807 (1980) or the Forum Newsletter 9, No. 1, 7 (April, 1980).) Forum members are requested to write the Editor stating their opinions on whether or not the Forum Executive Council should pursue this issue.

Other Items Reports were given by the Prize Committee and the Nominating Committee. The next Executive Committee Meeting will be at the New York meeting in January, 1981.

Forum Membership Members of the APS may join the Forum simply by writing Dietrich Schroeder, Department of Physics & Astronomy, University of North Carolina, Chapel Hill, NC 27514. There are no Forum dues for APS members.

Letter to the Editor (excerpts):

On the AAAS adoption of a resolution for control of nuclear weapons: resolutions with these objectives are good, but not effective.

1. We talk about continued vigorous support of U.S. efforts. Everyone knows these efforts are riddled with politics and have as many opinions as there are politicians. It is difficult to know what and whom to support.
2. Comprehensive test ban treaties would kill research. There are many new things

happening in nuclear physics. Are we going to limit our experimental searching for fear we may develop a new and more awesome weapon? Even at this point we may be too late.

3. We can oppose development of new weapons systems but it would have little effect. This does nothing but point up our frustration with the system which should be attacked directly.

4. Conversion of nuclear weapons development to peaceful purposes is a worthy point. We are attempting to do this for increased power production; and so are most countries on the Globe. The fine line must be drawn between (1) the haves and have nots, (2) the problems in this country with advocates of no nuclear power, (3) the insurmountable problem of compliance by other countries. Again the question arises, who will initiate, and when?

In all of the above the AAAS resolution assumes there is a plan, but in reality it is all talk. For a solution, the APS and other members of scientific communities could get together with their peers in other countries and formulate positive plans to accomplish these objectives. We in the scientific community on this Globe have tremendous clout if we use it properly.

John Gilmore, Vice President
Minuteman Laboratories, Inc., 916 Main St.
Acton, MA 01720 (18 May 1980)

"The Mobile Land-Based MX - A National Security Disaster" by B. Kent Harrison, Physics & Astronomy Department, Brigham Young University, Provo, Utah 84602.

The U.S. Air Force, in concert with the Department of Defense and the White House, is currently trying to sell the American people on building the largest military system ever planned - indeed, the largest public works project in the history of the world. It is the mobile land-based MX missile system, estimated by the Air Force to cost \$33 billion; but independent estimates run as high as \$120 billion or more. This article is presented in hopes of raising the conscious-

ness of readers across the nation about this system.

The MX missile itself needs to be distinguished from its proposed basing mode. The missile is a new ICBM, currently under development, weighing 190,000 pounds, 71 feet long, and carrying ten independently targeted re-entry vehicles (RVs), each carrying a 335 kiloton nuclear warhead. The RVs are to have an accuracy (estimated) of 0.05 nautical miles circular error probable (CEP), much better than existing Minuteman II or III RVs.

The currently favored basing system proposes 200 basing sites, each containing one missile hidden in one of 23 shelters. The shelters in each site are to be a minimum of 7000 feet apart, but connected by a road. (Originally, this road was to be in the form of a loop, or "racetrack", but is now planned to be straight.) The missile in each site is to be transported from one shelter to another by a "transporter-erector-launcher" (TEL) weighing 670,000 pounds and 180 feet long. The theory is that, in an enemy attack, the enemy could not detect which shelter in each site contained the missile, so that all 4600 shelters would have to be attacked in order to insure destruction of the system.

This basing system would be arms-control verifiable in that portholes in the shelter roofs could be opened to give Soviet satellites a view of the missile. Deployment is currently planned for the deserts of western Utah and eastern Nevada, with construction of the main base, roads, and utilities to begin in 1981 and shelter construction to begin in 1983.

The MX is being developed to counter an increasing Soviet threat to our Minuteman force. Opinions differ about the urgency of this threat, but there is substantial feeling that the U.S. needs to make some response such as the MX. However, the basing system is another matter; the mobile land-based mode described above has attracted considerable opposition among knowledgeable scientists, many military personnel, and other informed persons. Curiously, the Air Force has been most reluctant to consider alternatives publicly; one gets the impression of a large

bureaucracy unwilling or unable to change its course. This impression is reinforced by the fact that the MX and its basing system were originally designed under SALT II requirements (and done so perhaps to make SALT II palatable to the Senate) - but now that SALT II appears non-ratifiable, MX is defended even more than ever.

