

2008 APS April Meeting and HEDP/HEDLA Meeting

St. Louis, Missouri

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## **Saturday, April 12, 2008 10:45AM - 12:33PM –**

**Session B4 FEd FPS: How to Communicate Physics to the General Public Using Books and Articles** Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), Promenade B

**10:45AM B4.00001 Writing about, and teaching, physics for non-scientists** ART HOBSON, University of Arkansas — Physicists must communicate their knowledge to the general public because, as the American Association for the Advancement of Science puts it, “without a scientifically literate population, the outlook for a better world is not promising.” I’ll discuss what I’ve learned about writing for non-scientists from my physics textbook for non-science college students, *Physics: Concepts and Connections*, now in its fourth edition and in use on 130 campuses, and also from my bi-weekly hometown newspaper column. Lessons learned include the process of organizing and writing a textbook, tips for writing effective prose, dos and don’ts when writing for non-scientists, choice of subject matter, being relevant to the needs of non-scientists, and unifying one’s book through the use of such general themes as “the scientific process,” or “energy.” For real-world relevance, I suggest emphasizing physics-related social topics, and modern and contemporary physics. I highly recommend Michael Alley’s book *The Craft of Scientific Writing*, as well as Strunk and White’s timeless *Elements of Style*.

**11:21AM B4.00002 ABSTRACT WITHDRAWN –**

**11:57AM B4.00003 Explaining Science to non-Scientists**, MICHAEL LEMONICK, Princeton University, TIME Magazine — No abstract available.

## **Saturday, April 12, 2008 1:30PM - 3:18PM –**

**Session D6 FIP FPS: Panel Discussion: International Gender Issues in Physics** Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), Promenade D

**1:30PM D6.00001 Session Introduction**, ARTHUR BIENENSTOCK, APS President, Stanford University —

**1:35PM D6.00002 Women Physicists in the European Union : how Brussels is moving toward gender equality**, GIULIA PANCHERI, INFN Frascati National Laboratories — The policies of the European Union towards gender equality in science occupation will be discussed along three aspects: 1. Current statistics recently published by the EU will be illustrated with some comparison with similar US statistics. The latest recommendations of the Helsinki group will be presented, together with the conclusions of the Women in Science meetings organized by the EU. 2. The implementation of these recommendations will be illustrated by this speaker’s experience both as independent expert for Physics Research Programs for the European Commission for the last 10 years, as well as from the point of view of having been European Coordinator of three Research Networks in Theoretical Physics from 1992 until 2006: the impact of this on young women students will be described. 3. National policies enforced through the Equal Opportunity Committees will be illustrated, with the specific case of the Affirmative Actions of Italian INFN Equal Opportunity Committee and their impact on hiring and promotion of women physicists.

**2:01PM D6.00003 Keeping Women in Physics**, MEG URRY, Yale University — In the United States women constitute a steadily increasing fraction of scientists in all fields, but progress in Physics is much slower than in other fields. Utilizing the best available talent, including women, is vital to our future prosperity and security. I discuss some of the myths and realities about why the numbers of women are low, and what steps can be taken to improve the situation. I will argue that we do not so much need to, as a colleague recently suggested to me, “pull them by the hair” to get women into Physics - rather, we need to avoid pushing them out.

**2:27PM D6.00004 Women in Physics in Latin America: why so few in leadership positions?**, MARCIA BARBOSA, Universidade Federal do Rio Grande do Sul — Women are greatly under-represented in physics in Latin America. Among all sciences, physics is the field where the increase in the number of women has been particularly slow. Because of this imbalance, many bright young people do not receive the opportunity to learn about physics and to prepare themselves for a physics career, and others are discouraged from doing so. However, the problems is not only that girls are not attracted to go to physics, they few ones that decide to follow the career find difficulties in funding and in promotions. We show that women in Latin America leave physics disproportionately with each step of career advance. Moreover, we also show that in many cases the promotion process exclude women with the same abilities of men. But, why should we care about this problem? Why should women be in physics after all? Women that have a passion for physics should be able to make a living and have a successful career in this field. But, the need of gender balance in science, it is not only a equal opportunity issue. Physics need a greater participation of female researchers in order to survive. Science is changing and it is becoming more interdisciplinary. This evolution is only possible through diversity of thought and of strategies to approach problems. Therefore, excluding women more than limiting the available pool of talented people to half of humanity, we are limiting diversity. Finally, in a society where technology is becoming quite important and is governing our everyday life and where women are highly involved in the educational process, exposing women to science generates a more scientific literate public. We show that the implementation of a few affirmative action strategies bring more balance to the promotion process.

