2009 APS April Meeting
Denver, Colorado
http://www.aps.org/meetings/april
challenges attendant to successfully carrying out these complex and costly scientific campaigns. Some reflections on the art of “Mega Physics Projects” will be...
8:30AM G7.00001 Skating on Thin Ice: Evolution of Conservation in Energy Policy. JACK GIBBONS — Why are we physicists so often drawn into the nexus of energy policy and governance? There are several explanations. First, we are quite accustomed to this phenomenon of “cause and effect,” so we instinctively examine those two ends as well as the connections between them (i.e., what happens between a lump of coal and a light bulb). That way of thinking makes energy production and consumption intimately connected and “conservation” naturally becomes a technological strategy rather than an appendage. Strangely, however, “conservation” in our society (called “The Cowboy Economy” by economist Kenneth Boulding) has been widely interpreted as competitive with supply and ridiculed as only a minor option, entailing denial of an amenity. After nearly a half-century of dialogue, innovation, and frustration, the rationality of what I call the “physics” perspective seems to have come of age. The evolution of relevant science and technology and public policy has advanced markedly, reflected and sustained at the national level by a succession of organizations. The Congressional Office of Technology Assessment, the Federal Office of Energy Conservation, the Federal Energy Administration, the U.S. Department of Energy, and the Office of Science and Technology Policy. Not surprisingly, physicists continue to play key roles in the incultation of science and analysis into the policy and governance. This requires, as implied by C.P. Snow, a bridging and strengthening of the thin ice between science and society. We still have a long road to travel.

9:06AM G7.00002 Civic Scientist Era. NEAL LANE, Rice University — No abstract available.

9:42AM G7.00003 Science as a Model for Rational, Legitimate Government. LEWIS BRANSCOMB, Kennedy School of Government, Harvard University — Before WWII science was largely dependent on support through teaching, and a few foundations. In the last half century, thanks to the contribution of applied science to winning the second world war, government became a deep-pockets source of support for science. While many academic scientists were deeply suspicious of government as a sponsor, the research universities saw an opportunity to build their institutions around government support. Government saw science as a means for sustaining its military primacy. Thus a marriage was consummated by partners — science and politics — who needed each other, but for quite different and to some degree conflicting motives. In the U.S. democracy, the relationship between science and politics has never been easy. The search for truth in science and for legitimacy in politics both require systems for generating public trust, but these systems are not the same, and indeed they are often incompatible. The most profound area of mismatch between science and politics is found not in conflicts over what kinds of research are deserving of public funding, but rather in conflicts over the advice government receives from scientific and technical experts. It is no accident that democratic America fostered progress in science and technology. Both American democracy and modern science are products of the Enlightenment, with its emphasis on reason and openness rather than on prejudice and traditional authority. American democracy has always benefited from a pragmatic willingness to learn from experience, very much as science relies on experience. Progress in science is based transparency and accountability; these are also basic principles of democratic government. If science is corrupted by government, government itself is in danger of becoming corrupt. In recent years we seemed to be going down that path. It is no accident that President Obama and media commentators speak often of the “new pragmatism,” or that he appointed exceptionally well-qualified specialists to top posts in his government. Both democracy and science stand to benefit enormously when our political leaders understand that the ethos of science and ethics of democracy have common roots.

Sunday, May 3, 2009 10:45AM - 12:33PM —
Session H7 FIP FPS: Managing Nuclear Fuels: An International Perspective Governor’s Square 12

10:45AM H7.00001 A Contract Between Science and Society. ELIZABETH DOWDESWELL, Nuclear Waste Management Organization, Canada — Growing energy demand, global climate disruption and the prospect of a carbon-constrained world have opened the door for discussion of a potential nuclear renaissance. The fact that deployment of nuclear energy has not been fully embraced points to a number of challenges. These range from concerns about safety, security and proliferation of nuclear materials to questions of feasibility and economics. Others cite the continuing quest for an acceptable approach to the management of long-lived wastes and uncertainty about risks to human health and the environment. Arguably public acceptance of nuclear energy will require policy makers to examine many social and ethical concerns, both real and perceived. Yet research suggests that public trust in governments and institutions is eroding while society’s expectations to be involved in decision-making have become more intense and sophisticated. The recent Canadian experience of selecting an approach for the long-term management of used nuclear fuel illustrates the complexity of obtaining a “social licence” to proceed. A key objective was to gather and document the terms and conditions that would make such a project acceptable to society and to reflect a fundamental understanding and respect for these factors in the project’s actual design and implementation. The underlying philosophy was that the analysis of scientific and technical evidence, while essential, could not be the sole determining factor. Ultimately it is society that will determine which risks it is prepared to accept. The mission of developing collaboratively with Canadians a management approach that would be socially acceptable, technically sound, environmentally responsible and economically feasible required the development of an integrated, systematic analytical framework and an interactive and transparent process of dialogue and deliberation. This investment in seeking diversity of perspectives resulted in the emergence of common ground among citizens and specialists. It defined the terms of a socio-scientific contract: safety, fairness and flexibility and taught us the importance of continuing to earn trust and confidence.

