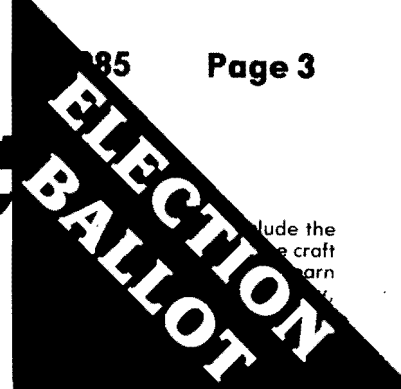


Physics & Soc



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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 University of Pennsylvania, Mansfield, PA 16933, 717-662-4275.

Forum on Physics and Society
Physics Department
Mansfield University of PA
Mansfield, PA 16933

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A Negotiable Defense Initiative; An Alternative to the Strategic Defense Initiative (Star Wars)
by A. de Volpi, Argonne National Lab,
Argonne, IL 60439

Is there an acceptable alternative to the Strategic Defense Initiative?

The unilateral development of strategic defense has been praised by Zbigniew Brzezinski (the Wall Street Journal, 10 July 1984) as an enhancement in mutual security, even at the expense of arms control and large budgets. Is there another approach that can yield improved national security without the liabilities of Star War fantasies?

Considerable public opposition has developed against President Reagan's Strategic Defense Initiative. The opposition presents at least a half-dozen categories of objections, including inadequacy of technology, escalation of the arms race, stimulation of Countermeasures, excessive cost, and extremely low confidence of success in a battle environment.

Yet, sincere concern over national security has led many strategists to support the need for a defense against the interim vulnerability of the United States to nuclear attack. According to former President Carter's national security advisor Brzezinski, the four scenarios that demand attention are a massive surprise attack, an escalation of crises between the superpowers, contagion from non-superpower conflicts, and a terrorist attack. The first-strike he considers the greatest peril, and the terrorist attack the most likely. Even more probable would be an unauthorized launch carried out by field commanders who have responsibility delegated to them, as in the case of submarine officers.

Those who visualize a future where nuclear-armed long-range missiles and bombers are reduced significantly in magnitude -- or even eliminated -- must realize that national vulnerability is not eliminated during the process of arms reduction, a vulnerability that continues to some degree even if all known arsenals of nuclear warheads were destroyed. To face up to these fears while not impeding the arms-control process requires a defense strategy that overcomes prevailing objections while still avoiding the military and political liabilities of interim vulnerability to nuclear attack.

Such a strategy is embodied in the concept of a **negotiable defense** -- a defense against nuclear attack that is negotiable between the United States and the Soviet Union. By limiting ballistic missile defense to this condition, each of the four risk scenarios can be diminished, and all of the major objections to the Strategic Defense Initiative can be absorbed.

A strong argument has been made that there is no effective defense against a full-scale surprise attack, particularly if the attack is against population centers. If high levels of armament do not provide the necessary deterrence, national security might have to be furthered by reducing the level of armaments below the threshold for "successful" first-strike. If a ballistic missile defense, containing passive

and active elements, were built up on phase with negotiated reductions in offensive systems, interim vulnerability could be reduced while invoking realistic defensive measures. The technology that is porous against a massive attack would not be as flawed against a small-scale attack or a single errant missile.

Under a negotiated approach, the need for competitive response -- in terms of offensive arms escalation or countermeasures -- would be averted; by mutual agreement, the arms control process would not be undermined by treaty violation; economic costs would be more tolerable and be offset by reductions in offensive systems; and the confidence level would increase as defensive systems became dominant.

For each of the scenarios of vulnerability, a negotiable defense leads to less public danger. The massive surprise attack can be diminished primarily by mutual arms reduction and secondarily by the complications that defensive systems cause for the planning and execution of an attack; crisis escalation to nuclear becomes less likely as the offensive arsenals are reduced and the defensive systems come into place; war contagion from other conflicts could be contained to the conventional level; and a means of confident protection against one or a few missiles could come into existence -- all without intermediate destabilization and arms-race oscillation.

For specifics, consider the following scenario: Arms-control negotiation stages push toward a limit of, say 100 strategic nuclear warheads, hand-in-hand with negotiated defensive systems. This might be facilitated by periodic revisions of the ABM treaty and protocols, which would progressively allow certain defensive systems to be developed, tested, and deployed at a rate commensurate with a build-down of offensive systems. The provisions might allow phased-array radars in the ABM mode, might permit development of laser, particle-beam, and kinetic-energy weapons, might allow the deployment of anti-ballistic missile battle stations in orbit, and might even allow practice shots on boosters and re-entry vehicles. The treaty would probably forbid nuclear-explosive defensive systems and anti-satellite systems. Such treaties, and the actions permitted, could be multilateral because many parties have a common interest in averting nuclear wars, denying third-party or terrorist threat capability, and intercepting unauthorized launches. One of the essential elements of such accords is a symmetric view regarding allowable defensive developments. A negotiable defense initiative is confined to measures that each side recognizes to be equally in the interest of the other party, developments that would be sanctioned eventually by treaty.

Therefore, having granted the impact of the weapons revolution that Brzezinski recognizes, one should note that the element of deterrence can be restored not necessarily by a simultaneous build up of strategic and defensive systems, but more likely by a phased replacement of offensive with defensive weapons. This too allows us to exploit our "advantages of high technology," and puts

"pressure on the Soviet Union to return to serious arms-control negotiations." The reciprocal stability that Brzezinski desires would be achieved, but now with restraint in defense expenditures. Although unilateral actions might still be required of both sides, they could be within the framework of a negotiable defense concept that could be defined at a summit meeting.

