

PHYSICS and SOCIETY

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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 and also to physics libraries upon request. 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.

Forum on Physics & Society
Physics Department
Mansfield State College
Mansfield, PA 16933

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MINUTES of the EXECUTIVE COMMITTEE Meeting FORUM on Physics and Society, April 26, 1982 by Dietrich Schroerer, Dept. of Physics and Astronomy, UNC, Chapel Hill, NC 27514.

The Executive Committee meeting was called to order by Nina Byers at 7:30 pm on Monday, April 26, 1982 in Suite E. of the Shoreham hotel in Washington, DC. Executive Committee members present were Nina Byers, Barry (Mike) Casper, William Chinowsky, John Dowling, Eric Fawcett, Kenneth W. Ford, William J. Gallagher, Ernest C. Hammond, Malvin A. Ruderman, Alvin M. Saperstein, Dietrich Schroerer, Brian Schwartz. Other persons attending included Ralph Alpher, Earl Callen, Vernon Ehlers, David Hafemeister, L. Charles Hebel, Anthony V. Nero, Mark Sakitt, Leo Sartori, Mary Shoaf, Peter D. Zimmerman.

1. Report of the Secretary:

The MINUTES of the January 25, 1982 meeting of the Forum Executive Committee were approved.

2. Announcements by Nina Byers:

The APS Council has approved another \$1500 subsidy for the Forum Newsletter for next year, to be deposited to the FORUM account after September of 1982.

The nominating committee is made up of Caroline Herzenberg (chairperson), Barry (Mike) Casper, Charles Schwartz, and E. William Colglazier.

Discussions with Andrew Sessler on the Committee of International Freedom of Scientists are continuing about Polish scientists in particular.

Rosemary Chalk of the AAAS hopes AAAS can interact with POPA and the Forum on the issue of scientific secrecy.

3. The APS and Regulations on Technology Transfer:

Nina Byers led a discussion of who should be able to claim to speak out on behalf of the APS on political issues. The general agreement was that care should be taken by officials of the APS not to speak improperly on its behalf. Nina then appointed Earl Callen to draft a position paper for the FORUM's consideration on the restrictions associated with limiting technology transfer.

4. The POPA-FORUM Connection:

Nina Byers suggested an official exchange of committee members between POPA and the FORUM as part of the POPA reorganization now under discussion, i.e., one POPA might be ex officio member of the FORUM Executive Committee, and vice versa. Presently this is happening unofficially through people who have dual appointments. (Continued under Item 7.)

5. APS-FORUM Studies:

Leo Sartori reported on an earlier open discussion about possible arms-race studies the FORUM might

undertake. Considerable interest was expressed at the discussion, and topics have been and are being collected. Groups of individuals will be organized to convert suggested topics into preliminary proposals for possible studies. POPA-Studies chairman Tony Nero pointed out that the link to POPA might come, once sharper preliminary proposals are developed. Leo's ad hoc subcommittee, including Perter Zimmerman, Chuck Hebel, Alvin Saperstein, and Dietrich Schroerer, will organize these groups and think about possible study formats.

6. Editor's Report:

John Dowling pointed out the availability of FORUM signup postcards, and asked that these be distributed at FORUM sessions. He asked whether foreign mailings of the Newsletter were needed. He will make a proposal at the next Executive Committee meeting concerning a Journal of Physics and Society.

7. Councillor's Report:

Mike Casper reported on the APS Council meeting. The Council is reworking the constitution and by-laws. Mike proposed that the FORUM Councillor should be made a voting member of POPA (see Item 4). Nina Byers suggested she write to the Council asking that this be done. Ken Ford then moved that:

Motion No. 1: The FORUM recommends to the APS Council that in the long term one FORUM Executive member, named by the FORUM chairman, be a member of POPA and that for now POPA is encouraged to invite a FORUM Executive Committee member to meet with POPA in its meetings.

This motion passed.

It is possible for the FORUM to nominate persons to become Fellows of the APS. The awards committee is charged to pursue this possibility. The awards committee consists of John Dowling (chairman), Leo Sartori, and Joseph Lach.

How might the FORUM become involved in educational efforts? An ad hoc committee was formed to think about this; chaired by Mike Casper, and with volunteers Ernest Hammond, Eric Fawcett, John Dowling, and Dietrich Schroerer.

8. AAPT Publication of FORUM Symposia:

The proceedings of the FORUM's nuclear proliferation session in San Francisco, edited by Jack Hollander, is ready to go to the AAPT for review and decision on publication. The Rosenfeld/Budnitz solar session is still being worked on. Ken Ford will continue to pursue the AAPT publication route in the future.

9. Program Chairman's Report:

A second short course on the arms race for the 1983 April meeting in Baltimore was approved. David

Hafemeister and Dietrich Schroerer will again organize it. A Symposium on the crisis in high-school science education will be held at the January 1983 New York meeting. It is being organized by Willie Fowler, and Albert Shankar will be one of the speakers. Will the AAPT cosponsor it? Earl Callen will organize a session on secrecy in science for the April 1983 meeting in Baltimore.

10. Ground Zero:

Leo Sartori reported that Ground Zero activities took place in many places, and that it was reasonably successful without us.

ANNOUNCEMENTS:

Journal of Physics and Society: the issue of whether there should be such a journal was raised again. John Dowling, the editor of this newsletter, is charged by the **Forum** to look into such a journal and what it entails. Please send your comments, opinions, and suggestions to him - Physics Department, Mansfield State College, Mansfield, PA 16933 or call 717-662-4275.

Editorial Board of Physics and Society. The **Forum** newsletter now has an editorial board. The members are Earl Callen, American University, Washington, DC 20016 (202-686-2549), Joel Primack, Univ. of California, Santa Cruz, CA 95064 (408-429-2580), Gerry Wheeler, Montana State Univ. Bozeman, MT 59717 (406-994-3614) and William Chinowsky, Univ. of California, Berkeley, CA 94720 (415-642-4966).

Acknowledgement: Ellen Hackett has helped with each **Forum** newsletter since I took over as editor. She has now graduated and gone to work for Kodak. I wish to thank her for her past help and to wish her well.

Division of History of Physics

The APS Council established a Division of History of Physics on 22 November 1980. The new Division sponsored sessions at the APS meetings in Baltimore (22 April 1981), San Francisco (25 & 26 January 1982) and Washington (27 April 1982), and plans to sponsor sessions at the New York, Baltimore and San Francisco meetings in 1983. An election of officers was held in December 1981. For 1982 the chairperson is Martin J. Klein (Yale); vice-chairperson, Laurie M. Brown (Northwestern); secretary-treasurer, Stephen G. Brush (Maryland). The Division now has about 1200 members. A **History of Physics Newsletter** will be published in Fall 1982; copies will be sent free of charge to all Division members and available to others on a subscription basis. For further information write to S. G. Brush, Institute for Physical Science and Technology, University of Maryland, College Park, MD 20742.