The Soviet threat is cited as need for haste; however, as Bernard Feld and Kosta Tsipis¹ have pointed out, the versatility of our triad deterrent and the difficulties of coordinating a full-scale attack against our Minuteman force lessen the real threat of such an attack and give us more time to consider what our best response should be.

There are several serious flaws with the mobile land-basing system. (1) The MX's 2000 warheads, mounted on RVs with unprecedented accuracy, would present a substantial threat to the Soviet land based missiles, which contain more than 70% of the total Soviet warheads. Thus the MX would likely be viewed by the Soviets as a first-strike weapon, with consequent likely escalation of Soviet arms buildup and increased probability of a Soviet preemptive first strike against the MX. (2) The system is vulnerable to Soviet attack in two senses. First, the Soviets could simply build enough missiles to attack all shelters. Indeed, at the present rate of deployment, the Soviets should have more than enough by the time the MX is finished! To counter this, we would then need to expand the system substantially, whereupon the Soviets would expand theirs, etc., etc. Second, it will be difficult to conceal the actual location of each missile. There are many tell-tale signatures of a missile's presence, and while the Air Force is confident of being able to counterfeit these at the empty shelters - at presumably great difficulty and expense - one is always nagged by the possibility that some signature may have been overlooked. (3) A related problem is that this system will not provide an effective deterrent until near completion, at the end of the 1980s. (4) If there were a Soviet attack against the entire MX land based shelter system, situated in Utah and Nevada as now planned, enormous amounts of fallout would result. Utah and Nevada would

be obliterated, and the eastward-moving fallout would devastate much of the population and food-growing capacity of the Midwest. It could be expected that many radiation-associated deaths would occur all the way to the east coast. Other areas would suffer indirectly because of damage to their food supply. (5) The cost of the system, perhaps \$100 billion - or more, if escalation results - is a huge sum to spend on a questionable weapon. What other military systems - or national needs - will need to be sacrificed in order to pay for it? (6) The ecological disruption of desert lands by the system could dislodge the fragile plant cover and cryptogam crust, resulting in massive dust bowl conditions and even in possible changes in U.S. weather patterns. Social and economic impact and effects on water, mining, grazing, and recreation are expected to be profound.

Alternatives to mobile land-based deployment of the MX exist. Several have been discussed in the open literature¹⁻⁴; I present here only one, the Shallow Underwater Mobile (SUM) system. This system was originated by physicists Richard Garwin and Sidney Drell and envisions a system of small submarines, carrying two to four MX missiles each, stationed off both east and west coasts of the U.S. The submarines would be located (a) in a large area, to render ineffective any Soviet counterforce attack, (b) close enough to the mainland to facilitate good communication, command, and control (C³), so that accuracy could be as good as land based missiles, (c) yet in water deep enough that there is no danger of disruption by tidal waves caused by a large Soviet missile barrage. Location of the boats would not be known to the Soviets; antisubmarine warfare (ASW) is not that well developed, and besides, the proximity to the U.S. coast would hinder ASW efforts. SUM could likely be operational and effective as a deterrent sooner than the land based mobile system, and its costs would probably be lower. Certainly it would not have the same dangers of escalating weapons numbers and costs. The SUM would be arms-control verifiable and would have characteristics sufficiently different from Poseidon/Trident that our deterrent could then be considered as a "Quadrad" (although some critics, ignoring the continued existence of

the Minutemen, state that deployment of the SUM would reduce our deterrent to a "dyad".)

The Air Force has refused to take this system seriously, citing supposed problems with the C³ and with the tidal wave threat ("van Dorn effect"). Spokespersons have later admitted that these are not problems after all, but the Air Force still publicly discounts it. One suspects a little inter-service rivalry, although in fairness it should be mentioned that the Navy doesn't seem enthusiastic about SUM, either. Drell notes that more studies of SUM need to be made, but that some alternative to the seriously flawed mobile land-based mode should be found. Fortunately, the Office of Technology Assessment has been charged with a review of alternatives in the next several months.

Congress, at present, seems determined to go ahead with deployment of the land-based system in Utah and Nevada, although the possibility of split basing with other locations has been raised. Readers of this article who have concerns about MX and its basing mode may wish to discuss them with their elected representatives as well as with other scientists.