11:21AM H7.00002 Radioactive Waste Management, its Global Implication on Societies, and Political Impact. KAZUAKI MATSUI, Institute for Applied Energy — Reprocessing plant in Rokkasho, Japan is under commissioning at the end of 2008, and it starts soon to reprocess about 800 Mt of spent fuel per annum, which have been stored at each nuclear power plant sites in Japan. Fission products together with minor actinides separated from uranium and plutonium in the spent fuel contain almost all radioactivity of it and will be vitrified with glass matrix, which then will fill the canisters. The canisters with the high level radioactive waste (HLW) are so hot in both thermal and radiological meanings that they have to be cooled off for decades before bringing out to any destination. Where is the final destination for HLW in Japan, which is located at the rim of the Pacific Ocean with volcanoes? Although geological formation in Japan is not so static and rather active as the other parts of the planet, experts concluded with some intensive studies and researches that there will be a lot of variety of geological formations even in Japan which can host the HLW for so long times of more than million years. Then an organization to implement HLW disposal program was set up and started to campaign for volunteers to accept. The mission of developing collaboratively with Canadians a management approach that would be socially acceptable, technically sound, environmentally responsible and economically feasible required the development of an integrated, systematic analytical framework and an interactive and transparent process of dialogue and deliberation. This investment in seeking diversity of perspectives resulted in the emergence of common ground among citizens and specialists. It defined the terms of a socio-scientific contract: safety, fairness and flexibility and taught us the importance of continuing to earn trust and confidence.

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Finally, I will discuss options for phased deployment of geoengineering to manage risks and maximize opportunities for learning by doing.

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KEITH, University of Calgary — The combination of high inertia and high uncertainty makes the coupled climate-economic system dangerously hard to control.

Governor’s Square 12

intelligence is informed and enabled by the advancements of modern physics. Over the next decade, in the face of resource constraints, the role of physics may

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Former Principal Deputy Director of National Intelligence — Physicists and the applications they invent address some of the most difficult intelligence problems

information science, the unique approach physicists bring to a problem can also have an indirect but important effect by influencing how challenges in areas

to technological capabilities that have enabled the U.S. intelligence community to provide unexpected and unparalleled information to our nation’s decision

In fact, I would argue that without the contributions of physicists and engineers to the intelligence discipline of national reconnaissance, the world might not have acquired the intelligence necessary to bring the Cold War to an end, and terrorists might now have an unending advantage as we start our journey through the 21st century.

In collaboration with: N.V. Zamfir, National Institute of Physics and Nuclear Engineering, Bucharest-Magurele, Romania.

Sunday, May 3, 2009 1:30PM - 3:18PM –
Session J7 FPS: Physics Contributions to the Intelligence Community

1:30PM J7.00001 Physicists & Engineers in the Spy Business—What Does the Record Say About National Reconnaissance? , ROBERT A. MCDONALD, National Reconnaissance Office — Readers of John LeCarre novels most likely have heard about “Tinker, Tailor, Soldier, Spy.” Is there another story, “Engineer, Mathematician, Physicist, Spy?” There may very well be when you consider that a physicist was part of the October 1962 intelligence find of Soviet nuclear missiles in Cuba, or when you consider that another student of physics made critical contributions to the U.S. intelligence that debunked the 1960s myth of an American-Soviet “missile gap.” The record suggests the fictions that LeCarre, Ian Fleming, Tom Clancy, and other authors have created have their counterparts in the real world of physics, engineering, and foreign intelligence activities.

In 1990, as the Cold War was coming to an end, I was reminded of the comments of a former CIA Director, the late William Casey. He asked why we in the intelligence community were not exploiting the advances in technology that were being made by physicists and engineers. I would argue that we are not adequately exploiting the potential of physicists to contribute to the U.S. intelligence community.