A **Guide to Disarmament Media** for use in organizing and educating efforts in disarmament includes a selected list of films, videotapes and slides, written guides, and resources to disarmament materials. Also featured are tips in presenting an effective program. The Guide is available at \$1.00 per copy; 2-10 copies, 75¢ each from Media Network, 208 W. 13 St., New York, NY 10011; (212) 620-0878.

NUCLEAR ARMS CONTROL HOTLINE - 3 minute taped message updated weekly on the latest information on arms control and military budget legislation and Executive Branch policy developments. Hotline highlights key upcoming votes in Congress. (202) 543-0006. Maintained by Council for a Livable World, 100 Maryland Ave., NE, Washington, DC 20002.

HUMAN RIGHTS ORGANIZATIONS - now sharing of offices at 36 W. 44th St., New York, NY 10036 are **Helsinki Watch** (212) 840-9460 Jeri Faber, Executive Director; **Fund for Free Expression** (212) 840-9460 Sophie Silberberg, Executive Director; **Americas Watch** (212) 840-9460 Aryeh Neier, Vice Chairperson; **Lawyers Committee for International Human Rights** (212) 921-2160 Michael Posner, Executive Director.



LETTERS TO THE EDITOR

Washington APS Session on Creationism

Comment on pages 3 & 4 of April 1982 **Forum** newsletter:

1. Concerning a program on creationism at the Washington meeting: "There will be no **Forum** co-sponsorship unless a pro-creation speaker is on the program." No doubt the **Forum** would invite the fox into the chicken coop for a discussion with the chickens.
2. With civilization on the brink of nuclear extinction, "The **Forum** declines the request for mailing labels from Ground Zero...there was fear that provision of mailing labels might be taken as constituting a 'tacit' affiliation." Fiddling while Rome burns.

Lee Kean
427 Raley Avenue, S.E.
Carrollton, Ohio 44615
13 May 1982

On the "Disarmament, Cold War, or Nuclear War" session at the San Francisco APS meeting.

Your issue of April 1982 presented a brief synopsis of my talk to the Forum Symposium on "Disarmament, Cold War, or Nuclear War" at the San Francisco meeting of the APS/AAPT on January 28, 1982, that is subject to misinterpretation. The comment that "He (Drell) pointed out that agreements and policies are not static and attention must be given to changes" was applied to the ABM treaty and U.S. civil defense policy. I in no way suggested changes in these policies. In fact, what I said was:

"This year is the tenth anniversary of the ABM treaty, and its scheduled five-year review conference marks an important occasion for arms control. I see no persuasive reason to consider modifying the ABM treaty in 1982...Overall, the treaty remains the most substantive achievement in arms control between the U.S. and the Soviet Union."

and

"Civil defense does not offer a realistic escape from the current nuclear 'balance of terror.' It should not be used to create and support the dangerous illusion that there is a likelihood of waging and surviving a nuclear war...."

Sidney D. Drell
Stanford University
Stanford, CA 94305
19 April 1982



On Science and the Public

A major task of the American Physical Society is the enhancement of the image of science and scientists in the public eye and the encouragement of rational-scientific thinking and action on the part of government, society, and individuals. Yet today we find wide discrepancies between popular and governmental beliefs on vital matters and the views held by many - if not most - of the members of the scientific community, prominent and otherwise. It behooves the APS to act towards eliminating these discrepancies and the **Forum** to make appropriate suggestions to the Council of the APS for the initiation of such acts.

The Washington Post reports that, by 2 to 1, Americans believe that the Soviet Union is ahead of the United States in nuclear weapons. Yet the numbers, and our own experts - speaking at **Forum** Symposia - tell us just the opposite. The government tells us of the possibilities of "limited nuclear war." Yet our experts tell us of the inevitable breakdown of the C³I apparatus which is the only mechanism which might serve to limit a nuclear war, once started. The government and the people talk about the superiority in "conventional armaments" of the Soviets and of the "inevitable" need for tactical nuclear weapons to block the "impending" Soviet invasions. Yet our experts, and the numbers, tell us otherwise. More importantly in a nation founded on the principles of the "Age of Enlightenment," in which means are to be rationally related to ends, we find vast expenditures - present and impending - for weapon systems based not upon their possible uses but on the impression they might make upon the ignorant, the irrational, and the mystical. Rather than being rational-scientific, we are to "keep up with the Jones'" even though, as Hans Bethe said, that implies stumbling into an economic system as bad as that of the Soviets. It is time for the Council of the American Physical Society to place before the American people, by its statements and deeds, an image of rational thought and action to meet the threat of nuclear holocaust which may be impending.

Specifically, speaking in their role as accomplished physicists, the Council should point out, **strongly** and **publicly**, that the inherent susceptibility of the components of the C³I system to easy incapacitation from the physical effects of distant nuclear explosions makes implausible the careful orchestration of weapon use required to prevent an initially "limited nuclear war" from becoming "total." Based upon their experience with the less than perfect reliability of large scale, single-time-use systems (Murphy's Law), they should point out the implausibility of the prevention of devastating retaliatory nuclear strikes, no matter how large the opponents "damage-limiting" first-strike is. Thus, as "operationalists" we know that the concept of "strategic nuclear superiority" is now meaningless; the people should be brought to this realization. Knowing the technological capabilities of modern long distance surveillance techniques, the Council's statement should deal with the American public's fear (6 to 1 in the Washington Post's survey of 29 April 1982) that the Soviets will be able to significantly cheat on any agreement to freeze or decrease the level of strategic nuclear explosive delivery systems. Finally, the Council statement should call for the rational treatment of our common problems; for the acquisition of tools - weapon and otherwise - which are directly related to clearly envisioned national purposes; for the avoidance of a tool chest so overburdened with tools, (acquired just because they could be had) that it falls over

disasterously on its owner. ("Heat not a furnace for your foe so hot, that it do singe yourself.")

Turning to our own membership, the Council could suggest that it become more involved with public education about the scientific aspects of the nuclear war threat - through participation in public forums and the inclusion of pertinent aspects of the problem in elementary and service courses in physics and physical science. The Council's recommendations to its membership and the impact of its public statements would be augmented by the provision of APS funds for the development of appropriate educational materials and for the staffing of pertinent research committees.

The public is becoming aware of its needs. The APS is in a position to service those needs, to the benefit of itself and of our civilization. It should act promptly and decisively to maximize its beneficent impact.

Alvin M. Saperstein
Dept. of Physics
Wayne State University
Detroit, MI 48202
30 April 1982

Committee on Opportunities in Physics: A Report by Earl Callen, Physics Department, American University, Washington, DC 20016.

The Committee on Professional Concerns (COPS) met at the Washington APS meeting and discussed the following items:

Accreditation of Physics Departments: Some 175 schools in the US give a Ph. D. in Physics, and a lot more have masters and bachelors programs. Is that too many? Should there be minimum standards? Accreditation? How? The professional concerns committee of the AAPT has been thinking about this, and wants a joint AAPT-APS committee to look into it.

