

Physics & 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, Department of Physics and Astronomy, Michigan State University, E. Lansing, MI 48824-1116, 517-353-9179.

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JOIN THE FORUM – write P. Zimmerman

ANY BRIGHT IDEAS FOR FORUM SESSIONS?

– then write D. Schroeer

A PROVOCATIVE IDEA

At the January APS Council meeting in Atlanta, President Sidney Drell raised an interesting, delicate, surely controversial question: Should physicists--and other scientists--try to develop guidelines and appropriate procedures for encouraging self-restraint on the kind of applied research work they conduct when there are potentially harmful consequences of that work (to the environment, to individuals, to mankind)? A great deal of applied work done by physicists, he noted, is on problems with import for the survival of the species.

Because it is phrased in ethical terms, Drell's question is more provocative and unsettling than a mere call for more risk-benefit analyses. It deserves some thoughtful discussion (and elaboration) even if, in the end, the scientific community were to conclude that it had no merit. Can one imagine a version of a "Hippocratic Oath" for research scientists? Can one conceive of "guidelines" that would not seem to impinge on basic freedoms? Beyond the decisions that every individual must make about how best to use his or her talents, should group decisions be made that are intended to influence the choices made by individuals?

Is the goal of self-restraint desirable; and, if desirable, is there a practical way to achieve it? Newsletter readers may have ideas on this subject. Please send them to: Kenneth W. Ford, 729 Westview Avenue, Philadelphia, PA 19119 (215-844-8054).

SAYING NO TO STAR WARS: THE NATIONAL SDI BOYCOTT by Lisbeth Gronland, Dept. of Physics, Cornell Univ., Ithaca, NY 14853 and David Wright, Dept. of Physics, Univ. of Pennsylvania, Philadelphia, PA 19104

Three years ago, President Reagan launched the Strategic Defense Initiative (SDI) program ("Star Wars") by calling on this nation's scientists and engineers to devise a weapons system capable of "rendering nuclear weapons impotent and obsolete." This program, with all its scientific, political and strategic implications, was formulated without consulting the Cabinet, the Joint Chiefs of Staff, top arms control advisors or the President's science advisors (1). Last spring, SDI established the Innovative Science and Technology Office (IST) to involve universities and industries in "mission-oriented" basic research for the Star Wars program.

Why did the Pentagon establish IST, and what do they want from academic researchers? One thing is fairly obvious: talent. According to the Director of IST, James Ionson, "[My] only marching order was: Try to get the most brilliant minds in our country involved in this program." What is perhaps less obvious is that SDI is also trying to buy legitimacy and scientific endorsement. Academic scientists and engineers have a certain amount of credibility and prestige in our society, and they lend that credibility and prestige to the Star Wars program by participating in it. SDI is soliciting proposals from academic researchers in an attempt to turn universities into lobbyists for Star Wars.

This goal has hardly been a secret. In Ionson's words: "This office is trying to sell something to Congress. If we can say that this fellow (sic) at MIT will get money to do such and such research, it's something real to sell" (2). In May of last year, an SDI press release incorrectly announcing that Cal Tech and MIT had joined SDI consortia elicited angry responses from the Presidents of those two institutions (3,4) who resented the use of their schools' names to imply endorsement of SDI. Predictably, articles began appearing in the press stating that such and

such number of applications for SDI funding had already been received by IST. In a July New York Times interview, Ionson bubbled that "Virtually everyone, on every campus, wants to get involved. There will be many, many Manhattan Projects in this" (3).

Of course, IST's drawing card is money. This program provides a new source of funds for basic research: the IST budget is set at 5% of the total SDI budget, for which the Administration has requested \$26 billion for the first five years. This comes at a time when other sources of research funding are becoming increasingly tight, and, once again, James Ionson gets right to the heart of the issue: "People go where the bucks are. There is a lot of money involved here... Even if someone is not an [SDI] advocate, there's still a lot to be gained--a lot of good science and the opportunity to perform that science. The only constraint is that it is mission oriented. People are shifting gears a little bit... The luxury to go off and sit in an ivory tower and do wonderful good science, what's in your own mind good science, that's a luxury that this country may not be able to afford for a while" (5).

Lured by the promise of new research funds, representatives from over 150 schools attended a briefing session on SDI research and funding held in Washington on March 29 of last year. Cornell's two representatives subsequently held a meeting on May 13 at Cornell "to brief interested parties" on the availability of SDI funds. This was, to our knowledge, the first time in recent history that a meeting had been called to promote a new funding source. Many of the faculty who attended this meeting did so to protest. Letters were sent to Cornell's administration by both a group of physics faculty and a group of engineering faculty expressing concern about Cornell's involvement with this program. The response from the administration was that as long as SDI research does not violate any of Cornell's rules against classified research or restrictions on publications, prohibiting such research would run counter to the principles of academic freedom to which Cornell adheres.

These events led us to write the Cornell pledge, which stated that those signing would neither solicit nor accept SDI funds. Rather than asking the university administration to institute a blanket ban on accepting SDI funds, we decided that a better approach was to encourage individual researchers to consider their potential involvement in the program, and have them publicly refuse to participate. We felt it was important for scientists and engineers to understand that applying for or accepting SDI funds is not a neutral act--that not only would it be interpreted as individual support for the program, but would also, in the words of the pledge, "lend their institution's name to a program of dubious scientific validity." Our plan was not so much to influence those researchers who supported the SDI program (we suspected there weren't many), but to convince those who opposed it that their actions carried weight. We hoped to convince those who said "Star Wars won't work anyway, what difference does it make if I take the money?", that it does matter. Our counter to Ionson's "People go where the bucks are" was "Put your money where your mouth is--if you think Star Wars is a dangerous program, don't work on it."