**2:53PM D6.00005 Panel Discussion –**

## **Sunday, April 13, 2008 10:45AM - 12:33PM –**

**Session J3 FHP FPS: Los Alamos and the Manhattan Project: 65th Anniversary (Followed by Panel Discussion)** Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), St. Louis E

**10:45AM J3.00001 A History Worth Preserving** , CYNTHIA KELLY — The Manhattan Project transformed the course of American and world history, science, politics and society. If we can read about this in books and watch History Channel documentaries, why do we need to preserve some of the properties of this enormous undertaking? The presentation, "A History Worth Preserving," will address why some of the physical properties need to be preserved and which ones we are struggling to maintain for future generations. The story of this effort begins in 1997 as the Department of Energy was posed to demolish the last remaining Manhattan Project properties at the Los Alamos laboratory. Located deep behind security fences, the "V Site's" asbestos-shingled wooden buildings looked like humble garages with over-sized wooden doors. The "V Site" properties were almost lost twice, first to bulldozers and then the Cerro Grande fire of 2000. Now, visitors can stand inside the building where J. Robert Oppenheimer and his crew once worked and imagine the Trinity "gadget" hanging from its hoist shortly before it ushered in the Atomic Age on July 16, 1945. As Richard Rhodes has commented, we preserve what we value of the physical past because it specifically embodies our social past. But many challenge whether the Manhattan Project properties ought to be preserved. Rather than recognize the Manhattan Project as a great achievement worthy of commemoration, some see it as a regrettable event, producing an instrument to take man's inhumanity to man to extremes. While these divergent views will no doubt persist, the significance of the Manhattan Project in producing the world's first atomic bombs is irrefutable. Preserving some of its tangible remains is essential so that future generations can understand what the undertaking entailed from its humble wooden sheds to enormous first-of-a-kind industrial plants with 125,000 people working in secret and living in frontier-like communities. With continuing pressure for their demolition, what progress has been made in preserving some properties of the Manhattan Project? The presentation will share the handful of remaining properties that we believe are needed to tell the story of the Manhattan Project. It will share our successes, what is still at risk, and the on-going struggle to preserve this history.

**11:21AM J3.00002 Recollections of a very junior physicist at Los Alamos, 1944-1946** , ANTHONY P. FRENCH, Massachusetts Institute of Technology — The author came to Los Alamos as a member of the British Mission after two years of making fission cross section measurements at the Cavendish Laboratory. He worked in a group headed by Egon Bretscher in Enrico Fermi's F Division. The talk presents his personal memories and experiences at Los Alamos as compared to his life and work in wartime Britain.

**11:57AM J3.00003 Panel Discussion among Physicist Alumni of the Manhattan Project.** , DAVID C. CASSIDY<sup>1</sup>, Hofstra University — Discussion among former participants in the Manhattan Project.

<sup>1</sup>Moderator

## **Sunday, April 13, 2008 1:30PM - 3:18PM –**

**Session L6 FPS: Nuclear Forensics** Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), Promenade

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**1:30PM L6.00001 TBD** , MICHAEL K. EVENSON, Defense Threat Reduction Agency — -