One's first thought is that there is no non-inflammatory way to recommend that a school lose accreditation. But there may be other mechanisms. If it is in fact decided that there should be some monitoring of quality, it could be done by recommending to the States that they each look at their own schools. Or the AAPT and APS could encourage the Princeton Testing Service, for example, to institute a low but standardized Ph.D. - level exam, and suggest that all new Ph.D.s voluntarily take this test. Those who pass could be considered to have passed their "Professional" examination. Some schools themselves might

require passing the test as part of the Ph.D. qualification process. The AAPT Professional Concerns Committee and APS-COPS are just starting to think about this touchy issue. My opinion is that it is an important matter, worthy of serious consideration. The COPS committee feels that way too, and the committee voted to encourage the AAPT to keep the collaborative effort moving forward.

Retired Physicists: The COPS have really stimulated something here. There are now several ideas before us - teaching, self-study seminars, and recareering. Wm. Blanpied suggests using retired physicists to help fill the vast void, in numbers and even more so in quality, in physics and mathematics teaching in the elementary and secondary schools. The APS Committee on Education is now following up on this. Clearly there are serious problems of union busting; the teachers unions must be brought in on this early, so that volunteers do not undercut efforts to obtain adequate salaries for teachers -- one major cause of the shortage in the first place. But no doubt, given good will on both sides, there are ways to have retired scientists come into the classrooms as resource persons to assist certified teachers. The same approach will be helpful in getting by the "education certification" barrier. Tom Moss and Nina Byers are designing a questionnaire to discover the degree of interest among our retired physicists. They will work with Wolf Franzen of the Educational Committee.

Another idea, suggested by Nina Byers, is to model self-study seminars after the "institutes for retired persons" organized by the New School, in New York, and by UCLA. The idea here is that those who want to keep their minds active, but find barriers to going back into their former work places, can get together and give each other seminar talks and tutorials on what is going on in science.

Ed Edelsack, who started this whole effort, suggests that the APS utilize the resources of the American Association of Retired Persons (with 13 million members).

Physics Entrepreneurs: A planned course was cancelled because of insufficient enrollments. Do members want such a course? There are people available to tell you how a physicist starts a business, what the problems are, and what it takes to make it go. A two day course could be given at the Baltimore meeting next April, for example, but we need to know if there is interest. It will cost you some money. Let us know. Write me at the above address.

Ombudsman: The COPS have quietly played a gentle ombudsman role in a couple of cases now. Like accreditation this is a touchy issue. It is the one over which a past APS Executive Committee tried to abolish our professional concerns committee in the first place.

But that will not happen again. The times and the people involved are different now. I sense more confidence among APS Council members in what we are doing, and in the people doing it. The COPS decided to consider problems as they come up, on a case basis, and to keep the APS offices fully informed in each instance of what we are doing. What seems to have got the APS Executive Committee especially inflamed last time was the consideration of guidelines for professional employment. We are not looking at those now. So far we don't seem to be in hot water.

DoD Physical Science Fellowships: Former COPS Chairperson and continuing member Ralph Alpher (the new COPS Chairperson is Israel Jacobs, of G.E.) has been active in finding out about the nature and probable impact of these fellowships, and in acquainting the Army Science Board with physics manpower problems. The purpose of the DoD fellowships is to encourage the development of expertise in areas of particular interest to the military - for example high power microwave generators, composite materials, VLSI and vertical-lift aerodynamics. ONR will administer 45 fellowships. ARO (Army) and AFOSR (Air Force) will presumably have equal numbers. Alpher represented APS in a presentation to the Army Science Board. He spoke of science manpower forecasting, impact of Federal science fund curtailment, of cutbacks in student support programs, and the implication for national security of the generally low U.S. science literacy vis-a-vis the Soviet Union and our economic competitors.

A Proposed APS Council Statement on Nuclear Weapons and Nuclear War by Mike Casper, Dept. of Physics, Carleton College, Northfield, MN 55057.

The APS Council met in Washington, DC on April 25, the last day of Ground Zero Week. In that context, I was amazed to find that the issue of nuclear war, now at the forefront of public concern, was nowhere on the Council agenda. That seemed to me outrageous and I so informed my colleagues. The response was: "Well, what do you think we should do?"

On reflection, I came up with a "Proposed APS Council Statement on Nuclear Weapons and Nuclear War." (see attached) I would appreciate criticism or comments about this proposal.

In the meantime, to its credit, the Council Executive Committee decided to consider action on the nuclear weapons/nuclear war issue at its June meeting. I re-

quested that my "Proposed APS Council Statement" be considered in those deliberations and appended an explanatory letter, which reads in part:

Points I and III, dealing with the Freeze and Nuclear War Education, are self-explanatory. Point II probably deserves some elaboration.

In the preamble paragraph of the statement, I attempted to describe the historical context in which we physicists now find ourselves as we deliberate about what to do about the prospect of nuclear war:

The atomic bomb story is the drama of our time. It began nearly forty years ago when physicists created a weapon of unprecedented destructive power. Since that time, members of our profession have been key contributors as enormous numbers of nuclear weapons have been designed and built and numerous sophisticated delivery systems have been devised and deployed. Now, in 1982, people around the world are becoming very nervous about how the atomic bomb story will end. That concern is well-justified, I believe. So far the story has all the makings of the most horrible tragedy in human history and there is a significant chance it will happen in our lifetime.

That is the historical context. It suggests both a special responsibility and a special opportunity for us as physicists. The unique role that physicists have played in developing nuclear arms over the past forty years has brought us to center stage in this drama. We must not stand aside and just let the holocaust happen. If we speak now with wisdom, people will listen.

What can we do now that befits our historical role and center stage position? We can say, "enough is enough; we will participate no more in the buildup of nuclear arms that is leading the world to nuclear destruction." That would have an impact.

Of course, the American Physical Society cannot speak with one voice for all physicists. What it can do is amplify individual voices to assure that they will be heard. It can circulate the proposed "International Voluntary Pledge of Physicists about Nuclear Weapons" to APS members and to professional associations of physicists in other countries, including the Soviet Union. Whether or not any individual physicist signs the pledge is a matter of personal choice. What the APS would be doing is simply giving him or her an opportunity to join with physicists around the world in saying "enough is enough."

I believe that future historians who will write the atomic bomb story will see this time as a critical juncture. As the latent fears of people world-wide about the prospect of nuclear war surfaced in spontaneous expressions of concern, they will ask "what did the physicists do?"

Will we be remembered as tragic figures who built the Bomb, but then stood by temporizing in the final act? I hope not. We can choose instead a role of moral leadership, joining with the physicians and the bishops and other heroic figures in sounding the alarm and stopping the world's mad rush toward nuclear suicide. The choice is ours to make. Now is the time to act.