The protection of populations and the development of reciprocal stability can be maintained with the Soviets (and other parties) by mutual agreement of acceptable defensive systems and the timing of their introduction. To reduce respective interim vulnerability, the serious limitations and instabilities of the Strategic Defense Initiative can be circumvented. To replace a nihilistic approach to Star War extravagances, a more feasible and positive posture would be a self-limiting negotiable defense that would accommodate reasonable national security threats.

The December, 1984 issue of *Science Digest* gives their list of "America's 100 Brightest Scientists Under 40." The 100 were chosen by a group of 55 nominating senior scientists, one of whom was a woman. There were two women out of 11 astronomers/astrophysicists. There were no women out of 21 physicists. Are you doing anything positive to alter this?

LIST OF WOMEN'S SCIENCE GROUPS AVAILABLE

With support from the National Science Foundation, the Office of Opportunities in Science has compiled and published a descriptive list of more than 75 associations, committees, and caucuses that work with women in science, engineering, mathematics, and medicine.

Information for each group includes address, phone, dues, number of members, publications, services, and current and future activities. Single copies are available free from Dara Scott, Office of Opportunities in Science, AAAS, 1776 Massachusetts Ave., NW, Washington, DC 20036.

TO OTHER CONCERNED PHYSICISTS:

Last year, a small group of physics students and faculty at Berkeley met to discuss their concern about the relationship between physics and the military. It was no one particular event that brought them together, but rather a series of individual realizations. Personal experiences had led them to the conclusion that connections between physics and the military were growing and affecting them directly. Students who were seeking employment realized that most of the jobs available in the commercial sector were either directly or indirectly related to the military. A few graduate students became concerned when they discovered that the research they were beginning had military applications. For professors and teaching assistants, the personal connection was more subtle. By teaching pure science to physics and engineering students, some realized that they were actually preparing the technical people needed for future weapons development.

Although one might expect that the University of California's ties with the Livermore and Los Alamos nuclear weapons labs would inspire concern, there is in fact very little public discussion of the issue. This lack of discussion motivated the group to establish its first project: a symposium sponsored by the Physics Department at which several speakers would present various perspectives on the topics mentioned above. This idea was presented to the faculty who voted their approval despite some misgivings. The speaker, who participated included Professors Charles Schwartz, Richard Muller, Arthur Rosenfeld and graduate student Brad Hubbard. Despite little publicity, over 200 students and faculty members attended, many staying after the event to continue the discussion.

In the Spring, a group of graduating seniors had interested students sign a pledge promising their continued awareness of the militarization of physics and their refusal to take jobs that were directly connected with the military. Although the senior class voted in favor of having the pledge read at the graduation ceremony, strenuous objections from a few students caused the Department Chairman to preclude it. However, the students were not prevented from distributing papers and making symbolic statements, which proved to be very effective.

Following these two successful events, the group has grown in size and undertaken several new efforts since the summer. The group has engaged in a search for reliable statistics on job opportunities. We are writing to various government sources, working through the campus placement center to survey recruiting companies, and surveying our own students and faculty. The best data we have found show that 31 percent of the U.S. physicists and astronomers engaged in research and development in 1980 worked on "national defense." By counting only the applied research and development jobs (thus excluding most jobs at academic institutions), the fraction engaged in defense work rises to 46 percent. During the last four years, the portion of R&D funds devoted to military projects increased 50 percent to 70 percent of all federal R&D funds. Thus, the concentration of positions in weapons research has most likely increased from 1980 to the present.

We are also preparing letters informing Berkeley students of our findings and asking them to look carefully into the connections between their careers and militarism. We are considering additional symposia and other educational forums as well as developing relations with students from other departments on this campus.

The goal of this letter is to encourage other physicists to examine the conditions that prevail at their institutions, to inform themselves and others around them. We know the concern about physics and militarism, which motivated us, is widely shared. Communication between groups at different places will provide mutual support and ideas about how we can have some constructive influence.

As physicists we are instrumental in the creation of new technology. Accordingly we have a unique responsibility to express our concerns on its use. We encourage you to join us in our attempt to become more vocal and active in working toward a more humane future.

Charles Schwartz, professor
Marc Fisher, graduate
Rebecca Lance, undergraduate
Box WN, Department of Physics
University of California
Berkeley, California 94720
30 Oct. 1984

SCIENTISTS NEED INTEGRATIVE IDEALS by Paul A. Smith, Physics Dept., Coe College, Cedar Rapids, IA 52402

One day's mail brought the editorials appearing in the 24 February 84 and 2 March 84 issues of SCIENCE, and the editorial of the March 84 issue of the *American Journal of Physics*. The titles were: "Mutual Deterrence or Nuclear Suicide", "Graduate Education: Signs of Trouble", and "Is 1984 fact or fiction?" They are sobering editorials appearing in science journals, yet they lack some essential insights.

We need to take to heart the insights which Wiesner and Yark published in *Scientific American* twenty years ago. (1) They noted then that there are problems for which there can be no technical solutions. Most of our political leaders have yet to take that insight to heart as the professors in our graduate schools have not taken it to heart. (2)

Graduate science education is in trouble because our narrowly research oriented graduate schools have trained scientists in excessively narrow ideals and perspectives. Specialists have not provided our nation with the broad based ideals, insights and understanding which are essential to wisely setting priorities involving sophisticated technologies.

It is difficult in the extreme to find mainline Ph.D. programs which are appropriately educating our future science professors in the personal ideals, perspectives and skills which are essential to helping future university students learn science with personal and communal integrity. The focus of our graduate programs is

so technically narrow as to almost exclude the possibility of future professors learning the craft of helping future university students learn science with personal and communal integrity, so as to be qualified to use science to promote personal and communal integrity.

Our problems are not due to a lack of commitment to our professional ideals. They are not due to a lack of funding to carry out well conceived programs. Rather our problems are rooted in the alienation generated by our inappropriate affirmations of our instrumental ideals. We have modernized our technologies, but not our affirmations of ideals and values in terms of which we set our professional priorities. Our inappropriate affirmations generate alienation.