One of the things we and other scientists are most outraged by is that SDI is being sold to the public as population defense--in what seems to be a deliberate misrepresentation of the facts. We felt that few honest scientists would claim that this was possible and thought an important function of the pledge was to make this clear to the public and to emphasize that even attempting to build such a system would be destabilizing and leave us less secure. Moreover, we felt it was important to oppose the SDI program now before it becomes too entrenched. By spending billions of dollars over the next few years, SDI will create a dependent constituency for itself. This will make it extremely difficult to cut off funding in the future, regardless of the results of the research.

Some people have suggested that we leave out the pledge not to take the money--that we would get more signatures that way. (In the words of one sympathetic professor, "That last paragraph is a real lulu, isn't it?") There are two reasons we think the pledge is important. We believe the arms race is not being conducted just in Washington, but rather that it requires the active participation or passive acceptance of millions of Americans for it to continue. We hoped the pledge would encourage the scientists and engineers who were being wooed by SDI to consider their connection to the arms race.

The second reason was a very pragmatic one. We wanted to document the depth of the opposition to Star Wars among academic researchers. We believe the main reason the pledge has received so much publicity is that it is a very strong statement.

Not knowing what sort of response to expect, we began circulating the pledge in the physics and mechanical & aerospace engineering departments in early June of last year. Encouraged by the initial response, we began distributing the pledge to friends and colleagues on other campuses. In mid-June, a friend at the Institute for Theoretical Physics at Santa Barbara told us that our pledge had already arrived there. Our first thought was that things were moving even faster than we expected, but as it turned out, this pledge had originated at the University of Illinois-Urbana, where physics professors Michael Weissman and John Kogut had been circulating it. The two pledges were remarkably similar. The four of us began to collaborate on the national effort and soon produced a merged version of the pledge.

During the next three months, we circulated the pledge in each of the engineering and physical science departments

at Cornell which are eligible to apply for SDI funding, finding a faculty member and graduate student in each department to circulate it among their colleagues. The response was tremendous. A majority of the total faculty in those 12 departments signed (physics: 69%, astronomy: 75%, chemistry: 46%, all engineering: 44%), as well as half of the graduate students and research staff in those departments, for a total of over 700 signatures. Many of those signing ordinarily accept other types of DoD funding, but felt this program was different. For such a high percentage of scientists and engineers to sign a statement as strong as the pledge is very significant.

Also, our initial suspicions were confirmed--not one person whom we talked to refused to sign because they supported the SDI program. Some were leery of signing anything "political" or did not want their names published, some were foreign nationals worried about potential visa problems, and there were those who wanted to leave open the option of accepting SDI funding, saying "If the government's going to waste that much money, I want some of it for my research." In the words of one of our colleagues,

the only real difference of opinion seems to be whether Star Wars is stupid and dangerous, or merely stupid.

Nationally, we were encouraged by the enthusiastic response from researchers across the country and from the press. An initial press conference was held in Urbana on July 11 with Illinois physicists Kogut, Larry Smarr and Fred Lamb, and a second one was held in Boston on September 12 with MIT physicists Phillip Morrison and Vera Kistiakowsky, and Cornell mechanical engineer Zellman Warhaft to officially announce the national campaign. A third press conference held in Washington on October 17 to announce some of the preliminary national results included Kogut, Warhaft, and physicists Sherman Frankel from the University of Pennsylvania and Phillip Anderson from Princeton. These generated considerable national and international press coverage, including the NBC and CBS evening news, the McNeil-Lehrer Report, and stories in most major newspapers (e.g. The Washington Post, The New York Times, USA Today, The International Herald Tribune) and the major physics, chemistry, and engineering trade journals. In addition, we began receiving requests for the pledge from people who had heard or read about it in the news. News reports have run in England, Italy, Australia, Greece, and Germany, and we've received dozens of phone calls from local newspapers and radio stations around the country. A two-hour special Nova-Frontline program on Star Wars to air April 22 will include coverage of the pledge.

The pledge is circulating at over 130 campuses nationwide, and has already gathered over 3,100 signatures from faculty and the senior researchers and 2,100 signatures from graduate students and other junior research staff. This includes a majority of the combined faculty of the nation's top 26 physics departments (as ranked by The Chronicle of Higher Education) and a majority of the faculty in each of 67 research departments. A national boycott of research funding on this scale is unprecedented.

We are preparing to hold another press conference in mid-April to announce the semi-final national results. To capitalize on the results of the drive, we are also coordinating a lobbying effort by pledge signers which coincides with the National Academy of Sciences meeting and the Spring APS meeting, both held in Washington at the end of April.

We believe the pledge has had two major impacts on the national debate on Star Wars. First, by generating discussion and publicity both nationally and locally it has helped to educate the public and congress about the infeasibilities and dangers of the program. And second, the pledge has helped to make science and engineers aware of the implications of their participation in the Star Wars program: it has raised the issues of the personal responsibility of scientists, of the political ramifications of one's work, and of the connection between science and the military--issues which are rarely, if ever, discussed. Each one of the over 5,000 scientists and engineers who have signed the pledge have had to think about these issues, and, equally important, each of those people who refused to sign have also had to think about them.

References

1. Philadelphia Inquirer, November 17, 1985, pg. 1.
2. Science 228, 304 (1985).
3. New York Times, July 22, 1985, pg. 1.
4. Science 228, 698 (1985); Chronicle of Higher Education, June 19, 1985; Nature 315, 266 (1985); Physics Today, July, 1985, pg. 56.
5. Science and Government Reports 15, 1 (1985).

COST OF GETTING THE SCIENTISTS AWAY FROM WEAPONS RESEARCH by Vladislav Bevc, Synergy Research Institute, P.O. Box 561, San Ramon, CA 94583.