PROPOSED APS COUNCIL STATEMENT ON NUCLEAR WEAPONS AND NUCLEAR WAR

We physicists were instrumental in creating the first nuclear weapons and our profession has prospered from its association with those weapons. In the beginning, perhaps it was plausible to believe that nuclear weapons might serve as an instrument of peace. However, it is now time to say "enough is enough." The existence of tens of thousands of thermonuclear bombs in the world's arsenals, the prospect of proliferation to nations around the globe, and indications that some political leaders now believe that nuclear war is somehow survivable or winnable all constitute a peril to the human race. There is a significant probability of nuclear war in our lifetime and that might well mean the sudden simultaneous slaughter of hundreds of millions of human beings. As physicists and as citizens, we pledge ourselves to do all in our power to prevent that holocaust.

In particular, we have adopted the following three-point program:

I. Nuclear Weapons Freeze: As a Council we endorse the proposal for a bilateral freeze on production, testing and deployment of nuclear weapons and nuclear weapons delivery systems. So that the members of the American Physical Society can independently voice their opinions on this issue, we have instructed the Executive Secretary to poll them about the freeze proposal by mail ballot.

II. International Voluntary Pledge of Physicists About Nuclear Weapons: If physicists and others with scientific and technical training were to refuse to participate, the nuclear arms race and the proliferation of nuclear weapons to other nations could not continue. In recognition of this fact and in order to provide an opportunity for physicists everywhere to join together to say "enough is enough," the American Physical Society is circulating to its own members and to professional associations of physicists in other countries, including the Soviet Union, the following "International Voluntary Pledge of Physicists About Nuclear Weapons":

"I believe that the nuclear arms race must be reversed and the proliferation of nuclear weapons halted if the human race is to avoid a nuclear holocaust. Consequently, I personally pledge not to use my knowledge and training as a physicist to participate in the design, development, production or testing of nuclear weapons or nuclear weapons delivery systems. I further pledge to assist to the best of my ability in the education of my fellow citizens about nuclear weapons, the strategic arms race and the consequences of nuclear war."

III. APS Program of Nuclear War Education: We have created a new Standing Committee of the APS Council to develop and oversee a program of public education about nuclear war. The first Chair of the committee is who will be aided in his/her duties by a full-time staff assistant.

Among the first projects of the nuclear war education committee will be a conference to design and develop materials for physicists to use in public education. The committee will sponsor speaker-training workshops at each major meeting of the society to instruct physicists in the use of these materials to prepare them for educational presentations. The committee will also help to plan research studies and schedule sessions at APS meetings on nuclear-war-related topics.

Irina Brailovsky's Plight by Earl Callen and Joseph Goldman, Physics Dept. American University, Washington, DC 20016.

The exchange of Letters (*Physics Today*, May, 1981 and May, 1982) between Irina Brailovsky, Russian refusnik, and Anatoly Logunov, rector of Moscow State University, leaves out some of the story. Being acquainted with the principals and with the Soviet system, we feel compelled to respond. One of us (E.C.) visited the Brailovsky's in 1973, and again with Irina in 1981, just before Victor's trial. The other (J.G.) is an immigrant from the Soviet Union, knows the Brailovsky's personally, was a fellow physics student with Logunov at Moscow State University, and met with him occasionally thereafter.

The Brailovsky's applied to emigrate 10 years ago. Their visa requests were rejected on grounds of knowing state secrets, although neither had ever held a security clearance or worked on a classified project. Arrested in late 1981, Victor was held incommunicado, tried without a lawyer, convicted of "defaming the Soviet State," and internally exiled.

Referring to Irina, Logunov writes that "during the period of my association at Moscow University (since October, 1977) in the position of rector, this individual did not work at the university nor did she have any relation with it". Of course not. Irina, a fluid dynamicist, had been employed as an applied mathematician by Moscow University under a previous rector, since deceased. She had been fired (as was Victor) when they applied to emigrate.

At that time Moscow University had failed to certify that Irina could be released without jeopardizing state security. Later, after she was fired, and after this individual Logunov had become rector, another university committee had reconsidered her case and cleared her. Their report was signed by Logunov himself, who has admitted in private conversations that there is no reason to detain Irina. Logunov claims to have told this to the Ministry of Interior orally, but refuses to forward to them the written committee report. He is said to take the position that his dealings with the Ministry are always oral.

In his **Physics Today** letter, Logunov asserts that "Moscow University and myself in particular do not have and can never have any connection with the solution of the question of an exit visa". Five years ago, Logunov could have gotten away with the obfuscation, but not now. By now, so many immigrants have gotten out, so many Party members and Soviet officials who have been themselves responsible for filling out the forms required by OVIR and the KGB have emigrated, that we have a pretty good idea how the system works, although the forms, and the very procedures, are themselves secret.

There is a form which OVIR requires to be sent from the employer. The employer (in this case Logunov, as current rector) must explain that the person involved does or does not know state secrets. The final entry on the form is crucial. On this line the employer must certify that "because of this reason this person can, or cannot, be allowed to emigrate", or words to that effect. Upon each rejection and reapplication OVIR goes back again to the institution where the individual worked, for the required clearance. This is the regular procedure, secret but absolutely well known to Russian officials and to the emigrant and refusenik communities. For Logunov to deny this is perhaps understandable, for he is an ambitious man, at 54 or so already the rector of the Soviet Union's greatest university, vice president of the Soviet Academy of Sciences, a member of the Central Committee of the Communist Party, and a member of the Supreme Council of the USSR. Logunov is a man on the make. But in doing so he forsakes the superb humanitarian tradition of physicists at Moscow State University. Mandelstam, Lansberg, Leontovich, Tamm, and

Khaikin perhaps did not achieve such heights, but they would not have acted in this way.

Logunov wants to move high in the Soviet firmament, but he also wants to be well regarded by his fellow scientists. He desires to travel in the West and to be welcomed by physicists at our conferences and our universities. We do not think he should be. As long as he personally blocks the emigration of Irina Brailovsky, we call upon scientists and persons of good will everywhere to shun Academician Anatoly Logunov.

SHOULD SMALL Ph. D PHYSICS PROGRAMS SURVIVE?

by Kenneth W. Ford.

This contribution is based on a talk given at last year's APS meeting in Baltimore. The author is Executive Vice President-designate at the University of Maryland, Adelphi, MD 20783 and was Chairperson of the **Forum** in 1981.

There are not enough physics graduate students to go around. From a national perspective, the "shortage" is not a problem, because supply and demand are more or less in balance for the principal products: physics Ph. D.'s (although, if nonstandard careers are included, the market could accommodate a greater supply of Ph.D.'s). From the perspective of an individual small department, on the other hand, it is a serious problem. Such a department, having little success in attracting doctoral students, may find it hard to justify to itself and to its administration the continuation of a program for which the cost per student seems exorbitant.