**2:06PM L6.00002 Nuclear Forensics: Report of the AAAS/APS Working Group** , BENN TANNENBAUM, AAAS — This report was produced by a Working Group of the American Physical Society's Program on Public Affairs in conjunction with the American Association for the Advancement of Science Center for Science, Technology and Security Policy. The primary purpose of this report is to provide the Congress, U.S. government agencies and other institutions involved in nuclear forensics with a clear unclassified statement of the state of the art of nuclear forensics; an assessment of its potential for preventing and identifying unattributed nuclear attacks; and identification of the policies, resources and human talent to fulfill that potential. In the course of its work, the Working Group observed that nuclear forensics was an essential part of the overall nuclear attribution process, which aims at identifying the origin of unidentified nuclear weapon material and, in the event, an unidentified nuclear explosion. A credible nuclear attribution capability and in particular nuclear forensics capability could deter essential participants in the chain of actors needed to smuggle nuclear weapon material or carry out a nuclear terrorist act and could also encourage states to better secure such materials and weapons. The Working Group also noted that nuclear forensics result would take some time to obtain and that neither internal coordination, nor international arrangements, nor the state of qualified personnel and needed equipment were currently enough to minimize the time needed to reach reliable results in an emergency such as would be caused by a nuclear detonation or the intercept of a weapon-size quantity of material. The Working Group assesses international cooperation to be crucial for forensics to work, since the material would likely come from inadequately documented foreign sources. In addition, international participation, if properly managed, could enhance the credibility of the deterrent effect of attribution. Finally the Working Group notes that the U.S. forensics capability involved a number of agencies and other groups that would have to cooperate rapidly in an emergency and that suitable exercises to ensure such cooperation were needed.

**2:42PM L6.00003 Nuclear Forensics and Attribution: A National Laboratory Perspective** , HOWARD L. HALL, Global Security Principal Directorate, Lawrence Livermore National Laboratory, P.O. Box 808 L-180, Livermore, CA 94550 — Current capabilities in technical nuclear forensics - the extraction of information from nuclear and/or radiological materials to support the attribution of a nuclear incident to material sources, transit routes, and ultimately perpetrator identity - derive largely from three sources: nuclear weapons testing and surveillance programs of the Cold War, advances in analytical chemistry and materials characterization techniques, and abilities to perform "conventional" forensics (e.g., fingerprints) on radiologically contaminated items. Leveraging that scientific infrastructure has provided a baseline capability to the nation, but we are only beginning to explore the scientific challenges that stand between today's capabilities and tomorrow's requirements. These scientific challenges include radically rethinking radioanalytical chemistry approaches, developing rapidly deployable sampling and analysis systems for field applications, and improving analytical instrumentation. Coupled with the ability to measure a signature faster or more exquisitely, we must also develop the ability to interpret those signatures for meaning. This requires understanding of the physics and chemistry of nuclear materials processes well beyond our current level - especially since we are unlikely to ever have direct access to all potential sources of nuclear threat materials.

## **Sunday, April 13, 2008 3:30PM - 5:18PM –**

**Session M6 FPS FGSA: Equipping Scientists to Run for Political Office** Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), Promenade D

**3:30PM M6.00001 Equipping Scientists to Run for Office: The Multi-Society Campaign Project** , FRANCIS SLAKEY, American Physical Society APS — No abstract available.

**3:40PM M6.00002 I WISH It Was Rocket Science: Lessons Learned from School Board Service<sup>1</sup>**, PHILIP W. HAMMER, The Franklin Institute — In this talk I will share my experience of election to the Haddon Heights, New Jersey Board of Education and my event-filled path to Board presidency. As a board member, I have worked with taxpayers, teachers, administrators, unions, fellow board members, students, and parents with the goal of improving public education in this small suburban district. In a state where every year the electorate simultaneously votes on their town's school budget, whether to increase their property taxes, and elect a new Board of Education, school board service presents a fascinating set of challenges and opportunities. I hope to convince other physicists that serving on their local school board is a great and personally rewarding way to have direct positive impact on local public education. I will also convey some important lessons learned about politics, education policy, and leadership.

<sup>1</sup>The author thanks the people of Haddon Heights for giving him the opportunity to serve.

**3:50PM M6.00003 State School Boards: Winning the Election and Achieving Your Goals**, MARSHALL BERMAN, NM State Board of Education — For political novices, planning an election campaign can be a difficult but potentially very rewarding activity. It is essential that you pick a qualified treasurer and a team dedicated to your goals and your election. Fund raising is usually minimal for this office. If you succeed in getting elected, you will face many challenges rarely connected to your scientific research, but often connected to the scientific method. You will again become a freshman. It is now essential that you gain the trust and confidence of your fellow Board members, and begin to move into committees, chairmanships, and possibly higher offices. You must learn to understand and work with other Board members. I will discuss my election campaign, and my subsequent four years on the New Mexico State Board of Education, including successes and areas of improvement.