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1. B.T. Feld and K. Tsipis, "Land-based Intercontinental Ballistic Missiles", *Scientific American*, 241, #5 (Nov 1979), p51.
2. K.M. Tsipis, "The MX Missile: A Look Beyond the Obvious", *Technology Review*, 81 #6 (May 1979), p. 1.
3. H. Scoville, Jr., "America's Greatest Construction: Can It Work?" *The New York Review of Books*, 27, #4 (March 20, 1980).
4. S. Drell, "SUM", *Arms Control Today*, 9 #8 (September 1979), p. 1

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1. "MX Debate", Bill Moyers Journal Transcript No. M-38, aired on PBS on 24 April 1980 (Copyright 1980, Educational Broadcasting Corporation).
2. MX: A Special Report, *Deseret News*, Salt Lake City, Utah, 21 April 1980.
3. *Congressional Record-Senate*, 9 November

1979, pp. S 16348-16374.

4. Copies of various statements before Congress and other materials can be obtained from The Union of Concerned Scientists, 1384 Massachusetts Avenue, Cambridge, MA 02138 and the MX Information Center, 232 1/2 University St., Salt Lake City, Utah 94102.
5. Eliot Marshall, "Congress Challenges MX Basing Plan," *Science* 208, 1007-9 (1980).

The MX Debate (Bill Moyers' Journal). Coproduced by WNET and KUED TV. Distributed by WNET/13, 356 W. 58th St., New York, NY 10019. 3/4" videocassette, color, 120 min., 1980. \$600 purchase, \$100 rental. Transcript #M-38 available for \$2: Bill Moyers' Journal, Box 900, New York, NY 10101. Reviewed by John Dowling.

The MX Debate is a Bill Moyers' Journal program which was aired nationwide over PBS. Overall it is an excellent program which gives background on the facts and vital issues associated with the MX. In addition it provides a forum for discussion and debate on the issues by the many parties concerned about this important weapons system.

The structure of the program is as follows. Moyers raises three primary issues: "Do we need the MX?" "How should the MX be deployed and based?", and what was "...the issue of its impact on Utah and Nevada." For each of these issues there was a short filmed episode, narrated by Moyers, which provided background on the issue. There were three panels of three experts each, one for each topic. Moyers directed questions on each topic to the appropriate panel. The panel responded to Moyers' questions and to each other's responses. The audience had an opportunity to ask questions after the second and after the third topic. A special panel of four local citizens was set up and allowed to ask one question each.

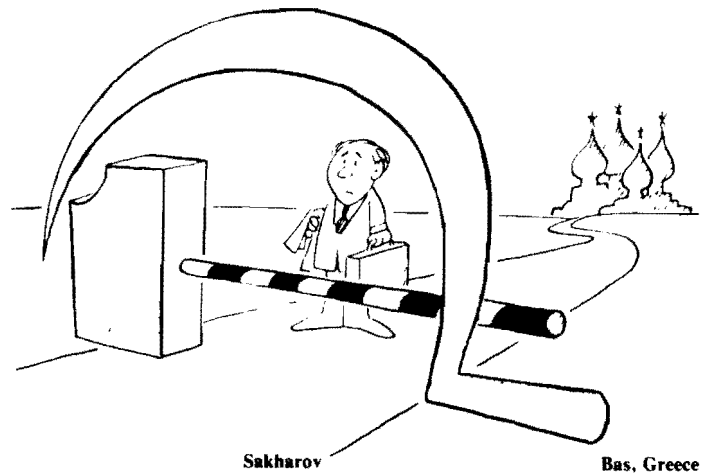
In summary, the program provided a national forum for an MX debate. As Moyers stated: "Obviously, we have not touched all the questions. We haven't even explored the big ones in the depth that they deserve." - but it was a very good start.

SPECIAL REPORT - APS ACTIVITIES IN HUMAN RIGHTS by John Parmentola, Bldg 6-402, Massachusetts Institute of Technology, Cambridge, MA 02139, for the APS Committee on International Freedom of Scientists (CIFS).

The purpose of this letter is to report on APS activities in the area of human rights and on other major events, both past and future, in the human rights field. Since the last report of September, 1979 (Physics and Society, Vol. 8, No. 3) the membership of the APS Committee on the International Freedom of Scientists (CIFS) has changed. The current chairman of CIFS is Kurt Gottfried of Cornell University and the present committee membership includes Bernard Cooper of West Virginia University, Eric Fawcett of the University of Toronto, Edward Gerjuoy of the University of Pittsburgh, James Griffin of the University of Maryland, Pierre Hohenberg of Bell Labs., Francis Low of M.I.T., John Parmentola of M.I.T., Andrew Sessler of L.B.L. and Ed Stern of the University of Washington.