At New Mexico Institute of Mining and Technology, where I served as president (and taught a little physics) for the past seven years, the question of phasing out the physics Ph.D. program never arose. I concurred with the department that there was no reason even to think of it. Nevertheless, the anemic numbers--graduate student enrollment and Ph.D. production--in that department illustrate the problem that some departments have--even if they are good. New Mexico Tech's physics department has 13 faculty members and annual grant and contract expenditures of about \$1 million. This fall, the department will enroll one new graduate student. Last year, it enrolled six. Total graduate student enrollment in the department is ten. In five years, seven Ph. D's have been awarded. The trend, if any, is down, not up.

There are other doctoral granting physics departments with fewer faculty, fewer students, and less research support than this one. It is not surprising that the need for some of these doctoral programs is being questioned by state boards, trustees, administrators, and faculty themselves.

What should be the criteria for terminating a Ph. D. program? If the department itself wants to terminate it, that should be reason enough. But let's assume that the department wants to keep it, that the questions are being raised outside the department. Those questions are likely to concern dollars spent per enrolled graduate student or per advanced degree, average class size, credit hour production per faculty member, and other measures of educational efficiency, based on the (not altogether incorrect) model of a university as a factory.

These kinds of questions are not irrelevant. It is indeed costly to lecture to two or three graduate students. And a doctoral granting department in which faculty members teach six hours is twice as expensive as a bachelor's granting department in which twelve hours is norm.

What I want to suggest here is that it is **research**, not educational efficiency, that should be the focal point of the questioning. Is the institution **committed** to research? (Committed, that is, to provide basic equipment and facilities, some travel money, seed money for new projects, and modest teaching loads?) Is the faculty **capable** of doing good research and **eager** to pursue research?

If the answer to either of these questions is no, there is no case for a doctoral program. If one exists, it should promptly be phased out.

If the answer to both questions is yes, there might as well be a doctoral program. It will strengthen the research, and its **marginal** cost (once the commitment to research is firm) will be small. This will be true even if there are no more than a handful of graduate students. Of course, in that case, faculty and students will need to devise their own efficiencies of teaching and learning, with fewer lecture courses, with alternate-year courses, and with directed self-study. Only certain kinds of students will flower in small departments.

To state the obvious: a Ph. D. degree is a research degree. I argue that a Ph. D. program is expensive primarily because research is expensive. (It is expensive to an institution--mainly through reduced

teaching loads--even if the research is externally supported.) Class size and credit hours are not the correct units for reckoning the cost of a doctoral program. If conditions favorable to good research exist and can be maintained, there is no reason to kill an existing Ph. D. program, no matter how puny it is. If, for reason of financial exigency or any other reason (such as a faculty in whom the fires no longer burn), conditions favorable to good research cannot be maintained, the program should go. Let both serious research and the doctoral program die peacefully together, or encourage both to live.

SYNOPSIS OF FORUM SESSIONS AT DALLAS AND WASHINGTON.

Systems Reliability and Accidental War

by Lloyd J. Dumas, University of Texas (Dallas),
Box 688, Richardson, TX 75080.

The continuing design, construction, deployment and expansion of arsenals of weapons of mass destruction and their associated support systems has been legitimized on the basis of their contribution to the maintenance and improvement of national security. Yet, there are military-technical reasons for believing that the superpowers, at least, have reached the point where their own security is **reduced**, not increased, by the expansion of their own weapons systems. We are thus increasingly endangered by our own weapons.

There are essentially four reasons why there has come to be an inverse relationship between the expansion of nuclear weapons systems and national security, i.e. why more and better weapons result in less and less security. These are: 1) the problem of weapons accidents; 2) the probability of accidental war; 3) the difficulties of preventing theft and/or unauthorized use of these weapons; and 4) the substantial advantage of offensive over defensive military capabilities. All of these problems have been exacerbated by the qualitative and quantitative expansion of the nuclear military. The first three are made considerably worse by growing problems in the reliability of military systems, including the human component of those systems.

The analysis touches briefly on all of these issues, focusing most strongly on the question of accidental war, and on the relation of that question to considerations of systems reliability.

Non-Nuclear Defense of Europe a Radical Solution

by Peter O. Zimmerman, Dept. of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803.

If a European war breaks out, NATO forces will be outnumbered and outgunned by those of the Warsaw Pact. The traditional Western solution to this dilemma has always involved the relatively rapid use of battlefield nuclear weapons. This answer is, however, a military and political mistake. Nuclear weapons are not particularly effective at stopping tanks, and always carry great risks that the war will escalate to a full scale nuclear exchange.

Because better, cheaper and more effective weapons are already on hand or will soon be available, the most effective way to overcome Soviet numerical superiority is not with small nuclear weapons but instead with the more rapid introduction of precision-guided munitions. These are the modern versions of the sophisticated missiles used by both Egyptians and Israelis in the Yom Kippur War.

A single soldier using a "smart" weapon costing less than \$50,000 can hit a tank on the first shot at a range of two miles. Firing from a prepared position, the defender will not even be under attack during most of the flight of the missile. This kind of battle can be fought successfully from the opening second of a war, without waiting for the President to give his permission to release nuclear weapons, crossing the nuclear threshold, or making radioactive the countryside being defended. In Sinai one such missile had a success rate of nearly 90% against Egyptian tanks!

In the very near future, the Army and Navy will have laser-guided missiles that can be fired from conventional artillery guns. The introduction of artillery-fired guided missiles adds more depth to the defense and permits extremely rapid strikes against new targets. Artillery-fired smart weapons score first-round hits most of the time at long range and in virtually any conditions of weather, darkness, and visibility in which tanks can reasonably operate. Some artillery-fired missiles will seek out their own targets with no direction from the ground. To meet these new weapons, Soviet tanks will be forced to disperse exactly as if confronted with a nuclear defense.

Dispersed tanks, in turn, are easier for defending infantry to deal with. Therefore, the tanks must be protected by dismounted Soviet infantry, which reduces the blitzkrieg to the velocity of a walking man. A Soviet blitzkrieg deprived of the lightning punch of massed armor can be beaten with conventional arms.

If a Soviet threat can be countered without battlefield nuclear weapons, it should be. In fact, the pretense that nuclear weapons might be used hinders the development of any believable defense plans for Europe and ties up 35,000 soldiers whose only jobs are to maintain, transport and protect those weapons. NATO should, therefore, renounce the first use of atomic weapons on the battlefield while retaining a longer-range nuclear deterrent force. This is not merely in NATO's political best interest at this time, but also makes military sense, and is the radical solution of this paper's title.

Much of this work was done in association with Dr. G. A. Greb and Professor H. F. York of the University of California at San Diego.

BALLISTIC MISSILE DEFENSE (BMD): SILOS AND SPACE
By Richard L. Garwin, IBM Thomas J. Watson Research Center, P.O. Box 218, Yorktown Heights, NY 10598, (and Columbia University).

Defense against the threat of nuclear destruction by ballistic missile attack has always been at the same time a desirable goal and a threat to the use of **deterrence** to dissuade such an attack. Despite tens of billions of dollars of investment in R&D each by the U.S. and Soviets, and a comparable investment in deployed systems, there is **no** effective ballistic missile defense (BMD) on either side, and the 1972 SALT ABM Treaty (of unlimited duration) binds the U.S. and the Soviets not to deploy (or to "develop") BMS systems.