For years scientists strived for objectivity in all their activities. Carried to the extreme this led to avoiding activities in which strict objectivity could not be maintained. Since our most essential human activities can not be carried out objectively, this ideal resulted in about as much pretense as objectivity. Formulating ideals and setting priorities involves making value judgments in ways which can not possibly be objective. Every instructor's assignment originated in non-objective behavior. Even evasions of this embarrassing fact of life also involve non-objective behavior.

The Manhattan Project involved most of our creative physicists in non-objective behavior which was guided by non-scientific ideals and non-scientific theories about human nature and behavior. After their "objective success" those physicists became leaders in the rapid expansion of our programs of graduate science education. The instrumental ideals and theories which guided them during the Manhattan Project continued to guide their behavior as leaders in the expansion of our graduate science programs. The world-wide dis-integrative costs are now becoming evident.

Our crisis in science education is rooted in the most cherished ideals of the professors in our graduate science programs. Scientists need to deal openly and honestly with the social implications of their professional ideals and instructional behavior, especially as their affirmations of their ideals inhibit personal and communal integrity.

The most essential human value is integrity. Without personal and communal integrity people and communities do not survive. Personal and communal integrity pertain to enjoying the kind of wholeness within which all interacting components work together in a creative, coherent, cooperative way. People and communities that are torn apart by internalized conflicts in ideals tragically lack integrity, and experience frustration and violence. Their survival is always in doubt. They do not enjoy security, the freedom to be vulnerable, because they lack integrity.

Too often our graduate science programs have done violence to our most sensitive and creative students' integrity. Too often Ph.D. recipients have not included the personally most sensitive and creative students who left graduate school in order to preserve their personal integrity. Those who have stuck it out by compromising their personal integrity have become members of a generation of science professors who do not

perceive the roots of our crisis in science education.

Our research dominated teaching universities have trained a whole generation of scientists who are ideologically biased in favor of narrow specialization, and so are insensitive to the importance of personal and communal integrity. Tragically and ironically this impersonal bias is the fruit of a compulsive dedication to objectivity which was sincerely intended as a means of avoiding all bias. Clearly we need to commit ourselves to new, more integrative ideals. All our ideals are at stake. Alienative ideals can not survive for long in our nuclear age. Let us cooperate in a search for integrative ideals under which we can survive.

(1) J. B. Wiesner H.F. York, *Sci. Amer.* 211 (No. 4), 27 (1964)

(2) The Tragedy of the Commons Revisited, B. L. Crowe, *Science* 166, 1103 (1969)

LETTERS TO THE EDITOR

ON THE PRESIDENT "RAYGUN" CARTOON

Editor's note: Professor Herman was quite upset about the cartoon published in *Physics & Society* 13 (3), 7 (1984). His letter, as well as replies from Leo Sartori, Forum Chair person, and Mildred Dresselhaus, President of APS, follow. The cartoon was inspired by a piece of graffiti I saw on a fence on my way to the session "Space and International Security" at the May, 1984 AAAS Meeting in New York City. The graffiti showed a western cowboy shooting from the hip, and underneath was scrawled "President Raygun." The cartoon resulted from my doodlings at the session. Based on the questions and comments to the speakers, the cartoon accurately reflected the concerns of the majority of the audience. While the cartoon is indeed an attack on the Star Wars proposal, it was not meant to be a personal attack on President Reagan. For those who thought the latter, I apologize.

It is difficult to toe the line between physics and society in *Physics & Society*. *Physics & Society* is a forum for discussing the problems that both physics and society face. The Strategic Defense Initiative is one problem. The central issues of the Strategic Defense Initiative are these: will it work, does it jeopardize the ABM Treaty, is it destabilizing, will it drain research money from other areas, and will it fuel the arms race. As Carl von Weizsacker eloquently stated, the real problem facing physics and society lies "...in transforming the political order of the world, which in its present form makes the misuse of scientific knowledge almost inevitable." How do physicists prevent this misuse?

1. Carl von Weizsacker, *The Unity of Nature*, (New York: Farrar, Straus and Giroux, 1980), p. 17.

I am writing to express my objection to an isolated aspect of the July, 1984 issue of *Physics and Society*, the Newsletter of the Forum on Physics and Society of the American Physical Society.

Most of the material appearing in this newsletter appears to be informative, in that it contains ostensibly objective discussions on issues of public interest in which physics or physicists' incisive modes of thinking can play a useful role in their analysis and the formulation of related public policy. I have trusted, therefore, that this newsletter is not simply a propaganda outlet for one or another political faction within the APS membership. Such trust, on my part, was rudely shown to be naive through the appearance of the political cartoon on p. 7 (lower right column in the July, 1984 issue) which appears to be politically attacking the overall defense philosophy of the present administration (and by and large, those of the past four decades) and personally attacking its president.

There do exist, after all, some reasonable individuals both within and outside of the physics community who -- citing a fairly long historic perspective -- regard military preparedness in situations such as that in which the world finds itself today as being an effective deterrent [sic] to all-out war. The cartoon in question makes a statement on this philosophy in a non-objective, propagandistic and personal manner, and as such several questions having serious implications for the APS arise:

1. Does this Newsletter belong to only one end of the political spectrum? If so,
2. Can we as physicists, and the general public, trust the articles in this Newsletter to be reasonably objective?
3. Is the APS becoming a political entity with *Physics and Society* being its medium for propaganda?
4. Can the public at large rely upon the thinking of members of the physics community to be truly objective, in light of an overt political bias as represented in this APS publication?
5. Are the nonprofit status or other legal positions of the APS jeopardized by political statements appearing in the Newsletter of one of its divisions?