It seems reasonable to assume that an effective way of arresting the unfettered growth of the military establishment and the arms race in designing ever more lethal and sophisticated weapons would be to get the scientists and engineers who make the development of weapons systems possible away from the weapons laboratories. This, of course, is being tried all the time but, in my opinion, in a very inefficient way. Periodically demonstrations and appeals are launched that seek to persuade people working in the weapons laboratories to leave them and engage in other, peaceful pursuits. It is apparent that such appeals, relying on moral persuasion and reasoning, have not diverted many scientists from working for the military, directly or indirectly. In fact, most of the technically talented people avidly seek jobs in the military-industrial complex because they are better paid than the jobs available elsewhere. The opportunities for making a decent living by doing science are getting scarcer every day. Thousands of scientists in the United States are unemployed or working at jobs that have no connection with their profession if we are to believe the conservative data of the U.S. Statistical Abstracts. When people who work at, say, the Lawrence Radiation Laboratory, Los Alamos National Laboratory, Oak Ridge, and the like, are asked to break with weapons research we are asking them to forsake \$60,000 plus a year jobs in well-equipped laboratories and set forth instead on a road of poverty where the vicissitudes of daily life will prevent them from working in the field where they expected to be active throughout their professional careers.

It would then seem that an economic incentive for these people to leave the weapons establishment would be needed. If we are interested in getting the scientists away from weapons research and development we must find a place for them where they can work in their field and make a decent living at par or better than what the military can offer. Let us make a back-of-envelope estimate of what kind of money would be needed to accomplish this purpose.

Consider, for the purpose of the argument, what it would take to lure away from the Radiation Laboratory at

Livermore its present personnel. For 6,000 people who work there the annual salaries and overhead alone would amount to some \$600 million. Then one would also have to build a research facility that would be equal or better than the radiation laboratory. Although the cost of this might still be lower than that of something as useless as an aircraft carrier it would most likely still come to some \$10 billion spread over, say, ten years. Putting it crudely and assuming that everything could be organized and carried out we see that when we are talking of luring people away from one weapons laboratory we are actually talking about an outlay of \$1.5 billion per year. I am aware that it sounds very crass putting it in this way, but that is the way the economics of the world works and as scientists we must deal with the reality. Values in this society are measured in dollars (\$).

Now the \$1.5 billion required to get rid of the radiation laboratory, according to the above scheme, when spread over 100 million people--I have picked this number because it represents the number of people who would most likely die when the nuclear exchange with the Soviet Union occurs--would amount to \$15 per year per person. This does not seem much, especially not when compared with the amount of taxes we pay to keep the military machine going, which, when we think rationally about it, serves only to assure our eventual destruction. I submit that if people really wanted it they could with some effort build a better laboratory than the Radiation Lab and lure away most of its personnel. It is, in the last analysis, only a matter of putting one's money where one's mouth is.

Even if, when projected on a nationwide scale including other weapons laboratories, I am off by a factor of 100, \$1,500 a year would not be too much for something the people really want. It would be still less than what we waste on paying the taxes for the arms race.

It is true that once a group determined to go all out and do what I am suggesting above, assuming that the funds were forthcoming, the matter would not be as easy as putting up the money and building a laboratory. Obstacles of all kinds would be presented by the government which would be quick to recognize that carrying out the proposed scheme would mean an end of the arms race at least at a sophisticated level. The organization setting out to establish such peace-oriented research laboratories would, in the first place, not qualify for the nonprofit status on grounds that it is interfering in the political process--war being only a continuation of politics--or being outright against the public interest which in the perception of our society requires periodic wars. The industry that at present thrives on military research and development would be a powerful enemy. And if matters became serious--as undoubtedly they would--the government would resort to repressive actions against an organization trying to lure scientists and engineers away from weapons research.

To find out whether the people of the United States think such undertaking to be worthwhile one would have to try and see if they are willing to support the establishment of research laboratories on a scale adequate to absorb as many scientists as there may be available. This would be the acid test whether the people in their professed craving for peace are really prepared to sacrifice part of their money or whether they expect that all the sacrifices have to be made by the scientists and none by the rest of the population. Should we find out that the people do not want to try this alternative, then we must conclude that the majority is more comfortable with the present state of affairs with the nuclear threat constantly present than they would be in trying to do something meaningful about it. If the latter is the case, we may just as well resign ourselves to what the people want.

**APS COUNCIL MEETING: REPORT OF THE FORUM COUNCILOR:
Kenneth W. Ford, 729 Westview Ave., Philadelphia, PA 19119.**

Sidney Drell, the incoming President of APS, has a long and distinguished record of contributions to society as well as to physics. In 1980, he received the Forum's Szilard Award for his work on arms control.

DEW: In his opening remarks to the APS Council at its January meeting in Atlanta, Drell assigned top priority to completion and release of the directed energy weapons (DEW) study, now under way, led by Nicolas Bloembergen and Kumar Patel. George Pake heads the review panel. Although the study focuses on technical issues and deals with only a subset of SDI technology, it is clearly the most sensitive study yet undertaken by APS. The study report is expected in the fall. The study is funded by \$400,000 in foundation grants, with APS committed to provide up to an additional \$50,000 if needed. Cooperation by the federal SDI office is reportedly good. Members of the study group are working with classified information. The report will require federal review and declassification before it is released.

[The report of the DEW study, whatever its conclusions, could attract a great deal of attention. There is much evidence that the American people are becoming very unsure about SDI. The media now function as a high-gain amplifier for SDI judgments. Consider the reverberations set off by the resignation of David Parnas from an SDI software advisory panel. On the day I write this (5 February), the Philadelphia Inquirer is editorializing: "If the Challenger tragedy bequeaths one key lesson it should be that computers cannot be trusted to be infallible. Some defense systems against Soviet nuclear