As Hans Bethe and I noted in our March 1968 **Scientific American** article on ABM, the defense of hardened **silos** is the one BMD role which might be achieved technically in strategically meaningful sense. In 1982, there is considerable discussion of BMD for hard-point defense and also for space-based BMD. The one is a **mission**, the other a **technology**.

What is so difficult about destroying an RV on ballistic trajectory with modern radar and computer technology, and the highly developed art of guided interceptors? Nothing, although to do it reliably even without countermeasures presents the same problem as doing anything else reliably in a complex system. But designing BMD systems is not like designing a physics experiment, nor like designing buildings to stand against earthquake, nor even like designing a weapon system to work in conventional war, where there would of course be countermeasures and destruction, but not a total change of the local environment, and where the system could be **tested**.

The history of BMD development is replete with instances in which simple countermeasures, sure to be deployed by the time we could build a BMD, were ignored, while vast expenditures and promises were made for the performance of the system. Worse, systems proponents and government officials claimed that the systems were **absolutely** necessary, else the U.S. national security would be imperiled.

Space-based ABM comes in two flavors-- the "overlay" proposed by the Army, in which a massive launch of ICBMs and SLBMs by the Soviet Union against U.S. targets would be met by the launching above the U.S. of a few rocket-based designating optical trackers (DOTs), which would survey the vast number of reentry vehicles (at least 2000) and decoys (probably tens of thousands) and assign homing interceptors to destroy them by non-nuclear attack (collisions, pellets, nets or the like). Space has the advantage that a ballistic trajectory is highly predictable, that radio waves and light are not bent or absorbed in thousands of kilometers of travel, that small objects can penetrate as well as large objects, and the like. But this is at least as much a **disadvantage** for the defense which must ensure the operation of highly complex, fragile DOTs and command and communications systems against the largely inert Soviet RV. In addition to this ultimate system vulnerability, the overlay, in my opinion, is totally **flawed**, in being vulnerable to the deployment of very many multi-layer aluminized mylar balloons as decoys, with one surrounding each RV. Whether the inside is heated or not the outside temperature of such a balloon (and even more the reflection of earth and sky) is totally **decoupled** from the inside temperature, so that there is no sensitivity of **any** infrared detector to the identity of a particular balloon as a decoy or RV.

A spaced-based system advocated by those even more confident of the infinite perfectability of technology (except as countermeasures on the other side) is the use of satellite-based powerful lasers or particle beams. These weapons would view the launching site of Soviet SLBMs and ICBMs, and could thus attack the rocket **boosters**, rather than waiting for the deployment of the more numerous and harder RVs. Furthermore, the hundreds of kilowatts of infrared radiated by the booster is far more readily detectable than the few watts radiated by a shiny RV. True, but the booster burns for only 4-5 minutes, and the task would be to destroy 1000 or more boosters (reliably) during that time. In fact, the only particle beam suitable for direction with microradian accuracy is the hydrogen atom, and it is peculiarly vulnerable to being stripped of its atomic electron by one centimeter of air at normal density. Indeed, from synchronous altitude, even 1 microradian divergence would lead to a beam spot of 40-m diam, so that boosters could be

destroyed only by specific vulnerability of the electronics to the weapon, which can in fact be shielded locally.

Laser weapons might in principle have smaller divergence (although a 3 micron laser with a 3-meter mirror would have precisely 1 microradian divergence), but the necessity to provide the potential for destroying 2000 boosters with 1 kilojoule (kj)/sq cm, even taking a laser efficiency of 10% requires one to store in orbit rapidly available prime energy in the amount of some 10^{18} megajoule (Mj), requiring some 100,000 tons of fuel in orbit. This assumes that the lasers are based at synchronous orbit. Lasers based at low altitudes will (some of them) be closer to their targets and will require **much** less fuel, since the same angular accuracy corresponds to a smaller spot. They will, however, have to **track** the missile. All these systems are vulnerable to the missile **rotation** during boost to spread the laser warming over a greater area, to **ablative** coats, which can harden the surface to require a factor 10 or more greater power, and the like. All these problems must be faced, in addition to the very great problem of providing a laser with a **power** output of 1 gigawatt, if a single laser from synchronous orbit is to destroy in ten seconds an unprotected booster.

But the nemesis of a satellite-based system is the "space mine," a small weapon which follows it around in orbit and can be detonated by the opponent by radio command. Even on the sea, it is certainly hallowed by international law and custom that every nation has the right to maintain the vessels of another nation within range of its guns (except in domestic waters). To attempt to establish the opposite in space will lead to war in space--and that as a prelude to war on earth, not as a substitute for it.

Silo defense is feasible because the silo is hardened to 100-bar overpressure (100 atm) or more. Thus the opposing force can be kept from destroying most of the silos, even given perfect accuracy and reliability, if the warheads can be kept 500 m away. But the bureaucracy has always forced the solution of systems defending **multiple** silos, in order to amortize the defense cost over more value protected, and this has led (trivially) to an attack on the radar being more feasible than an attack on the silos, especially since operating radars (such as those deployed with the 1970-era SAFEGUARD system) were hard only to about 1-2 bar. The radars were also more **valuable** than the silos, since destroying a relatively few of them would expose the silos to the naked threat. Thus for more than 20 years, I have advised concentration on single-silo defense systems. Most recently, incidentally, in connection with the Multiple Protective Shelter (MPS) basing of the MX, perceptively canceled by President Reagan, **preferential** defense of in-

dividual shelters was proposed by the Army, Air Force, and Department of Defense. Just as it would be unknown which 200 of 4600 shelters contained an MX missile, it would also be unknown which 200 shelters contained a defense unit (DU), which in the event of attack would break out of its shelter and defend the **one** shelter in its complex containing an MX missile (as well as defend itself!). But an extension of the VELA system deployed by the U.S. since the 1960s for detecting from satellites nuclear explosions on earth (called IONDS) will show the U.S. each nuclear explosion in time of war, and even simpler reconnaissance systems could tell the Soviet Union within seconds which of their warheads exploded at the appointed place and time, and thus which shelters survived. Thus, preferential BMD cannot lead to an **enduring** force of missiles, and single-shelter defense with the LoADS system (low-altitude defense system) can be overwhelmed, due to its greater expense than the opposing warheads.

Furthermore, a nation which deploys BMD such as space defense or containing soft radars on the ground, may be deluding itself into believing that it has a technology which would in fact be incapable of defending cities, although that cannot be done because of unreliability of the system and the very large number of warheads only 1% of which need get through to destroy the cities. The deployment of such a defense system, combined with exaggerated evaluation of the effectiveness of civil defense, could lead to still greater emphasis on offense to ensure the destruction of the defensive system or of the defended targets.