I, for one, am upset enough to resign my membership in the Forum, but resignation is rarely effective. So I shall simply indicate my displeasure at what at best is an editorial misjudgment [sic] or at worst is a deliberate entry into partisan politics, trusting that appropriate forces will prevent reoccurrences [sic] of this type. The APS in general and the Forum in particular must require objective styles of reporting and analysis.

Roger M. Herman, Professor of Physics
Pennsylvania State University,
University Park, PA 16802
30 Aug. 1984

In response to your August 30 letter to Leo Sartori, regarding the July 1984 issue of "Physics and Society", I find it regrettable that the political cartoon on p. 7 upset you to the extent that you considered resigning from the Forum. Fortunately, however, you realize how much more effective you can be as a participating member of the Forum.

In your first question you ask whether this Newsletter belongs only to one end of the political spectrum. It should not. Especially in areas where there is no clear consensus, an effort should be made to give an objective accounting of issues concerning science policy.

In answer to your second question, "Can we as physicists, and the general public, trust the articles in this Newsletter to be reasonably objective," I would hope so.

In your third question, "Is the APS becoming a political entity with "Physics and Society" being its medium for propaganda?" I say, certainly not. Not only the Forum, but also the Panel on Public Affairs and the International Physics Group are all responsive to a need for the physics community to serve a useful role in the making of related public policy. We must remember that when we venture outside our proven areas of expertise, that of physics, we do so as amateurs, and we do so at the request of the general public, out of a sense of public service. The APS general membership probably comprises as wide a range of political opinion as does American society outside the physics community. Perhaps the Forum needs to make a more conscious effort to present a balanced viewpoint.

In your fourth question you ask, "Can the public at large rely upon the thinking of members of the physics community to be truly objective, in light of an overt political bias as represented in this APS publication?" Presumably, this is an internal newsletter. However, there is always the danger of biased viewpoints getting into the press.

Thank you for not resigning from the Forum. It is important for people like you to participate and to help achieve a more balanced viewpoint.

Mildred S. Dresselhaus, Physics Department
MIT, Cambridge, MA 02139
19 Sept. 84

I agree entirely with the point made in your letter: the cartoon in question was inappropriate for the Forum Newsletter, both as to content and as to style. On behalf of the Forum I apologize to you and to anyone else who may have been offended.

I am glad that you recognize this to be an isolated incident. Although the Forum does not shrink from addressing politically sensitive

issues, we are mindful of our responsibilities as an arm of the APS. We strive to present a broad spectrum of views in our symposia, and to be as objective as possible in our Newsletter. I believe that most of the time we succeed, but clearly in this instance we did not. I can assure you that this does not represent "deliberate entry into partisan politics" on the part of the Forum Executive Committee.

Leo Sartori, Chairperson
Forum on Physics & Society
Physics Dept.
University of Nebraska
Lincoln, NE 68588
9 Oct. 1984

QUOTE WITHOUT COMMENT

"The Views of Abrahamson (new chief of Strategic Defense Initiative) might be called optimistic. They might also be seen as a continuance of the obsessive view that weapons are the principal means (for Ronald Reagan, the **only** means) of responding to the Soviet Union." This is from an editorial by John Rigden, Editor, *American Journal of Physics* 52 (11), 969 (1984).

COMMITTEE ON OPPORTUNITIES IN PHYSICS

A Report on the 7 Sept. 1984 COP Meeting by Israel Jacobs, General Electric Corporate R&D, Schenectady, NY 12301

The COP has been urged by President Mildred Dresselhaus to resume an oversight role on physics manpower questions, one of its earliest rationales for existence. To this end a two-hour discussion took place with Beverly Porter who directs AIP Manpower Statistics Division. COP members were struck by the multitude of questions raised by such studies, e.g. impact of the growing foreign graduate student component in physics departments, evolving ages distributions in academia as affected by changes in retirement rules and academic policies. A notable (and depressing) feature is the negligible increase in the number of PhD's awarded to women in physics, especially in contrast to chemistry, engineering and life sciences. The AIP staff has just started to gather salary data. COP members felt that more of this information should be available to students and to faculty who counsel them. An effort will be made to develop a suitable package for dissemination. Linwood Lee will work with Beverly Porter on this project.

With joint sponsorship from the Forum, the COP ran a successful symposium on the Small Business Innovative Research (SBIR) Programs at the March meeting in Detroit. Thanks go to Tom Moss who put this together and we can report a number of compliments on the session. The SBIR Programs can indeed have positive effects in academia, on funding for graduate students and consulting for faculty. Following on the heels of a COP-Forum Symposium on "University/Industry Partnership-Opportunities and Risks" at the San Francisco (11/83) meeting, the committee felt that we should pause in this area of effort.

COP will re-establish liaison contact with the APS Committee on Education and new member Jill Wittels will take this assignment. In the past, there have been a number of common interests and joint sub-committees.

The Committee examined several ombudsman role cases. As usual these are difficult and require tact and sensitivity. Although the scope of action chosen by COP is rather limited there is a growing body of evidence that its "expressions of interest" in such cases do have a beneficial effect. In addition, the Committee receives important support in this limited ombudsman role from responsible APS officers.

Consideration of ombudsman cases has led COP to examine recent Sigma Xi concerns about "Honor in Science" (see article in *American Scientist*, 71, 462 Sept.-Oct. 1983, and editorial in Jan.-Feb. 1984 issue). These focus on growing evidence of scientific fraud, unprofessional behavior in peer review of proposals and publications, irresponsible authorship, etc. The committee agreed to make contact with Sigma Xi and follows its effort closely in this area. Paul Zweifel and Roland Good are taking this assignment.

Lastly, Chairman Joseph Budnick reported on a request from the APS Committee on Committees for a review of COP functions in order to justify the continuing existence of COP. He will work on a response, with the help of COP former Chairmen Ralph Alpher and Israel Jacobs.