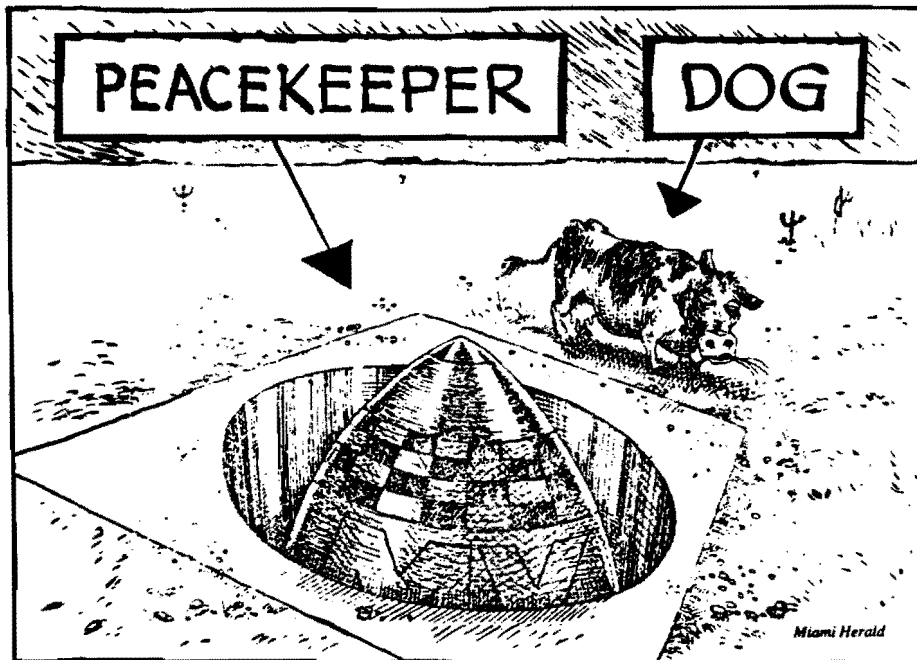
weapons ultimately may prove useful and feasible, but not the President's projected total population protection via Star Wars. Any American strategic defense system in space that depends on technological perfection is destined to be a space version of the Maginot line."]

SDI: Council considered a possible resolution concerned with informing the public about what might be called the fantasy version of SDI: an invulnerable population shield. This matter will be referred to a special committee or to the Panel on Public Affairs and brought back to Council in April. The stimulus for this topic came from Jay Orear and Michael Fisher at Cornell.

Education: Council approved the appointment of a new full-time physicist for the New York APS office so that the Society could be more effective in dealing with educational issues. This action was recommended by the Education Committee. [See my separate report on Education Committee activities.]

Committee on Opportunities: Council decided against following a recommendation of the Committee on Committees that the Committee on Opportunities in Physics be phased out. The Committee on Opportunities was given a three-year continuation. Its charge is to be rewritten to emphasize manpower issues and a concern for career paths of physicists.

Congressional Fellows: The number of applications for Congressional Fellowships was anomalously low this year. Whether it is a fluctuation or a trend no one knows. In order to increase the pool, the deadline for application was extended to March 1.



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we'll teach you the difference between a dog and a cowl

THE APS AND PHYSICS EDUCATION by Kenneth W. Ford, Chair, APS Committee on Education, 729 Westview., Philadelphia, PA 19119.

There is no longer much disagreement with the thesis that serious problems beset physics education in the United States. Taking a 15-year time span, 1970 to 1985, one sees some ominous trends. In that time, bachelor's degrees awarded in physics have fallen from about 0.7 percent of all bachelor's degrees to about 0.5 percent (in absolute numbers, a drop from about 5,800 annually to about 4,900 annually); the number of U.S. citizens earning Ph.D.'s in physics has fallen by about a factor of two (from about 1,300 annually--which, to be sure, was a peak--to about 700 annually); and the number of college graduates seeking a career in high-school physics teaching has fallen by perhaps a factor of 5. The young person, fresh out of college or graduate school, who wants to teach physics in high school or middle school may soon be extinct. There are lots of good and dedicated physics teachers scattered over the high-school landscape, but there is general agreement that the number of qualified teachers is declining. At present, fewer than one in five high-school graduates has studied any physics, a fraction that seems to be slowly declining. Meaningful data below the high-school level are almost nonexistent, but anecdotal evidence suggests that science education in elementary schools is, on the average, impoverished.

The participation in physics education by women and minorities, although not declining, remains discouragingly low. Currently, about 13 percent of physics bachelor's degrees are awarded to women, and about 6 percent to minorities (or 4 percent if American Orientals are not counted). Women earn 7 percent of the Ph.D.'s in physics, and minorities earn 3 percent (less than 2 percent not counting American Orientals). Only at the bachelor's level has there been an appreciable increase in absolute numbers for either women or minorities.

What, if anything, can the American Physical Society do about physics education? Science education in the United States is a multi-billion dollar problem. Adequately qualified teachers, adequate salaries, smaller classes, and reasonable budgets for equipment and supplies will not come quickly and will not come cheaply. Yet, nothing is to be gained by declaring the problems hopeless. By choosing its targets carefully, a scientific society can make worthwhile contributions that have the potential for multiplicative effect. It can conduct, sponsor, and encourage special projects in physics education; it can acquire and disseminate information; it can nudge and motivate.

APS has had a Committee on Education since 1974. An overview of recent APS educational activities can be found on the APS page of the March issue of Physics Today. Most significantly, the APS Council, at its January meeting, approved the appointment of a new APS staff member to conduct and support the educational work of the Society. That position may be filled by mid-year.

Much of the committee's recent work has focused on the high-school level. We are involved in summer placement of high-school teachers, in helping to organize a U.S. entry in the International Physics Olympiad, in sponsoring symposia on pre-college education, and in encouraging much increased interaction between college departments and schools at the local level. The committee also sponsored a survey of high-school teachers in New Jersey. These

efforts succeed because of some very dedicated volunteer labor, good support from an overworked APS staff, and the benefit of constant cooperation with AAPT and AIP.

Some college projects are also in the works or have been recently completed. The committee sponsors summer industrial internships for college students and fresh graduates (a joint program with MIT); it co-sponsored (with AAPT) a conference of physics department chairs; and it conducted (also with AAPT) a survey of department chairs on the quality and quantity of physics students. (An unanswered question: Do departments, in trying to attract the best, still turn their backs on the "average" student?)