However, there are two technologies of silo defense which are clearly incapable of providing standoff distances beyond the 500 m or so which would render a silo safe. These would be consistent with the spirit of the ABM treaty, are cheap to develop and to deploy, and simply ought to be committed rather than complain about the vulnerability of silos. In one system, small disposable radars are housed in microsilos a few km north of each of the silos to be defended. Upon tactical warning of an attack, the covers of the silos are blown, and the radars look up to see the RV as it passes over, directed at the silo to be protected. Such a radar need see the RV at a distance of a few km, not many hundred km, and it sees it side-on, not nose-on. These two differences from the usual ABM case correspond to a power-aperture product reduced by $10^{*}10$ from the usual case, so the radars can be made cheap and **expendable**. More radars wait in their microsilos to be revealed when one has been destroyed by nuclear attack. The enemy RV is actually countered by a 100 kiloton nuclear weapon buried some tens of meters in the ground 1 km north of the silo. The 100 kiloton of earth thrown into the air by the detonation of such a

buried weapon is impenetrable by the RV (or by several RVs arriving simultaneously, for that matter), and the protection lasts for some tens of minutes because of the dirt lofted to high altitudes, which abrades the reentry vehicle of other RVs directed at other silos in the field. This debris defense is very cheap. The radioactivity which would be produced by the detonation of one such device is less than 1% of that which would be produced by the detonation of an enemy warhead, but the success of a BMD system is measured by the **absence** of **any** detonation rather than by the reduction in fallout (which fallout could be produced by attacking other targets).

Finally, a non-nuclear defense of the same kind can be achieved with somewhat greater expense, if the radars are given greater precision (but are still expendable), and the buried weapon is replaced by multiple-rocket launchers in their own minisilos, each launcher capable of putting 10 1-kg rocket per sq meter at an interceptor plane 500 m or 1 km north of the silo. Available trajectory accuracy and rocket dispersion suggest that 5000 rockets suffice for an intercept with 60% probability, and the technology for this SWARMJET system is available.

Both debris-defense and SWARMJET systems have been proposed for four years. They are not going forward because there is "no interest in a near-term silo defense of limited capability." Why not?



A Joint Washington Office of the Scientific Societies
by Earl Callen, Department of Physics, American
University, Washington, DC 20016

(Editor's note: This is a synopsis of Callen's paper presented at the April 1982 Washington APS meeting.)

Eight years ago the American Physical Society (APS) set up a committee to consider whether the Society should have a Washington representative, whose purpose would be to transmit to the government the opinions of the APS on science/society issues. The committee concluded that the idea was premature; the Society at the time had no advisory apparatus to support the representative. The result was the formation of the APS Panel on Public Affairs (POPA), which advises the officers and APS Council on social questions with technological component or impact. POPA is now a functioning, active body. Under its aegis the APS has issued reports on nuclear reactor safety,

nuclear waste management, photovoltaics and coal utilization. POPA also has spun off a Committee on International Freedom of Scientists (CIFS), and has subcommittees on national and on international scientific affairs. Thus it would seem that the time is ripe to return to the original idea of a Washington representative.

It may well be, but I think that there is another and larger plan which also merits consideration. Congressman George Brown, who is knowledgeable about science politics, has commented that the voice of science would be more powerful if we spoke as one; we would have more impact if someone, appearing before a congressional committee or in the executive offices, spoke as the representative not only of the APS but of, say, the chemists, biologists, mathematicians and electrical engineers. There are issues on which such a consensus is achievable -- scientific creationism, overall funding, censorship, technology transfer, etc.

An umbrella organization for science, and possibly for engineering, could perform another service. It is not only the government decision makers who need education. The scientific community is also less effective than it could be, because it so frequently fails to understand the political process, and because it simply does not exist as a political constituency. Congresspersons who argue for scientific interests today get precious little beyond spiritual reward for their efforts. A staffed, joint scientific office in Washington could help to put muscle behind the pleadings of its advocates on the Hill.

There already exist organizations within which a new unified Washington scientific presence could be embedded. But first there are many questions to be answered and steps to be taken. Does the American Physical Society itself need a Washington representative? Many other scientific societies have them. Do the physicists wish to explore some kind of joint effort with other Societies? Which Societies? Are they interested? What should be the rules of decision making, and of representation? Do we go to an existing organization, or create a new one?

Eighteen months ago the **Forum on Physics and Society** urged the Council of the American Physical Society to begin thinking about these questions. Six months ago the APS Committee on Opportunities in Physics reiterated that suggestion. The purpose of my talk at the Washington meeting, and of this article, is to help stimulate the process.

SCIENTIFIC FREEDOM IN LATIN AMERICA: THE ROLE OF GOVERNMENTS by Jose Federico Westerkamp, Center for Legal and Social Studies, Buenos Aires, Argentina. (Editor's note: these are excerpts from Professor Westerkamp's talk at the **Forum** session "Scientific Freedom and Communications" given at the 1982 Washington APS meeting.)

Sometimes I have been asked in the U.S.A. and in Europe how could it be that countries like Argentina, Brazil, Chile, Uruguay, and others could show such a record of human rights violations.

It is a fact that the lack of **scientific freedom** and the **attack on basic human rights** is a chronic and urgent problem that requires intensifying efforts to defend and advance both of these important issues. Attacks on them should be faced. Scientific societies and individual scientists are urged to become more actively involved in these matters; particularly those in the Latin American countries which remain indifferent to the events, or are not able to face them. A cooperative effort by scientists and scientific societies in Latin and North America might be successful in responding to violations of the basic human rights of scientists.

The life of intellectuals in Latin America has never been as secure as their counterparts in W. Europe and N. America. Universities in Latin America have always been watched carefully by their governments, and the appointments of rectors, deans, etc. have often been a purely political affair. As a consequence, the turnover in university staffs has been immense; almost every Latin American scientist has been forced at some time to leave, or has been silenced. Also governments play a dominant role in the development of science in S. America, as contrasted with the situation in N. America and W. Europe, where private institutions, and an **immense respect for academic freedom** have always been of great significance. In S. America, on the contrary, the so-called "Doctrine of The National Security" has been adopted by military governments and used to force intellectuals and scientists to remain silent or to leave their own countries.

In Argentina, for example, science is cultivated in the national universities and in several national institutes. While it is true that several private universities exist, their independence is compromised by grants from the government; and their professors, instructors, and teaching assistants depend partially on the government. These universities cannot now appoint anybody dismissed from a national university for political reasons. In the long run there is no position available for a dissenter; he or she must leave the country, or **change professions**.

In Uruguay, the situation is very similar to or worse than Argentina. The troubles in Chile are well-known; in Bolivia and Paraguay scientific activity is very small. In Brazil, though in the past serious troubles occurred, scientific freedom has been improving steadily, and many scientists have come back to the country. The fact that there is a Congress helped to improve the political climate. Venezuela is a democratic country and no serious human rights problems have arisen. The same can be said of Ecuador and Peru; and Mexico is well-known to the North American scientific community. In countries like Nicaragua and Cuba, the governments keep strict control of scientific development.