CIFS Report

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 133 Small Committee members helping 74 oppressed scientists. Except for one scientist in Poland, the rest of those currently being helped are in the Soviet Union. In the past we have also helped those in Argentina.

Petitions were signed on behalf of Alexander Paritsky at the American Physical Society Meeting in Detroit, Michigan, March 26-30, 1984 and on behalf of Yacov Alpert at the annual meeting of the American Physical Society Plasma Physics Division in Boston on October 29 - November 2, 1984. We also helped in obtaining signatures on behalf of Yuri Tarnopolsky at the American Chemical Society National Meetings in St. Louis in April, 1984, and Philadelphia in August, 1984.

The Soviet situation is particularly bleak today. Almost no one gets out. This past year, only one of the Soviet refuseniks, Valery Godyak, was allowed to emigrate, and he now lives in New York City. Correspondence with oppressed scientists in the Soviet Union still 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.

If you would be interested in participating in this work, please contact Dr. Julian Hecklen, Coordinator, Small Committees, Committee on the International Freedom of Scientists, American Physical Society, Dept. of Chemistry, 152 Davey Laboratory, The Pennsylvania State University, University Park, Pa., 16802.

To save one soul is to create a universe.

FORUM NEWS

New Books by Forum members:

Waging Nuclear Peace by Robert Ehrlich, George Mason University. This is an interdisciplinary survey of the issues surrounding nuclear war. Includes the following sections: Introduction to the Issues, Nuclear Arms and Nuclear War, The Effects of Nuclear War, and Policy Options and Objectives. Available from SUNY Press, 300 Raritan Center Parkway, Edison, NY 08818, 336 pp. \$12.95 paper, \$39.50 hardcover.

Science, Technology and the Nuclear Arms Race by Dietrich Schroerer, University of North Carolina. This text is based on a course developed and taught by Schroerer since 1976. The book is aimed at non-scientists and its purpose is to provide students with a feeling for the nuclear arms race. There are qualitative descriptions of weapons technologies and of the science on which they are based, technology assessments, order of magnitude estimates of weapons effects, and simple calculations and discussions of the implications of weapons technologies and ways to control them. Available from John Wiley and Sons, New York.

Physics and the Nuclear Arms Race: Selected Reprints edited by Dietrich Schroerer and John Dowling. Includes reprints of important articles which deal with "Physics and the Nuclear Arms Race." Gathers together important papers of use to physicists who teach courses on this subject. 159 pp. Available from AAPT Publications, Dept. of Physics and Astronomy, University of Maryland, College Park, MD 20742. \$5 in U.S., \$6 outside U.S.

MIDGETMAN STUDY

The Land-based missiles subgroup of the Forum Arms Control study is in the process of reconstituting itself and becoming active again. They will be primarily concerned with a study on Midgetman (SICM, Small Intercontinental Ballistic Missiles).

Herb Nelson
Code 6110
Naval Research Laboratory
Washington, DC 20375-5000
202-767-2037

FORUM ELECTIONS

Now is the time for all good Forum members to elect their officers. This year the offices of Vice-Chairperson and three Executive Committee Members are up for election. This issue of Physics and Society features a centerfold which contains a ballot for the Forum elections as well as an application for Forum membership (which you as a Forum member should give to your APS friends and encourage them to join). The ballot can be folded and is already addressed. Please return it to Peter Zimmerman, 7208 Ludwood Ct., Alexandria, VA 22306 before 1 March 1985. The Forum wishes to thank this year's nominating committee chaired by Paul Horwitz, and aided by Carol Crannell, Bryan Schwartz, and Ken Ford.

PAUL CRAIG: VICE-CHAIRPERSON

Background: Currently Professor, Department of Applied Science, University of California, Davis and faculty associate at the Lawrence Berkeley Laboratory. B.S. Physics from Haverford College, 1954. Ph.D. CalTech, 1959 (cryogenics). (Unclassified) basic research at Los Alamos 1959-1962; Brookhaven National Laboratory 1962-1971. Guggenheim Fellow (Mossbauer Effect), 1965-66; National Science Foundation (mostly in the Office of Energy R&D Policy) 1971-75. University of California, 1975-. In 1972-73 I was a member of POPA. I have served on the Board of Directors and the Executive Committee of the Environmental Defense Fund. My current research interests are energy and the arms race. Co-author (with Prof. John Jugerman) of text *Nuclear Arms Race: Technology and Society*, to be published by McGraw-Hill in 1985.

Statement: I believe that the Forum is now playing a significant role within the APS. The Forum provides visibility within APS for social concerns which many physicists feel, but which find limited outlet in APS technical sections. I would like to see the Forum play a more active role in developing more sessions at APS meetings. My own highest priority is the arms race (where the Forum has been especially active), but this should be only one of many areas. The Forum should work to develop sessions on the social implications of physics in areas relating to emerging technologies (e.g. automation, robotics, electronic communications, cheap sensing devices, cheap computing).

I would also like to see the Forum work with the APS council to develop higher visibility in Washington. The Forum could work with Congressional staff to assist in structuring balanced hearings on issues of importance to the physics community. My experience in Washington should prove useful in developing this area.

GERALD WHEELER: VICE-CHAIRPERSON

Background: Gerald Wheeler is an Associate Professor of Physics at Montana State University at Bozeman, Montana 59717 and is currently a W.K. Kellogg Fellow studying Arms Control. He has been directly involved with over 100 television programs featuring some aspect of science. He is a physics consultant for Children's Television Workshop, chair of the AIP Committee on Public Information and Education, and a former Chairperson of the AAPT's Committee on Science Education for the general public. He received his Ph.D. in experimental nuclear physics from SUNY, at Stony Brook. He has writ-

ten two teacher's guides for elementary teachers, a physics textbook for nonscience majors and has a chapter in an upcoming book from AAAS on the connection between science and media.