In addition, CIFS is no longer a subcommittee of the Panel on Public Affairs (POPA), but a full APS Committee reporting to Council and the President and with a budget to support its activities. The committee is entrusted with the responsibility of advising the President, Council and APS committees such as POPA on issues associated with the repression of science which comes about through the suppression of internationally respected human rights of individual scientists.

Among the events to be described in this letter, the most startling has been the exile of the courageous human rights activist Andrei Sakharov to the remote and closed city of Gorky. There have been reports that KGB agents psychologically abuse Sakharov and official Soviet policy indicates that Sakharov will not be allowed to leave the Soviet Union under any circumstances. The response of the international scientific community to the exile of Sakharov has been tremendous. At the Hamburg meeting of the Scientific Forum held under the sponsorship of the Helsinki Accords a large number of delegates signed a statement criticizing Soviet infractions of the Helsinki Accords. The Royal Danish Aca-



Sakharov

Bas, Greece

demy and three major Norwegian scientific societies have sent strong statements of protest to Alexandrov regarding Sakharov. The APS has responded with vigor and grave concern. Both the past President Lewis Branscomb and the current President Herman Feshbach have sent strong letters of protest to Academician Alexandrov. Foreign members of the Soviet Academy of Sciences have officially threatened to resign from the academy if the academy takes any action against Sakharov. In fact some have resigned. Along with the Soviet invasion of Afghanistan and the breakdown of the Salt process, the exile of Sakharov signals the surfacing of the "hardliners" within the Soviet Politburo. In response to this situation some American scientists have advocated cutting off scientific and technological exchange with the Soviets for an indefinite period. Others are inclined toward appealing to the liberal elements within Soviet society by advocating the continuation of scientific communication and exchange, however such decisions should be based on an evaluation of the scientific quality and content of present and future programs between the U.S. and U.S.S.R.

Several scientific societies have expressed these viewpoints through formal testimony before Congress, in particular Congressperson Brown's Committee on Science and Technology. The APS, through its President, Herman Feshbach, has emphasized the importance of continuing scientific communication; however,

programs, conferences, etc., which do not meet accepted scientific standards and quality should be reconsidered and possibly discontinued.

On an historical note, the Fourth International Conference on Collective Phenomena in Moscow has successfully taken place. The APS did send a letter of support to the conference organizers. Prior to the conference, Viktor Brailovsky, in whose apartment the conference was held, was arrested and formally charged with disseminating anti-Soviet propaganda. This could result in a three year sentence. Brailovsky was told not to leave Moscow and that he should not attend the Moscow seminar. When he pointed out that the seminar would be held in his apartment, he was told not to turn away any foreign scientists. On the same day Yuri Golfand's apartment was searched and a considerable amount of scientific material was confiscated

The KGB did not disrupt the conference, however the Leningrad refusniks were not permitted to attend. In fact, Abraham Kagan was told by the police that they would confiscate his ticket if he appeared at the railroad station. During the seminar, Yuri Golfand read a paper by Orlov on Quantum Logic and Naum Meiman, who is quite ill, read a paper by Sakharov on the Baryon Asymmetry of the Universe. All in all the seminar proceeded without incident; however, the general mood of the refusniks was sombre and it was clear that their scientific level had deteriorated since the last seminar.

According to reports, the current situation in Kiev is probably worse than anywhere in the USSR. It appears that there are 12,000 refusniks in Kiev and the authorities have declared that they will severely reduce the number of emigrants.

The situation in Argentina continues to be the worst of all. Since the coup d'etat of 1976, the number of individuals detained in prison and the number of "disappeared" have reached alarming numbers. The recent O.A.S. human rights report indicates that in the last year the number of abductions and disappearances has significantly decreased, however the Argentine government continues to

ignore basic due process of law with regard to those in prison and it has not made efforts to satisfactorily account for the current status of the large number of those who have disappeared. The Argentine government's response to this report has been highly defensive to say the least. To make things worse, there are indications that official U.S. human rights policy toward Argentina, which could be characterized as a hardline policy in the past, is expected to be put on the back burner in the near future. This change here is to be associated with the U.S. Government's concern with regard to Argentinian wheat sales to the Russians. Furthermore the central figure in the whole Carter human rights policy, Patricia Derian, is expected to resign because of this change in official U.S. policy toward Argentina.

The author of this letter and Bruce A. Kiernan of the AAAS have written a position paper (available on request) on sending a human rights fact finding mission to Argentina. The money to support this venture is currently being raised by the Scientists and Engineers Emigrant Fund and the delegation of participants is being organized.