2:06PM J7.00002 Physics, Physicists and Revolutionary Capabilities for the Intelligence Community, LISA PORTER, Intelligence Advanced Research Projects Activity — Over the past several decades, physicists have made seminal contributions to technological capabilities that have enabled the U.S. intelligence community to provide unexpected and unparalleled information to our nation’s decision makers and help dispel the cloud of uncertainty they face in dealing with crises and challenges around the world. As we look to the future, we recognize that the ever-quickening pace of changes in the world and the threats we must confront demand continued innovation and improvement in the capabilities needed to provide the information on which our leaders depend. This talk will focus on some of the major technological challenges that the intelligence community faces in the coming years, and the many ways that physicists can help to overcome those challenges. The potential impact of physicists on the future capabilities of the US intelligence community is huge. In addition to the more obvious and direct impact through research in areas ranging from novel sensors to quantum information science, the unique approach physicists bring to a problem can also have an indirect but important effect by influencing how challenges in areas ranging from cybersecurity to advanced analytics are approached and solved. Several examples will be given.

2:42PM J7.00003 Physicists and the Intelligence Community: The Next Decade, DONALD KERR, Former Principal Deputy Director of National Intelligence — Physicists and the applications they invent address some of the most difficult intelligence problems we face. Gathering access to information is the key issue and imaginative use of acoustics, optical imaging, radar, RF propagation, and other physics based capabilities is often the key to success. However, just like accelerator physicists, we are then faced with the challenge of analyzing large data sets. Here, too, intelligence is informed and enabled by the advancements of modern physics. Over the next decade, in the face of resource constraints, the role of physics may be key to providing the capabilities necessary to ensure the nation’s security.

Monday, May 4, 2009 10:45AM - 12:33PM –
Session Q7 FPS: Is Geoengineering a Possible Stop-Gap Measure to Rapid Climate Change?

10:45AM Q7.00001 Solar-band Climate Engineering Technologies, Risks and Unknowns , DAVID KEITH, University of Calgary — The combination of high inertia and high uncertainty makes the coupled climate-economic system dangerously hard to control. If the climate’s sensitivity is at the high end of current estimates, it may be too late to avert dramatic consequences for human societies or natural ecosystems even with immediate and aggressive mitigation efforts. The engineered alteration of planetary radiation budgets—geoengineering—offers and means of managing climate risk, but entails a host of new risks. Most discussion of geoengineering has focused on the injection of sulfur particles into the stratosphere. I will consider the physics of engineered particles, and in particular the possibility of designing self-levitating particles that exploit photophoretic forces, enabling more control over particle distribution and lifetime than is possible with sulfates, perhaps allowing climate engineering to be accomplished with fewer side-effects. Finally, I will discuss options for phased deployment of geoengineering to manage risks and maximize opportunities for learning by doing.
The typical issue contains a number of substantive articles, stimulating commentary and letters, informative news and interesting book reviews. The editors tireless efforts of these two men, the FPS “newsletter” is in reality a high-quality quarterly journal that is always thought-provoking and sometimes controversial.

Plasma Physics Laboratory — This year we wish to use the FPS awards session to recognize those individuals who have made special contributions to issues at the nuclear age, and the humanitarian imperative for so doing.

From the Russell-Einstein Manifesto, London, 9 July 1955, signed also by Max Born, Percy W. Bridgman, Leopold Infeld, Frederic Joliot-Curie, Herman J. Muller, Linus Pauling, Cecil F. Powell, Joseph Rotblat and Hideki Yukawa