Statement: I believe the Forum has four goals: 1. To facilitate participation of its members in public affairs. 2. To inform the physics community about science/technical issues embedded in social issues. 3. To promote studies that will further society's knowledge about such technical issues. 4. To take on active leadership role in transmitting this knowledge to the general public.

The Forum has succeeded in the first three; the fourth needs our attention. I think the Forum stands at a unique position to capitalize on this fourth goal. There appears to be a "window" right now in the public's attitude about the importance of a scientific/technological literacy. This awareness will only last for a short time. We have to react, and most important react correctly to this condition. The Forum needs a leader who will keep up the pace of previous activities that capitalize on the movement. How we react will be as crucial as what we say. Too often in the past physicists have had an important message that was unheard because they failed to realize how to communicate.

I feel that my background in Physics and my expertise in communicating science to the public prepares me to carry out the goals as stated.

ARON M. BERNSTEIN: EXECUTIVE COMMITTEE

Background: Professor of Physics at MIT working in experimental nuclear physics, specializing in intermediate energy electromagnetic interactions using the MIT/BATES Electron Linear Accelerator. Ph.D. University of Pennsylvania, 1957; postdoc at Princeton University 1957-61. MIT faculty from 1961 to date. Guggenheim Foundation Fellowship 1968-1969 while on sabbatical at GEN, Saclay, France. Forum related activities include teaching undergraduate seminar on the nuclear arms race for the last three years, conducting undergraduate research projects on the nuclear arms race, both with Phil Morrison. Chairs the MIT Faculty Disarmament Study Group which has included faculty seminars and Institute programs such as the Nov. 11th Convocations, and speaking on the nuclear arms race in colleges and public forums.

Statement: The nuclear arms race is a race to oblivion. It is important to analyze the political, historical and technical issues and propose realistic solutions. This is a process which will take time, just as getting into the present situation evolved over a long period. The talents of the American physics community are important in this endeavor. Indeed, many prominent members of our profession have been actively involved. It is important for the APS to play its role in sponsoring meetings and study groups. Since the problem is complex it would be useful for the APS to join with other professional societies in working in this arena. As a member of the Forum Executive Committee I would give my priority to programs which are educational,

analytical, or which deal with ideas to reverse the nuclear arms race. I would also support other programs which deal with issues such as energy conservation and physics education.

AVIVA BRECHER: EXECUTIVE COMMITTEE

Background: Aviva Brecher obtained her B.S. and M.S. in Physics from MIT in 1968 and her Ph.D. in Applied Physics from U.C. (S.D.) in 1972. Her professional career has included academic research in Earth and Planetary Sciences at MIT, teaching physics at MIT and Wellesley College, and technical consulting at Arthur D. Little, Inc. Her consulting work has focused on risk analysis and systems analysis for geotechnical and nuclear applications, such as modeling the nuclear waste package performance in mined repositories and evaluating transportation safety for nuclear waste. Her work on such technical issues with major social impacts and related policy analyses (e.g., in support of EPA radiation standards regulations and of the National Waste Policy Act of 1982) have led to more active involvement in public policy, as a 1984 APS Congressional Science Fellow. In Sen. Paul Tsongas' (D-Ma.) office, she has worked on space arms control legislation, including amendments to constrain antisatellite weapons testing and star-wars programs. Other high-tech legislation to which she contributed included an Agency for Technological Innovation proposal, the Computer Security and Education Act of 1984 and an analysis of Acid Rain Control legislative initiatives.

Statement: As a member of the Forum's Executive Committee I pledge to continue the public outreach and education work on hi-tech issues with major social repercussions, with the benefit of my recent experience as an APS Congressional Scientist. While on the Hill I have organized tutorials on Star Wars issues for Senators and their staff, participated in a staff/lobbyist Space Policy Working Group, helped organize hearings and initiate OTA studies to assess Star Wars technologies and the social-political implications which affect the APS constituency; the Space Station development and the future of space sciences; the privatization of university research funding; the future of energy production and research; the rate of conversion of science majors to computer-science majors. I view such a diversification of the Forum agenda as a transition from Weapons to Hope. I believe that, as a result, a larger and younger fraction of the APS community will become interested and involved in Forum activities.

IRENE M. ENGLE: EXECUTIVE COMMITTEE

Background: Irene M. Engle obtained her B. S., M. S., and Ph.D. degrees from the Pennsylvania State University. During her career as a student (1960-1970) she took time out to teach (Ripon College in Wisconsin, a Penn State branch campus, and Juniata College) and to work in a Navy laboratory. Her research interests have ranged from structural vibrations, electronic properties

of metals, nucleon electromagnetic structure, and planetary magnetospheric physics to the physics of imaging of extraterrestrial objects. She is currently a tenured civilian faculty member in the Physics Department, Michelson Laboratory of the U.S. Naval Academy in Annapolis, MD 21402. She is an active member of the American Geophysical Union and of the Washington Area Astronomers. During the past several years, she has been creating and presenting mini-courses for gifted middle-school youngsters. She has even served a short moonlighting tour as a substitute teacher of physics in the local high school when the regular teacher was immobilized for a month. She has served on the APS Committee on the Status of Women in Physics for the past 4 years and is the founding editor (now managing editor) of the CSWP Gazette, the quarterly newsletter of that committee. She has been in charge of the expanding Roster of Women in Physics and is the coordinator of the APS direct mail service which uses the Roster as its data base. She recently began a 3-year term as the APS representative to the Advisory Committee of the AIP Manpower Commission.