At the graduate level, the most significant phenomenon of the decade is the rapid increase in the percentage of foreign students. This carries with it a concern about a potential instability of graduate enrollments, and a concern about the quality of instruction that undergraduates are receiving from non-English-speaking teaching assistants. In 1986, the Committee on Education plans to have a look at some issues of graduate education, including a seeming increase in narrow specialization, and the traditional impenetrable barrier between theory and experiment.

Deciding where to put its limited time and resources is no easy task for the committee. Suggestions from APS members are eagerly solicited and will be studiously pondered.

CIFS REPORT by Julian Hecklen, Dept. of Chemistry, 152 Davey Laboratory, Pennsylvania State University, University Park, PA 16802.

The Committee on International Freedom of Scientists (CIFS) attempts to help oppressed scientists around the world. One of its activities is to form Small Committees to correspond with individual oppressed scientists to help them on a personal level.

At the present time, CIFS has 167 Small Committee members helping 84 oppressed scientists. Except for two scientists in Poland, the rest of those currently being helped are in the Soviet Union. In the past, we have also helped those in Argentina and Turkey.

Correspondence with oppressed scientists in the Soviet Union is important for several reasons: (1) it provides a moral lift to the oppressed scientist to know that someone cares; (2) it is a means of receiving scientific and other information; (3) Soviet officials are less likely to harass someone with western contacts. During this past year, two of our oppressed scientists have been granted permission to emigrate. Another has been given permission to go to the west for medical treatment. Another oppressed scientist has been allowed to attend seminars from which he had been banned since applying for emigration.

If you would be interested in participating in this work, please contact me at the above address.

To save one soul is to create a universe.

COPS REPORT by Israel Jacobs, General Electric Co., Research & Development Center, P.O. Box 8, Schenectady, NY 12301.

Discussions and actions taken at both of the cited meetings are combined in this report. Your correspondent apologizes for the gap in the regular reporting schedule.

•After some uncertainty regarding time slots, there will be a jointly sponsored COP/Forum symposium on the "Impact of SDI on the Physics Profession" on Wednesday evening, April 30, at the APS Washington meeting. (See FORUM SESSIONS in this newsletter for more details.)

•There were several items reflecting our major attention to manpower concerns. The appearance in the APS Bulletin of an applications/announcement page for the Placement Services of the AIP Manpower Placement Division is a direct result of discussions last July with the Division Head, Beverly Citrynell. The Placement Service centers at the Las Vegas (3/86) and Washington (4/86) meetings of APS will be visited by COP members Jacobs and Linwood Lee, respectively, to get firsthand information on their impact and operation.

•COP is sending member Paul Zweifel as an observer to a meeting arranged by the AIP Manpower Advisory Committee. It is intended to design a survey on foreign graduate assistants. Academic Departments will be questioned on positive and negative aspects of foreign student teachers.

•We met with Roman Czujko who works with Beverly Porter of the AIP Manpower Statistics Division. Interesting excerpts from their recent statistics follow:

- a. First year graduate class in physics is now nearly 40% foreign students.
- b. The number of undergraduate students in physics may reach a minimum in the early 1990s.
- c. Physicists in universities are, on average, older than other scientists. In 1981:
 - 40% of physics professors were older than 50.
 - 40% of physics professors were between 40 and 49.
 - 20% of physics professors were under 40.
 Median age increases by about .5 year/year and will continue to increase at this rate until 1991.
- d. The academic employment problem in physics may have hit bottom in 1983.
- e. Projected numbers of openings for professors and

associate professors of physics in U.S. universities, resulting from death and retirement are as follows:

| Year | 1981-86 | 1986-91 | 1991-96 | 1996-2001 |
|--------|---------|---------|---------|-----------|
| Number | 769 | 911 | 1018 | 1119 |

Note that these are for the five-year periods. Not all such openings will be filled. However, this shows the size of the coming wave of retirements.

•COP has had a concern with the topic of ethical behavior or integrity in science. What to do is not clear. We have been stimulated by articles and editorials in the Sigma Xi - American Scientist. Would a "Guest Comment" in Physics Today be appropriate? Jacobs leans toward a wider use of the Sigma Xi pamphlet "Honor in Science," e.g., to be distributed to graduate students.

•Francis Perkins who is APS Division Councilor for Plasma Physics has recently written Ken Ford, APS Forum Councilor, suggesting a session on "The Physicist as Entrepreneur," a copy of which letter reached COP. It is worth noting some past efforts in this direction. COP ran a symposium at the March 1984 (Detroit) meeting on the Federal Small Business Innovation Research Program (SBIR) which had good attendance. Two previous COP attempts animated by C.C. Foster of Indiana to put on well-organized short courses with tuition (jointly with the APS Education Committee) had to be cancelled because of insufficient enrollment. They were "Business for Enterprising Physicists" scheduled to precede the March 1982 meeting in Dallas, and "Starting and Managing a Business - for Enterprising Physicists" to precede the April 1983 meeting in Baltimore. COP will consider again whether it is time for another symposium on the topic. Would a Divisional Meeting (such as Plasma Physics) be a preferable site to a General Meeting?

•At each of the COP meetings of this report we also spent time discussing comments and recommendations from the APS Committee on Committees and the Council regarding the scope and goals of COP. We worked with COP member Ken Ford to develop a new charge from Council to COP. (In January 1986, Council approved continuation of COP for 3 more years and requested a list of projected activities.)

•Linwood Lee, Jr. of SUNY-Stony Brook, is the new COP chairman for 1986, succeeding Roland Good of Penn State University. Other membership changes will be announced shortly.

"Worse Shape Now"

"Let's face it—the fact is that there has been bad management of many defense programs in the past. We spent billions of the taxpayers dollars; sometimes we spent it badly. Part of this is due to basic uncertainties in the defense business. Some uncertainties will always exist. However, most of it has been due to bad management, both in the Department of Defense and in the defense industry. . . Frankly, gentlemen, in defense procurement we have a real mess on our hands."

David Packard
Deputy Secretary of Defense
1970

"Defense procurement is in worse shape now than it was fifteen years ago."