11:21AM Q7.00002 The Many Problems with Geoeengineering Using Stratospheric Aerosols1, ALAN ROBOCK, Rutgers University — In response to the global warming problem, there has been a recent renewed call for geoeengineering “solutions” involving injecting particles into the stratosphere or blocking sunlight with satellites between the Sun and Earth. While volcanic eruptions have been suggested as innocuous examples of stratospheric aerosols cooling the planet, the volcano analog actually argues against geoeengineering because of ozone depletion and regional hydrologic and temperature responses. In this talk, I consider the suggestion to create an artificial stratospheric aerosol layer. No systems to conduct geoeengineering now exist, but a comparison of different proposed stratospheric injection schemes, airplanes, balloons, artillery, and a space elevator, shows that using airplanes would not be that expensive. We simulated the climate response to both tropical and Arctic stratospheric injection of sulfate aerosol precursors using a comprehensive atmosphere-ocean general circulation model, the National Aeronautics and Space Administration Goddard Institute for Space Studies ModelE. We simulated the injection of SO2 and the model converts it to sulfate aerosols, transports them and removes them through dry and wet deposition, and calculates the climate response to the radiative-forcing, from the aerosols. We conducted simulations of future climate with the Intergovernmental Panel on Climate Change A1B business-as-usual scenario both with and without geoeengineering, and compare the results. We found that if there were a way to continuously inject SO2 into the lower stratosphere, it would produce global cooling. Acid deposition from the sulfate would not be enough to disturb most ecosystems. Tropical SO2 injection would produce sustained cooling in most of the world, with more cooling over continents. Arctic SO2 injection would not just cool the Arctic. But both tropical and Arctic SO2 injection would disrupt the Asian and African summer monsoons, reducing precipitation to the food supply for billions of people. These regional climate anomalies are but one of many reasons why geoeengineering may be a bad idea. I also discuss other reasons. Global efforts to mitigate anthropogenic emissions and to adapt to climate change are a much better way to channel our resources to address anthropogenic global warming.

11:57AM Q7.00003 Recent Results from Iron Enrichment Experiments: Implications for Geo-engineering, KENNETH COALE, Moss Landing Marine Laboratory — The oceans play a key role in cycling carbon and are responsible for about half the photosynthesis on the planet. Ice core records tie to changes in marine production changes in climate and recent experiments suggest iron availability covaries with marine production over the last several glacial-interglacial transitions. Several open ocean iron enrichment experiments have recently been conducted to test this linkage directly and findings from these groundbreaking experiments will be presented. Together these results unequivocally demonstrate the pivotal role iron plays in controlling community structure and growth and the uptake of CO2 in major ocean regions. The combustion of fossil fuels has increased atmospheric carbon dioxide approximately 100 ppm above preindustrial levels and has become a major environmental concern. The question of purposeful iron fertilization to control climate is gaining considerable attention partly due to the results of these experiments and the fact that iron is inexpensive and can leverage massive carbon uptake. In addition, the resultant blooms of phytoplankton reduce ocean acidification. What remains to be tested is whether iron fertilization would create unintended and negative consequences to ocean ecosystems. In this talk, both the theory, practice and results of iron fertilization experiments will be presented altogether with a discussion of some possible negative impacts. Natural iron inputs have had a major impact on climate in the past when atmospheric carbon dioxide was much less than it is today. The role of iron fertilization as a geoengineering solution to climate change, has yet to be tested and can only be evaluated through experimental manipulations designed for this purpose.

11:30PM Session R7 FPS: FPS Awards Session —
Governor’s Square 12
1:30PM R7.00001 Leo Szilard Lectureship Award Talk: Science and International Security, RAYMOND JEANLOZ, University of California, Berkeley — The proliferation of nuclear-weapons technology is one of the gravest dangers facing the world, with potentially devastating consequences if it is not contained. The scientific community has a special role to play in confronting this threat, not only because many of the issues involved are highly technical, and science offers important tools such as hypothesis testing, but also because open communication lies at the heart of scientific research. International dialogs among scientists can thus be uniquely powerful in confronting problems of global concern, especially when political constraints hinder communication between nations. Many view the scientific community as at least partly responsible for major threats confronting the world, but we also have the opportunity to reduce those dangers through the same processes that lead to discovery and advancement of knowledge.

2:06PM R7.00002 Joseph A. Burton Forum Award Talk: Remembering our Humanity: the deep impact of the Russell-Einstein Manifesto, PATRICIA M. LEWIS, James Martin Center for Nonproliferation Studies — “There lies before us, if we choose, continual progress in happiness, knowledge, and wisdom. Shall we, instead, choose death, because we cannot forget our quarrels? We appeal as human beings to human beings: Remember your humanity, and forget the rest.” Before his death, Albert Einstein joined Bertrand Russell and other notable scientists and philosophers in issuing a statement calling for the abolition of war and for governments to “find peaceful means for the settlement of all matters of dispute between them.” As a first step, they called for the renunciation of nuclear weapons. The initiative led to the establishment of the Pugwash Conferences on Science and World Affairs, which bring together influential scholars and public figures concerned with reducing the danger of armed conflict and seeking cooperative solutions for global problems. The Russell-Einstein Manifesto has had a major impact on the way in which people discuss the issues of peace and war. The paper traces the growing awareness of the meaning of war, ways in which violent conflict can be prevented, particularly when political constraints hinder communication between nations.