Statement: The Forum has been active in analysis of many complex technical problems whose resolutions are important, if not crucial, to successful continuance of our society and way of life. All too often, issues have two or more honestly conflicting points of view. In many, if not in most cases, personal values not specifically relevant to the technical questions determine the position of an individual on an issue. Not surprisingly, the most effective communicators of the technical points in support of a point of view are those whose personal value systems are consonant with the point of view. In the past, the Forum has been successful in gathering articulate defenders of opposing viewpoints so fellow physicists may be educated in as balanced a manner as is reasonably feasible. In this, it has been serving one need of members of the Society. I would like to see these programs continued and expanded. Furthermore, I would like to see the Forum attempt to go one step beyond its past activities by serving some needs of non-physicist society members. Objective reportings of technical options, the pros and cons of opposing solutions and their values, communicated in non-specialist language, from a source whose veracity could be relied upon, could prove extremely beneficial to the public. For example, meaningful information concerning alternative energy sources, all their costs, environmental impacts, and vulnerabilities to non-domestic market and political conditions, should help all come to reasonable decisions in specific cases where choices must be made. This is admittedly a tall order, but I would like to see the Forum increase its action as a public information service on issues where physicists have particular special expertise.

LAWRENCE KRAUSS: EXECUTIVE COMMITTEE

Background: Lawrence Krauss obtained his B.Sc. Hons. in Mathematics and Physics from Carleton University in Ottawa, Canada, in 1977. He obtained his Ph.D. in Physics from M.I.T. in 1982. Since then he has been a Junior Fellow of the Harvard Society of Fellows and the Physics

Department of Harvard University. He has been active in issues of Science and Society, focusing most recently on the issues of nuclear war. He was a local organizer of the Union of Concerned Scientists; Convocation Against Nuclear War in 1981. He also organized a letter sent by 20 prominent physicists to President Reagan in the same year, and has written a variety of popular pieces on the subject of nuclear war. Among the positions he has held are included: Board of Directors, Canadian Ass'n of Physicists, 1977; APS Forum Awards Committee, 1983; and regional coordinator for the new international petition of physicists on a nuclear weapons freeze, 1983. He was awarded the first prize by the Gravity Research Foundation in 1984.

Statement: I believe that the Forum must take a stronger position as the voice of the APS on issues of science and society, and also must make a more active effort to recruit and communicate to the younger generation of physicists who have recently completed their studies. Active liaison with other science and society groups which include physicists should be maintained and improved. I also believe that the Forum should go beyond the Annual APS meetings and consider organizing regional and/or summer meetings to help train physicists to lecture on issues such as nuclear war.

HERB NELSON: EXECUTIVE COMMITTEE

Background: Herb Nelson has been in the Naval Research Lab in Washington (Code 6110, Naval Research Lab, Washington, DC 20375) since 1980, first as an NRC postdoc, then as a staff member. He received his Ph.D. in physical chemistry from the University of California at Berkeley in 1980. He was a member of the subgroup on land-based missile vulnerability of the Forum Arms Control Study Project. He is co-ordinator of a proposed study on the Midgetman Missile.

Statement: I first became involved in Forum affairs through my interest in arms control issues, specifically the Forum studies on arms control. This kind of informal study group is an excellent method for attracting involvement of all Forum members in the workings of the Forum and in the study of pressing questions of public policy. I would therefore hope to expand the number of studies both in the areas currently covered and in the emerging areas such as technological transfer, classification and education.

As Forum members become better informed about a variety of scientific and policy issues we will have fulfilled one of the primary functions of the Forum. We will have created a core group of informed, interested people in the physics community who can disseminate this knowledge through their interactions with their colleagues.

MARK SAKITT: EXECUTIVE COMMITTEE

Background: Mark Sakitt is a Senior Scientist at the Brookhaven National Laboratory, Upton, NY 11973 where he does research in experimental high energy physics. He is on the Advisory Board of the SUNY-Stony Brook Arms Control, Disarmament and Peace Studies Resource Center and

currently teaches a course, at the university on "Nuclear War; Technology Strategy and Arms Control." He is on the APS Forum's Committee to Study Feasibility of Arms Control Studies. He received his Ph.D. in Physics from the University of Maryland in 1964 and is a Fellow of the APS.

Statement: The Forum has three major functions concerning the technological aspects of societal problems, and while my personal interest is in the field of arms control, I believe these functions apply to a more general class of problems.

The first function is to inform and engage the interest of the membership on critical problems like the arms race. In addition to maintaining active Forum sessions at APS meetings, we should consider topical mini-conferences.

The second function is to assist and encourage members who wish to work on the educational aspects of these problems by, for example, developing academic courses. In addition to the excellent short courses that the Forum runs, we should consider acting as a resource, utilizing the existing experience to help new entries into this field.

The third function is to act as an avenue for those who would like to work professionally on these problems, either on a part-time basis or during sabbatical periods. An active series of useful appropriate small studies should be pursued by the Forum to involve those seriously interested in entering this work. In addition, information about opportunities where existing institutions, active in this field, welcome collaboration or offer temporary positions for sabbatical periods, should be publicized.

FORUM SESSIONS

Physics and Public Policy: Arms and Security Invited session for the Toronto meeting of the American Physical Society. Organized by the Forum on Physics and Society. Chaired by Fred L. Wilson, College of Liberal Arts, Rochester Institute of Technology, 1 Lomb Memorial Drive, Rochester, NY 14623 (716) 475-6204.

A. Policy Questions in the Changing Antisubmarine Environment. M. Sakitt, Brookhaven National Laboratory, Upton and The Arms Control, Disarmament, Peace Studies Resource Center, SUNY-Stony Brook.

B. The Role of Modeling and Predictions in Formulating Security Strategies. Alvin M. Saperstein, Wayne State University, Detroit. (30 min.)

C. "Restraining the Qualitative Arms Race Through Test Restraints" Martin B. Einhorn, University of Michigan, Ann Arbor.

D. Physics, Education and National Security Policy Lester G. Paldy, State University of New York at Stony Brook, Stony Brook, NY.