David Packard
Chairman, The President's Blue
Ribbon Commission on Defense Procurement
1985

INTERESTING READING

From The Defense Monitor, Vol 15, No. 1, (1986) Center for Defense Information, 1500 Massachusetts Ave. NW, Washington, DC 20005 on "Waste in Military Procurement: The Prospects for Reform."

ANNOUNCEMENTS

ASTRONOMERS and the ARMS RACE

ASTRONOMERS AND THE ARMS RACE is a newsletter to be published quarterly as a communication service to the astronomical community. We intend to focus on material of particular interest to astronomers, including news and views about the militarization of space, military applications of techniques and expertise associated with astronomy, and the efforts of astronomers to influence the arms race.

Submissions will be accepted for publication at the discretion of the editors and will be judged mainly on relevance to astronomy, conciseness, and accuracy. They should be one of the following types:

- News items
- Guest editorials and letters to the editor
- Features
- Reviews of books or articles
- Resources

Subscriptions are \$2/year (checks payable to D.E. Harris), available by sending your name and mailing address to AAR, P.O. Box 2218, Cambridge, MA 02238.

NEWS ON BOOKS

New book from Forum members on the arms race: **Nuclear Arms Race: Technology and Society** by Paul P. Craig and John A. Jungerman, both of the University of California - Davis. The primary focus of the text is nuclear weapons themselves. This includes the physical effects of nuclear weapons: blast, radiation, thermal effects, fallout, EMP, etc. There is a thorough discussion of global nuclear exchange and the psychological impact of nuclear war on survivors. The text is available (along with an instructor's manual) from McGraw Hill.

BOOK REVIEW

Nuclear Arms Control: Background and Issues. Committee on International Security & Arms Control; National Academy of Sciences. Washington, DC: National Academy Press, 1985. 378 pp. \$16.50 (paper) ISBN 0-309-03491-4. Reviewed by John Dowling, Dept. of Physics & Astronomy, Michigan State University, E. Lansing, MI 48824.

In traditional NAS style this book is an excellent and balanced survey of what is current and important in arms control today. Nuclear Arms Control provides an overview and examines the following issues: the Strategic Arms Limitation Talks, the Strategic Arms Reductions Talks, the Nuclear Freeze, Anti-Satellite Warfare, Nuclear Test Bans, and the Non-Proliferation of Nuclear Weapons. Readers learn about arms control objectives and processes, verification, linkage, compliance, the negotiating process, etc. There is a list of acronyms (quite necessary) and appendices provide texts of important arms control treaties. The issues are well-defined. An excellently balanced discussion sets forth all the pertinent pros and cons on each topic. The only criticism is that discussing both sides of an issue tends to take the life out of the book - it is well-written, but not very exciting. You read it to learn what all the arguments are, and if you read it carefully you will be well-informed on what you need to know about arms control today.

NEW FORUM BOOK ON ACID RAIN

Acid Rain: How Serious and What to Do, edited by D. Hafemeister. Available for \$6 (postage paid) from AAPT, Suite 101, 5110 Roanoke Pl., College Park, MD 20740.

The four chapters in this booklet originated at a session of the American Physical Society in Washington, D.C., in April 1985. This session was sponsored by the Forum on Physics and Society of the American Physical Society in order to bring together some of the nation's leading experts on the subject of acid rain. The Forum is delighted with the results; the authors are well respected by their peers, and they have done a good job emphasizing the scientific aspects of the acid deposition issue. The first chapter summarizes some of the results of the study, Acid Deposition: Long Term Trends, which was completed by the National Research Council of the National Academy of Sciences in the fall of 1985. This chapter was written by Myron Uman, the staff director of the study, and it contains data on the acidification of lakes, ring widths of trees, and so forth. The next two chapters by George Hidy and Michael Oppenheimer analyze the meanings of these data and they propose somewhat different courses of action. The last chapter by Leonard Weiss reviews the status of our present national and state laws that deal with the acid deposition.

JOIN THE FORUM

LETTER TO THE EDITOR

SDI Costs

The President believes that he can find \$26 billion over five years to pay for research in the physical and applied mathematical sciences under the rubric SDI. This, despite unprecedented Federal deficits. Well and good. Within the same time frame several committees of generally respected physicists have been struggling to sort through proposals for forward-looking research programs. But they have chosen to limit themselves within much tighter budget constraints. I suggest that these committees expand the scope of their proposal considerations to include a set of programs that require the use of the full \$26 billion the President believes he can find. And I suggest that they not limit their considerations to the agenda set out by the DOD. What should be the course of scientific research if \$26 billion of funding were made available? I suggest that that is a question deserving of serious consideration by the physics, mathematics, and electrical engineering communities. There has been public discussion critical of SDI. No one, so far as I know, has made serious public counterproposals for constructive use of the funding to compete with the proposals coming out of DOD. Is SDI the consensus best choice? Or can the Forum on Physics and Society develop a research agenda with greater potential for fruitful development?

Dr. Emanuel Baskir
5711 Warm Springs Road
Houston, TX 77035
1 January 1986

NEWS OF THE FORUM

STATEMENT FROM THE FORUM CHAIRPERSON - Dave Hafemeister, Physics Department, Calpoly, San Luis Obispo, CA 93407.

Over the last year, there have been several mini-articles in our Newsletter, Physics and Society (P&S), which have used data bases and physics equations to calculate some effects that relate to the world we live in. These mini-articles have been peer-reviewed by "experts" before publishing them in P&S. We would like to encourage more of you to submit your unpublished calculations, or summaries of longer already published articles. P&S is, and always will be, an unbiased newsletter AND mini-journal which serves both Forum members and all members of the APS. Calculations that show BOTH SIDES of SDI, CO₂, etc., are WELCOME.

It is important to the physics community to have the possibility of publishing in P&S pointed out because there are not many alternatives. Most of the journals that deal with these issues only like WORDS and not equations and data bases. And, most of the physics journals are more interested (as they should be) in the pure interactions of physics. Thus, P&S can and does partially fill the vacuum. So, please send John Dowling, the P&S editor, your accurate, unpublished, and meaningful calculations, OR, a synopsis of your paper that appeared in Science, etc. We promise to have it peer-reviewed by knowledgeable physicists.