2:42PM R7.00003 Forum on Physics and Society Special Recognition, ANDREW POST-ZWICKER, Princeton Plasma Physics Laboratory — This year we wish to use the FPS awards session to recognize those individuals who have made special contributions to issues at the interface of physics and society. Twelve years ago, Al Saperstein became the editor of Physics and Society, with Jeff Marque as the news editor. The two have been functioning as co-editors for the past four years. They have conscious intention brought all to a news-basket, reforms and challenges. The links to the tireless efforts of these two men, the FPS “newsletter” is in reality a high-quality quarterly journal that is always thought-provoking and sometimes controversial. The typical issue contains a number of substantive articles, stimulating commentary and letters, informative news and interesting book reviews. The editors have had to exert considerable effort to assemble such interesting material on a range of relevant topics, often laboring with little additional help - and without benefit of a large staff. In closing, I express our deep appreciation to each of them for their many years of tireless service. Each year, the Forum on Physics and Society has the privilege of nominating APS members that have made outstanding contributions to the rank of Fellow. This year, we will introduce our newly elected Fellows during this Forum on Physics and Society Awards session.

Monday, May 4, 2009 1:30PM - 3:18PM —
Session X6 FPS: The Role of Scientists in Arms Control —
Governor’s Square 16
Tuesday, May 5, 2009 1:30PM - 3:18PM —
1:30PM X6.00001 Dr. Inside and Dr. Outside: Physicists Involved With National Security and Foreign Policy, PETER D. ZIMMERMAN, Department of War Studies, King's College London, Strand Campus, London UK WC2R 2LS — Physicists have had a special interest in American national security and arms control since at least the Manhattan Project. They have served our country in uniform and in the career civil service. Some have left academic careers for brief periods to work as political appointees, consultants, or resident scholars and then returned to an academic life, but often with changed goals. Some have tried government life and left nearly immediately, while others dipped a toe in and decided to stay. I will look at real-life examples, mostly using real names, drawn from my career and circle of colleagues to try to explain why some physicists have been extremely successful, why others have not, and what happens to a physicist who moved to Washington and decides to stay. I will also discuss routes into public service for those interesting in giving it a try.

2:06PM X6.00002 Progress in CTBT Monitoring since its 1999 Senate Defeat, DAVID HAFEMEISTER, Center for International Security and Cooperation, Stanford University — Progress in monitoring the Comprehensive Nuclear Test Ban Treaty (CTBT) is examined, beginning with the 2002 National Academy of Sciences CTBT study, followed by recent findings on regional seismology, array–monitoring, correlation–detection, seismic modeling and non-seismic technologies. The NAS–CTBT study concluded that the fully–completed International Monitoring System (IMS) will reliably detect and identify underground nuclear explosions with a threshold of 0.1 kt in hard rock, if conducted anywhere in Europe, Asia, North Africa, and North America. In some locations the threshold is 0.01 kt or lower, using arrays or regional seismic stations. As an example, the 0.6–kiloton North Korean test of October 9, 2006 was promptly detected by seismometers in Australia, Europe, North America and Asia. The P/S ratio between 1–15 Hz clearly showed that the event was an explosion and not an earthquake. Radioactive venting, observed as far as Canada, proved that it was a nuclear explosion. Advances in seismic monitoring strengthen the conclusions of the NAS study. Interferometric synthetic aperture radar can, in some cases, identify and locate 1–kt tests at 500 m depth by measuring subsidence to 2–5 mm. InSAR can discriminate between earthquakes and explosions from the subsidence pattern and it can locate nuclear tests to within 100 meters.

2:42PM X6.00003 Technology and Policy: Looking to the Future, KORY SYLVESTER, NNSA/Department of Energy — As the proper scope and nature of arms control continues to be debated, it is certain that technical capabilities and advice will play a significant role. While national priorities and strategic objectives and broader perspectives of international security and foreign policy will ultimately dictate, technical expertise and assessment is critical to the identification, development and evaluation of alternatives. Strategic linkages between arms control, nonproliferation, and homeland security have perhaps never been so intertwined. Incomplete information and strongly held but disparate views about the potential of science and technology to amplify threats as readily as they mitigate them creates a highly dynamic environment for policymakers. To contribute meaningfully scientists and engineers will have to remain engaged with national security debates and think about the strategic and policy environment in which technical questions are posed to them, and how to identify and frame the important questions that aren’t.