CANADIAN PERSPECTIVES ON ENERGY
Toronto APS Plenary Session, January 20-24, 1985

SESSION CHAIRMAN
Prof. Allan Griffin
Physics Department
University of Toronto

ENERGY PLANNING FOR CANADA
Dr. Robb Wright, Director General
Energy Strategy Branch (13th Floor)
Department of Energy, Mines and Resources

**THE POTENTIAL FOR CONSERVATION
IN CANADA**
Dr. Graham Armstrong
Energy Conservation and Oil Substitution Branch
Department of Energy, Mines and Resources

THE JAMES BAY HYDROELECTRIC PROJECT
Mr. Guy Larocque, Manager
Society Energy de la Bay James

Forum Session at Baltimore Meeting March 1985
The Electromagnetic Pulse from Nuclear Explosions: Generation and Consequences

Chairperson: Bernard R. Cooper
Department of Physics
West Virginia University
P. O. Box 6023
Morgantown, WV 26506-6023

1. "Generation of EMP" Conrad L. Longmire, Mission Research Corporation, P. O. Drawer 719, Santa Barbara, CA 93102, 805-963-8761

2. "The 1962 Honolulu EMP Event" John R. Mattox, High Energy Physics Laboratory, Stanford University, Stanford, CA 94303, 415-497-1061

3. "Estimating Vulnerability to Electromagnetic Pulse Effects" John M. Richardson, National Academy of Sciences, 2101 Constitution Avenue, Washington, DC 20418, 202-334-3344

4. "EMP Hardening of Telecommunications" Joseph Mileta, Harry Diamond Laboratory, 2800 Powder Mill Road, Adelphi, MD 20783, 703-490-2303

Contributed Paper Session at the April Washington Meeting.

As you may or may not know, the annual April "Washington" meeting is in neither Washington or Baltimore, it's in Crystal City, Virginia. Fortunately for those of you who like Washington, Crystal City is only a Metro stop or two away from all that the Capital city has to offer. Every year the Forum encourages its members to submit a paper to a special Forum contributed paper session. If you have a paper dealing with any aspect of Physics and Society, e.g., energy, education, arms control, scientific freedom, etc., please submit the usual abstract by 1 February 1985 to APS. The meeting this year is from 24 to 27 April 1985.

SHORT COURSE
ENERGY SOURCES:
CONSERVATION AND RENEWABLES

(Saturday/Sunday, April 27-28, 1985, OTA Conference Room after APS/DC Meeting)

A decade has passed since the oil embargo of 1973-4. The use of energy will continue to affect world security, economics and the environment. In 1974 the American Physical Society conducted a study on EFFICIENT USES OF ENERGY (AIP Conference Series 25, the most popular AIP book sold) which indicated useful ways to apply physics and technology to reduce the energy problem. The faculty for the Short Course are nationally-renowned "experts" in their fields of study. They will discuss the progress and possible future directions in conservation (enhanced end-use efficiency) and in renewable resources. The workshop is intended for a physics-based audience in that we will emphasize equations and data bases. The proceedings (about 500 pages) will be included in the cost of \$40. The workshop is being organized by David Hofemeister (Cal Poly U), Henry Kelly (Office of Technology Assessment), and Barbara Levi (Princeton), and it is sponsored by the Forum of the APS and the American Association of Physics Teachers.

LIST OF TOPICS

1. Reflections on 10 Years of Energy Policy; John Gibbons (OTA)
2. Responses and Planning a Decade after the Oil Embargo of 1973; Robb Socolow (Princeton)
3. Energy Efficiency in Buildings: Progress Since 1973 and Future Potential; Art Rosenfeld (LBL)
4. The Response of the Congress: New Laws; Ben Cooper (U.S. Senate)
5. Engineering/Economic End-Use Energy Models; Daniel Hamblin and Teresa Vineyard (ORNL)
6. Finding, and Fixing Heat Losses in Houses; Gautam Dutt (Princeton)
7. Heating, Ventilation, and Thermal Flows and Storage in Large Buildings; Art Rosenfeld/Bruce Birdsall (LBL)
8. Passive Solar; David Claridge (U. Colorado)
9. Indoor Air Pollution: Dependence on Sources, Ventilation Rates and Other Factors; Tony Nero/Richard Sextro (LBL)
10. Window Technologies; Steve Selkowitz (LBL)
11. Lighting Technologies; Sam Berman (LBL)
12. Appliances; Howard Geller (ACEEE)
13. Industrial Energy Conservation; Marc Ross (U. Michigan)
14. Potential for Energy Savings in Old and New Auto Engines; John Reitz (Ford)
15. Managing Electricity Demand Through Dynamic Pricing; Robert Peeddie (Elect. Dist Board)/Douglas Bulleit (ICS)
16. Cogeneration and Economics of Energy Conservation; Bob Williams (Princeton)
17. Photovoltaics; Paul Maycock (Photovoltaic Energy Systems)
18. Production of Liquids and Gases from Biological Feedstocks; Tom Bull (OTA)
19. Rural Electrification Using Small Hydro Installations; Pete Smith (Energenics Systems)
20. Wind Energy Systems; Lou Divone (DOE)
21. Ice Ponds; Ted Taylor (Nova)
22. Heat Pumps and ACES House; Ann Baxter (ORNL)
23. Technical Appendices

REGISTRATION FOR THE SHORT COURSE

The cost of \$40 will include a 500 page AIP book as well as a ticket to the conference. DON'T PROCRASTINATE AS ATTENDANCE WILL BE LIMITED TO ABOUT 100. Send your name, address, phone number, and a check for \$40 (made out to the American Physical Society) to David Hofemeister, 553 Serrano, San Luis Obispo, CA 93401; (805-544-5096).