As my last gasp, I would like to congratulate Dietrich Schroerer (University of North Carolina) for being elected Vice-Chairperson of the Forum, Peter Zimmerman (ACDA) as Secretary/Treasurer, and Ruth Howes (Ball State University) and Evans Harrell (Georgia Tech) for being elected to the Executive Committee. I would like to thank Max Dresden, Henry Kelly, and Barbara Levi for their steady help as they depart from the Executive Committee. It is interesting to note that the "seat of power" has finally moved from the west to the east since the last six Chairs of the Forum resided to the west of Omaha, Nebraska. (As in the case of the US, four of the last five election winners had been from California.) I wish Paul Craig (University of California, Davis) the very best as he takes over as Chair of the Forum at the Washington meeting.

FORUM SESSIONS AT WASHINGTON APS MEETING, 1986

Monday, April 28, 2:00 pm, Washington Convention Center:
The Impact of Precision Guided Munitions on Defense Policy, chaired by Mark Sakitt, Brookhaven National Lab.

Current and Future Precision Guided Munition Technology: Spiros Pallas, Office of the Under Secretary of Defense for Research and Evaluation.

Platforms and Weapons: Seymour Deitchman, Vice President for Programs at the Institute of Defense Analyses.

New Technology and Western Security Policy: Daniel Cotter, former Assistant to the Secretary of Defense and former Deputy Director of ARPA.

Guided Munitions: Promises vs. Track Record: Pierre Sprey, defense consultant.

Monday, April 28, 7:30 pm, Hyatt Regency Hotel. Forum Awards Session chaired by Dave Hafemeister, Calpoly University, CA.

Dauids and Goliath: How Physics Applied to Energy Efficiency Has Saved 100 Power Plants and One Alaska Pipeline: Arthur Rosenfeld, Lawrence-Berkeley Lab.

The Prospects for Arms Control: Spurgeon Keeny, Arms Control Association.

1986 SZILARD AND FORUM AWARDS

The Forum on Physics and Society of the APS has named its 1986 award winners. Professor Arthur Rosenfeld (University of California at Berkeley and the Lawrence Berkeley Lab) has won the Szilard Award and Spurgeon Keeny (Arms Control Association) has won the APS Forum Award. The Awards Session will be held at 7:30 p.m., Monday, April 28, at the Washington APS Meeting.

The Forum gives the Szilard Award annually to an individual or group that has constructively applied physics in the public interest. This year's recipient, Arthur H. Rosenfeld, is being recognized for his research on energy conservation technologies. Rosenfeld has multiplied his own individual impact on this field by founding (in 1974) and directing the Energy and Buildings Research Program at the Lawrence Berkeley Laboratory. The staff of 100 professionals in this program has played a leading role in the Department of Energy's conservation efforts, such as building simulations and measurements, indoor air quality, economy of energy-efficient appliances, daylighting techniques and new lighting technologies. Pursuing all these routes to more efficient use of energy has helped to reduce our nation's rate of energy consumption by about \$150 billion per year. Before establishing the LBL program, Rosenfeld did research on high energy physics and directed the Particle Data Group at LBL.

The Forum created its annual Forum Award to honor an individual or a group who has promoted the public understanding of the relation of physics to society. This year's recipient, Spurgeon Keeny, is being recognized for communicating to public leaders the impact of science and technology on policy issues. Keeny served every President (except Ford) from Eisenhower to Carter, either directly in the White House or as an official in an executive agency. Keeny's career has been dominated by his interest in nuclear arms control issues. In 1958, he was a member of the US Delegation to the Conference of Experts on Nuclear Test Detection, a technical meeting whose findings gave the US and USSR confidence that a ban on atmospheric tests could be verified. Most recently, while serving as Scholar-in-Residence at the National Academy of Sciences from 1981-1985, Keeny was the principal editor of Nuclear Arms Control: Background and Issues (National Academy of Sciences, 1985). Keeny also has an interest in nuclear power issues and was Chairman of the Ford Foundation's Nuclear Energy Policy Study, which culminated in the book, Nuclear Power: Issues and Choices (Ballinger, 1977). Keeny is currently president of the Arms Control Association.

Tuesday, April 29, 9:30 am, Executive Committee Meeting, Place to be announced at Forum sessions on Monday.

Wednesday, April 30, 9:00 am, Washington Convention Center.
SDI: Policy and Technical Issues, chaired by Aviva Brecher.

American Academy of Arts & Sciences Study on Weapons:
 Franklin Long, Cornell University.

Office of Technology Assessment Report on Ballistic Missile Defense: Technologies & Future Research Options: Anthony Fainberg and Gerald Epstein, OTA/Internal Security & Commerce.

A Prudent Approach to Strategic Defense Research Based on the Stanford Workshop: Theodore Postel, Stanford University Center for International Security.

SDI: The Battle Management Problems: Herbet Lin, MIT Center for International Studies.

Wednesday, April 30, 7:30 pm, Hyatt Regency Hotel, Impacts of the Strategic Defense Initiative on the Physics Community, sponsored by both the Forum and the Committee on Opportunities in Physics. Cochaired by Aviva Brecher, Boston University and Mike Casper, Carleton College.

Physics in IST: Recent Progress, Future Challenges: James Ionson, Director of IST.

SDI Technical Personnel Requirements: Richard Bleach, SDI Office.

SDI: Implications for University Physicists: Vera Kistiakowski, MIT.

Implications of SDI for Non-Weapons National Labs: Alex de Volpe, Argonne National Lab and Peter Gollon, Brookhaven National Lab.

SDI Implications for Physics Graduates: Charles Schwartz, University of California - Berkeley.