**4:00PM M6.00004 TBA**, LESLEY STONE, Scientists and Engineers for America — This abstract not available.

**4:10PM M6.00005 Scientists Serving in Public Office**, MICHAEL FORTNER, State Representative for the 95th District of Illinois and Northern Illinois University — This abstract is not available.

**4:20PM M6.00006 Panel Discussion** —

**Monday, April 14, 2008 1:30PM - 4:30PM** —

**Session S6 FPS FHP: FPS/FHP Awards Session** Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), St. Louis H

**1:30PM S6.00001 Abraham Pais Award Lecture**, GERALD HOLTON, Harvard Univ — No abstract available.

**2:06PM S6.00002 Andrei Sakharov Prize**, LIANGYING XU, Chinese Academy of Sciences — Ever since my youth, the writings of Einstein had always enlightened my life. However, I later began to follow Marxism and threw myself into the Chinese revolution. Yet, ironically, after the victory of the revolution I myself became a target of the revolutionary dictatorship. Started from 1962 I collected, edited and translated "Collected Works of Einstein" in the countryside. Fourteen years later the three-volume collected works were published in China, which created immense impacts to Chinese intellectuals. It was Einstein's thoughts on human rights and democracy that awakened me. Since then I have devoted myself to the fight for human rights and to the cause of democratic enlightenment in China. My goal is to transform an autocratic China that tramples human rights into a democratic and free modern China that respects human rights.

**2:42PM S6.00003 Joseph A. Burton Forum Award: Nuclear Non-proliferation: the Future depends on us**, PIERRE GOLDSCHMIDT, Senior Associate at the Carnegie Endowment for International Peace —

**3:18PM S6.00004 Leo Szilard Lectureship Award**, ANATOLI DIAKOV, Moscow Institute of Physics and Technology — No abstract available.

**3:54PM S6.00005 Leo Szilard Lectureship Award Talk: Nuclear disarmament after the cold war**, PAVEL PODVIG, Stanford University — Now that the cold war is long over, our thinking of nuclear weapons and the role that they play in international security has undergone serious changes. The emphasis has shifted from superpower confrontation to nuclear proliferation, spread of weapon materials, and to the dangers of countries developing nuclear weapon capability under a cover of a civilian program. At the same time, the old cold-war dangers, while receded, have not disappeared completely. The United States and Russia keep maintaining thousands of nuclear weapons in their arsenals, some of them in very high degree of readiness. This situation presents a serious challenge that the international community has to deal with. Although Russia and the United States are taking some steps to reduce their nuclear arsenals, the traditional arms control process has stalled — the last treaty that was signed in 2002 does not place serious limits on strategic forces of either side. The START Treaty, which provides a framework for verification and transparency in reduction of nuclear arsenals, will expire at the end of 2009. Little effort has been undertaken to extend the treaty or renegotiate it. Moreover, in recent years Russia has stepped up the efforts to modernize its strategic nuclear forces. The United States has resisted joining the Comprehensive Nuclear Test Ban Treaty and has been working on controversial new nuclear weapon development programs. The U.S. missile defense program makes the dialogue between Russia and the United States even more difficult. The reluctance of Russia and the United States to engage in a discussion about drastic reductions of their nuclear forces undermines the case of nuclear nonproliferation and seriously complicated their effort to contain the spread of nuclear weapon technologies and expertise. One of the reasons for the current lack of progress in nuclear disarmament is the contradiction between the diminished role that nuclear weapons play in security of nuclear weapon states and the inertia of cold-war institutions that are involved in their development and support. Dealing with this contradiction would require development of new mechanisms of cooperation between nuclear weapons states and their strong commitment to the cause of nuclear nonproliferation. One important area of cooperation is development of a framework that would prevent the spread of nuclear materials and technology at the time when increasing number of countries is turning toward expanded use of nuclear power to cover their energy needs.