There are many outstanding cases which continue to be of concern to the APS. Among the long list, Yuri Orlov is probably the most well known. On January 21, 1980, past APS President Lewis Branscomb sent a strong letter of protest in response to the continued abuse of Orlov in prison. In President Branscomb's own words, "It appears that Dr. Orlov has been punished (reduced diet and solitary confinement) because he attempted to regain scientific notes taken from him by the camp authorities and because he has attempted to inform his professional colleagues of his scientific progress... My concerns about the future of U.S.-Soviet scientific relations now impel me to speak with complete candor. American physicists are convinced Dr. Orlov was unjustly imprisoned... U.S.-Soviet scientific collaboration has been seriously undermined by Dr. Orlov's arrest and trial..." Of course, the many Moscow, Leningrad, and Kiev refusniks continue to be of concern and the long list of oppressed Argentinians constitute a testament to our inability to ameliorate the human rights problems of our col-

leagues in Argentina. In this regard, volunteers are needed who want to "adopt" oppressed scientists. This could be accomplished through the organization of "small committees" within the various divisions which could adopt individual cases. Along these lines Aaron Temkin of NASA and Arnold Russek of the University of Connecticut head such a committee in DEAP, James Langer of Carnegie-Mellon heads another for the Division of Condensed Matter, George Bekefi of M.I.T. for the Division of Plasma Physics, Maurice Shapiro of the Naval Research Lab for the Division of Cosmic Physics, Louisa Hansen of the Lawrence Livermore Lab, for the Division of Nuclear Physics, and Eli Greenbaum of Oak Ridge for the Division of Biological Physics. Detailed histories and resumes of oppressed scientists of concern to the APS are available upon request from CIFS.

Since the beginning of this year several letters of concern have been sent by the APS to foreign governments in support of oppressed colleagues. In brief summary, on May 8, 1980, a letter of inquiry and concern was sent to President Videla of Argentina with regard to the cases of Daniel Bendersky and Federico Alvarez Rojas. Bendersky, a 27 year old science student, was taken from his home in September, 1978, by four men in plain clothes who claimed to be federal police and who carried official credentials. He has not been seen since his arrest nor has he been charged with any crime. Bendersky has been admitted in absentia as a graduate student at M.I.T. Rojas, a physicist at the Argentine Atomic Energy Commission in Buenos Aires, and his wife Hilda Leikis de Rojas, a computer programmer, were kidnapped on October 1, 1976 and detained by the army. The couple had no known political activities and no charges have been filed. They have not been heard from since their abduction. They leave three young children. On the anniversary of the founding of the Helsinki Watch movement, May 12, President Herman Feshback issued a statement to the BBC and the Voice of America in support of the Helsinki Watch members. On April 18, a strong letter of protest was sent to Academician Alexandrov in support of Naum Meiman. Kurt Gottfried, Chairman of CIFS, issued a statement to the BBC and the Voice of America on April, 29th in celebration of Sakharov's 59th birthday.

Because of the tremendous successes of the Forum Session on human rights held during the January APS Chicago meeting and the special session in honor of Sakharov held after the Forum Awards Sessions during the April APS meeting, another session is currently being planned for the New York meeting in January 1981. We will keep you informed of the details.

Avital. Produced by Mordechai Gal and Tal Larish. Distributed by Tal Larish, 302 E. 38th St., New York, NY 10016. 16 mm, color, 45 min., 1979. \$500 purchase, \$60 rental. Reviewed by John Dowling.

The title "Avital" refers to Avital Shcharansky, who since her emigration from Russia in 1974 has been fighting for her husband's freedom also. Anatoly Shcharansky is a Soviet scientist and a Jew who attempted to emigrate to Israel. He was arrested in March 1977 and was tried and convicted on charges of treason and espionage in 1978.

"Avital" is the story of Avital's struggle to achieve freedom for her husband. The film gives a history and summary of what has befallen her husband as well as what she has been doing to effect his release. It includes interviews with Avital, people who are aiding her in her fight, and scenes at a reception where Senator Byrd introduces her to a host of congressional leaders.

"Avital" is a good film which can be used to promote the cause of human rights. It can be used as an introduction to the subject and to stimulate a course of action to attempt to secure freedom from repression for people everywhere. It also shows, rather poignantly the human suffering caused by such travesties of justice.

Forum Membership Members of the APS may join the Forum simply by writing Dietrich Schroerer, Department of Physics & Astronomy, University of North Carolina, Chapel Hill, NC 27514. There are no Forum dues for APS members.