This Nuclear War Education Conference is a multidisciplinary conference being sponsored by George Mason University and is being held at the Key Bridge Marriott Hotel in Arlington, VA on April 10-12, 1986. For more information on this conference call Robert Ehrlich (703 323 2303) at Physics Dept., George Mason University, Fairfax, VA 22030.

Nuclear War Education Conference

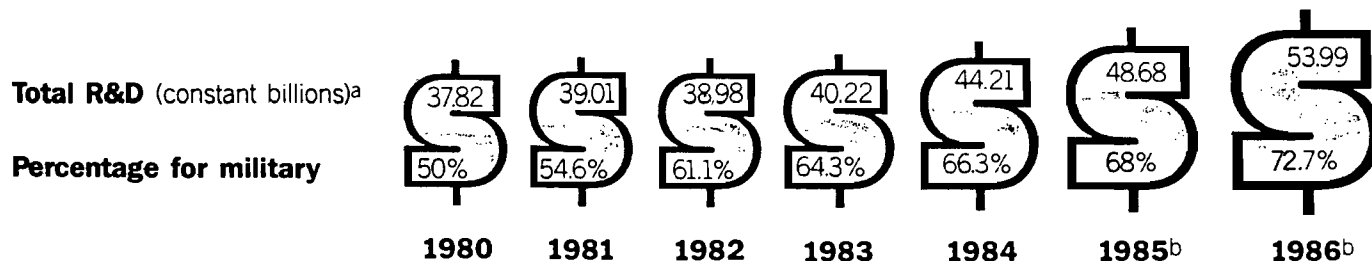
April 10-12, 1986

| Thursday April 10 | | Friday April 11 | | Saturday April 12 | |
|--|--|--------------------|---|--|--|
| 5:00-6:00 | Registration | 8:00-8:30 | Coffee and donuts | 8:00-8:30 | Coffee and donuts |
| 6:00-7:00 | Cocktails | 8:30-9:00 | Opening remarks | 8:30-10:30 | Contributed papers |
| 7:00-9:00 | Banquet and speaker: Paul Warnke | 9:00-10:30 | Contributed papers (10 min. each) | 10:30-11:00 | Coffee break |
| | | 10:30-11:00 | Coffee break | 11:00-1:00 | Panel discussion "SDI: What is It? What Should Be the University's Role?" |
| Panel | | 11:00-1:00 | Panel discussion "Nuclear War Education: Propaganda, Humanity's Salvation, or Consulting Opportunity?" | 1:00-2:00 | Lunch and speaker: Jane Wales |
| <i>Harmon Dunathan</i> , Hampshire College | | 1:00-2:00 | Lunch and speaker: George Weigel | 2:00-3:30 | Contributed papers |
| <i>William Kincade</i> , Carnegie Foundation | | 2:00-3:00 | Contributed papers | 3:30-4:00 | Coffee break |
| <i>Michael Nacht</i> , University of Maryland | | 3:30-4:00 | Coffee break | 4:00-5:30 | Contributed papers |
| <i>Thomas Smith</i> , American Security Council | | 4:00-5:30 | Contributed papers | | |
| <i>Commentator:</i> Loren Thompson, Georgetown University | | 6:30-8:30 | Banquet and speaker: George Keyworth | Panel | |
| | | | | <i>Sanford Gottlieb</i> , United Campuses Against Nuclear War | |
| | | | | <i>James Ionson</i> , Strategic Defense Initiative Organization | |
| | | | | <i>Jonathan Knight</i> , American Association of University Professors | |
| | | | | <i>Edward Warner</i> , RAND Corporation | |
| | | | | <i>Commentator:</i> Ruth Howes, Ball State University | |

From The Bulletin of the Atomic Scientists, Vol 42, No. 3, 45-49 (1986),
 "Government Dollars for University Research" by Frank Long.

The growth of R&D spending during the Reagan years

Military portion is shaded.



^aBased on National Science Foundation calculations to allow for inflation, where 1984 is the constant year.

^bEstimated.

Source: National Science Foundation report 85-322.

URGENT APPEAL TO MEMBERS AND FRIENDS OF THE APS TO SUPPORT BASIC SCIENCE:

Confronted by a severe fiscal crisis, our elected representatives have taken drastic action to curtail spending. The reduction of the Federal deficit cannot succeed, however, without a healthy economy. No element is more vital to maintaining that health than investment in science and particularly in basic science. Any momentum that is lost may take years to recover. Our economic competitors will not be idle during those years.

Yet, the science community seems dangerously complacent. In the current fiscal year, the Gramm-Rudman-Hollings Deficit Reduction Act mandates across the board cuts that will curtail some existing programs and severely limit the number of new starts. The situation for the coming fiscal year is far less certain and potentially far more serious. Although the President's asking budget for FY 87 includes healthy increases for science, few expect the President's budget to be adopted in its present form. There is little doubt that Congress will restore many programs that have been eliminated in the asking budget. To do so, they will quite naturally look to those areas that have fared relatively well. The danger for basic science is great.

The scientific societies and the various university associations have not been silent, and Congress has heard testimony from many of these organizations. They have not, however, heard from the individual scientists who actually conduct the research. In the opinion of many experienced observers in Washington, those voices must be heard if science is to be protected. I share that view.

I therefore urge that all members and friends of the APS undertake the responsibility of informing their elected representatives of the need to invest in scientific research--a need that is even greater in times of economic stress. Even as we send that message, we must demonstrate the unity of the scientific community. It would be unfortunate if we appear to be pleading only for those projects in which we have a personal stake. I recommend that in your contacts with members of Congress you stress the value of science rather than of particular projects. The priorities of science are best argued through the merit review process.

The time is short. Committee action on the budget must be completed by April 1. We must by then have made clear that the science we love for its beauty is also the foundation of our material well-being.

Sidney D. Drell, President of the American Physical Society

Phone or mail a letter to your Representative or Senators:

Your Representative
 U.S. House of Representatives
 Washington, DC 20515
 (202) 224-3121

Your Senator
 U.S. Senate
 Washington, DC 20510
 (202) 224-2131