Why should scientists care about what happens to their fellow scientists? This question has only recently been answered, and I would like to quote **Philip Handler**, the great scientist and former president of NAS who played such an important role in the issue of human rights: "Tortured shoe makers hurt quite as much as tortured scientists. Protesting only for scientists doesn't quite fit with my own beliefs about them; the shoe makers are taken off behind the barn and shot." Or, as Callen, Cooper and Parmentola said in their famous report on "Science and Human Rights" (*Technology Review*, Dec., Jan. 1980): "We act in aid of scientists because we are scientists. They are our people. We know them and we know the mechanisms by which we can help them, the institutions and the pressure points. We can marshal our own worldwide community in their behalf. We hope the shoe makers are doing something for the shoe makers, and we support organizations of broader scope, such as Amnesty International. Meanwhile, we do what we can."

An effective government requires the participation of scientists in shaping policies based on science. Therefore, scientists as a group acquire a significant degree of latent political power. But, because scientists do not have a reputation of being easily managed by administrators, politicians and, above all, military men, "a fear of scientists as an 'elite group' has arisen." This is the reason why Latin American scientists often face persecutions, because, as an elite group, they have gained a high degree of visibility, and many come to represent popular struggles within their countries.

Summing up, we can assert that in several Latin American countries, particularly those belonging to the Southern Cone, there exists:

- a regional decline of academic and scientific freedom, and consequently, a deterioration in the quality and availability of scientific and general education at all levels, as well as a restricted research environment.

- attacks on scientists, and military intervention in public universities and scientific institutes imperil long range possibilities of national scientific and technological development and progress.

- individual educators, scientists and students have suffered gross violations of universally established human rights, including the right to life, liberty and personal security. These violations whether by security forces, paramilitary groups, legal measures or a definite educational and cultural policy by the military governments, have created a climate of fear in the universities in such a way that, those who remain at their posts must practice self-censorship out of fear that any contravention of government norms will label them and their students as "subversive," thereby subjecting them to dismissal or arrest.

A Forum Ad Hoc Committee on Arms Control by Leo Sartori, Behlen Laboratory of Physics, Univ. of Nebraska-Lincoln, Lincoln, NE 68588.

The danger of nuclear war is the overriding problem of the present day. Many of us feel that physicists, having been instrumental in the creation of nuclear weapons, bear a special responsibility to contribute to their control and eventual elimination. There is a growing conviction within the physics community that the APS should encourage and assist physicists to carry out serious studies on problems related to nuclear weapons, arms control, and disarmament.

Accordingly, the **Forum** has established an ad hoc committee on arms control studies. The committee will coordinate the formation of study groups on topics related to nuclear arms, assist these groups in carrying on their work, investigate appropriate ways of disseminating their results, and look into possible sources of financial support. The committee will maintain close contact with the POPA subcommittee on studies.

At an open discussion following a **Forum** session at the recent Washington meeting, twenty subjects for possible studies were suggested; the subjects are listed below. This is a "raw" list; there was only very limited discussion of each topic, or of what specific aspects might be suitable for a study of the type we envisage. The next step is to carry out feasibility studies in order to define the problem more precisely and decide in each instance whether it is desirable to proceed with a formal study.

The subjects listed are not new; most of them are under continuing analysis within the government and by defense contractors. Nonetheless, we proceed from the premise that it can be highly useful to have an independent fresh look at these questions, carried out by groups of people with diverse technical skills and experience, free of institutional bias and on an unclassified basis so that the results can be broadly disseminated.

We are soliciting volunteers to participate in this effort, beginning with the feasibility studies. If you are interested, please write to me (address above) indicating which of the proposed studies you want to work on, and what relevant experience you have. (Direct experience in weapons-related work is **not** a requirement.) You may choose several subjects, in the expectation that not all of them will actually lead to a study. If you do list more than one, please rank them in the order of your interest. If you are willing to be an organizer or leader of a particular study group, indicate that as well. If you have ideas concerning what direction the study should take, what aspects of the problem should be emphasized, etc., include them in your reply. Finally, if you want to suggest another good topic that is not on our list, feel free to do so.

From the responses the coordinating committee will ascertain which subjects command the greatest interest and will designate provisional study groups, taking into account interests, experience, and geography. The groups will undertake the feasibility studies and draft proposals for actual studies in those areas judged to be sufficiently promising.

One matter which will be discussed with the POPA subcommittee on studies is the possibility of organizing a formal funded study under the aegis of POPA similar in scale to previous POPA studies, reports of which have appeared in **Reviews of Modern Physics**. This is, however, not the only possible format.

The tentative list of subjects follows. Please note that there is considerable overlap and several of the topics could be combined.

1. Civil defense.
2. International physics community and arms control.
3. Verification of arms control agreements.
4. Cruise missiles.
5. Ballistic missile defense.

The objective of the **FORUM** is the advancement and diffusion of knowledge regarding the interrelation of physics, physicists and society.

The **FORUM** is charged with providing for all members of the Society an opportunity for discussion of and involvement with such matters.

The **FORUM** sponsors symposia at the general meetings of the Society, publishes a quarterly Newsletter, appoints committees or study groups to conduct studies, may sponsor Topical Conferences and short courses on topics of interest.

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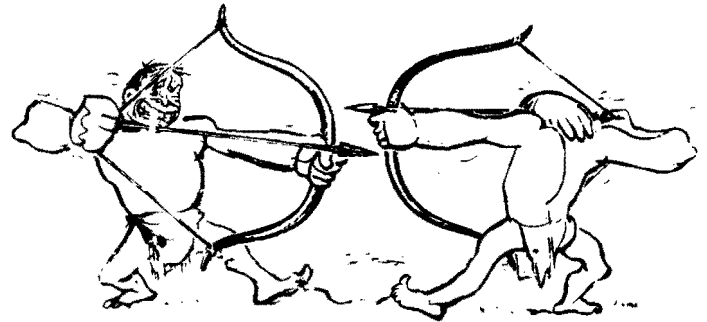
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6. Reliability of large-scale systems.
7. "Window of vulnerability."
8. Bias errors and their implications for ICBM vulnerability.
9. "Role of conventional weapons in breaking the addiction to nuclear war."
10. New technology: stabilizing or destabilizing.
11. Long-range solutions to the arms race.
12. Limited nuclear war.
13. Mechanisms for terminating nuclear war.
14. Electromagnetic pulse and its implications.
15. Laser and particle beam weapons.
16. C³I (Command, control, communications, and intelligence.)
17. Submarine vulnerability.
18. Nuclear proliferation.
19. Survey of national attitudes on nuclear war and related questions.
20. Chemical and biological warfare.

Please try to get your replies to me by September 15, 1982. Shortly after that date the study groups will be constituted and will begin work.



THE TIGHTER I DRAW THE BOW, THE SAFER I BECOME

Cartoon courtesy of UCS/UCAM

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Are you concerned about the Arms Race? Cutbacks in support for science? Restrictions on the free flow of information?

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