**Tuesday, April 15, 2008 1:30PM - 3:18PM** —

**Session X6 FPS: Space Debris** Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), Promenade D

**1:30PM X6.00001 An Introduction to Space Debris** , DAVID WRIGHT, Union of Concerned Scientists — Space debris is any human-made object in orbit that no longer serves a useful purpose, including defunct satellites, discarded equipment and rocket stages, and fragments from the breakup of satellites and rocket stages. It is a concern because—due to its very high speed in orbit—even relatively small pieces can damage or destroy satellites in a collision. Since debris at high altitudes can stay in orbit for decades or longer, it accumulates as more is produced and the risk of collisions with satellites grows. Since there is currently no effective way to remove large amounts of debris from orbit, controlling the production of debris is essential for preserving the long-term use of space. Today there are 860 active satellites in orbit, supporting a wide range of civil and military uses. The 50 years of space activity since the launch of Sputnik 1 has also resulted in well over half a million pieces of orbiting debris larger than 1 cm in size. There are two main sources of space debris: (1) routine space activity and the accidental breakup of satellites and stages placed in orbit by such activity, and (2) the testing or use of destructive anti-satellite (ASAT) weapons that physically collide with satellites at high speed. The international community is attempting to reduce the first category by developing strict guidelines to limit the debris created as a result of routine space activities. However, the destruction of a single large spy satellite by an ASAT weapon could double the total amount of large debris in low earth orbit, and there are currently no international restrictions on these systems. This talk will give an introduction to what's in space, the origins of space debris, efforts to stem its growth, the threat it poses to satellites in orbit, and the long-term evolution of the debris population.

**2:06PM X6.00002 Considering the Consequences of Space Warfare in the Geosynchronous Region** , CAROLINE REILLY, RAND Corporation — Today in the United States there is a rejuvenated push for space weapons and the restraint that was exercised regarding the military use of space during the Cold War is notably absent. This talk aims to demonstrate that space is an unacceptable arena for warfare based on the notion that fragment-generating attacks in space could cause irreparable damage to the hundreds of satellites orbiting the Earth, particularly in the invaluable geosynchronous region. In an effort to highlight the drawbacks of space weapons, a simulation entitled GeoPell modelled the consequences of a kinetic energy “pellet cluster” attack initiated at the geostationary altitude. The worst-case estimate predicted by GeoPell indicated that within two years of placing the cluster of one million pellets into a retrograde geostationary orbit and subsequently dispersing the pellets with a bursting charge, almost every geosynchronous satellite would be destroyed. Thus, the technical consequences of this hypothetical space attack suggest space weapons and warfare should be avoided due to the detrimental effects such weapons would have on the orbital environment. Cooperative restraint-based measures, possibly in the form of a ban on space weapons testing and deployment, are necessary to salvage the final frontier.

**2:42PM X6.00003 China's ASAT Weapon: Capabilities and the Potential Threat** , GEOFFREY FORDEN, MIT — Much has been said about China's 11 January 2007 test of an anti-satellite (ASAT) weapon but few analysts have based their comments on a scientific determination of the weapons capabilities. This paper presents such an analysis derived from the observed pattern of debris, as observed by NORAD and posted on-line by NASA. It is clear that this was a direct hit-to-kill weapon (as opposed to a fragmentation-type explosive warhead), it massed about 600 kg, and was capable of accelerations of at least 6 Gs. It can be inferred with a reasonable degree of confidence that it used an on-board optical tracker, most likely operating in visible light. Furthermore, since the closing speed between the target satellite and the interceptor was 8 km/s during the test, this weapon could be used to attack satellites at higher altitude orbits, such as NAVSTAR/GPS and geostationary satellites that include communications and early warning satellites. This test produced ten times as many pieces of debris as an earlier US hit-to-kill ASAT test which, because of their higher altitudes, will last thousands of years—hundreds of times longer than the debris in the US test. China's test increased the chances of some low earth orbit satellite being hit by a piece of debris by 50%, from about 12% to 18% each year. Given this weapon's capabilities, it is possible to “war game” what an all-out Chinese ASAT attack would look like and what responses the US could take. (It is important to emphasize that this is a capabilities-based exercise and not based on Chinese intentions.) If China did launch such an attack, it could eliminate a large fraction of US military satellites in low earth orbit including photo-reconnaissance and electronic intelligence satellites, but not all of them, in the first 24 hours; the requirement that the target satellites be illuminated by the sun limits the attack. Furthermore, the US could maneuver its LEO satellites in the first hours of the attack and greatly complicate the task of their destruction. If coupled by attacks on China's largest radars, the US could save a number of their LEO satellites. China would have to choose to attack either US GPS satellites or communications satellites, but not both, since its launch capabilities are insufficient. If it attacked the GPS constellation, it could not prevent the US from using precision guided munitions.