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The Asia Science Letter is a quarterly publication of the Asian Office of Aerospace Research and Development (AOARD), Detachment 2 of the U.S. Air Force Office of Scientific Research (AFOSR), the basic research manager of the Air Force Research Laboratory (AFRL). Its purpose is to inform the Air Force S&T community on the research and development activities in Asia and Pacific Rim countries including India and Australia. The assessments in this periodical are solely those of the authors and do not necessarily reflect official U.S. Government, U.S. Air Force, or AFOSR positions.

Highlights

The Under Secretary of Defense for Acquisition, Technology, and Logistics, E. C. "Pete" Aldridge, was in Japan to co-chair the 23rd Executive Science and Technology Forum (S&TF) in Tokyo on 20 February 2003. Mr. Aldridge was accompanied by Ms. Beth McCormick, Director of Policy, Office of the Secretary of the Air Force, who was briefed by AOARD on 18 February.

Dr. Robert Sierakowski, AFRL/MN Chief Scientist, led a team of scientists to Japan in March. They attended the International Conference on Low Energy Antiproton Physics and visited several sites including the Electro-Communications University – Applied Micro Systems, Yokohama Medical College, Tohoku University – Dept. of Mechatronics and Precision Engineering, and Ritsumeikan University – Dept. of Robotics.

AOARD program managers, Dr. Park, Dr. Goretta, Col. Brewer, and I visited several research institutions in India in February 2003. Site visits included Agharkar Research Institute, the University of Pune Department of Physics, the Indian Institute of Technology – Chennai, and the Indian Institute of Science – Bangalore (see articles in this newsletter).

AOARD welcomes three new personnel. Dr. Misoon Mah (Ph.D. in Electrical Engineering) arrived in February from the AFRL Sensors Directorate, WPAFB, OH. In addition to 20 years of experience as an AFRL Electronics Engineer, Dr. Mah is experienced in international activities such as management of the Three-Dimensional Microwave Integrated Circuit Program (3DIC), a highly successful U.S./Korea joint effort to develop next generation phased array apertures.

Lt. Col. Thomas Erstfeld (Ph.D. in Chemistry) arrived in March from the Pentagon (Defense Prisoner of War/Missing Personnel Office). His broad background includes assignments as an electronic materials researcher, commander of a fuels quality control laboratory, Associate Professor at the Air Force Academy, and Program Manager at AFOSR.

Mr. Takashi Makishima, coming from DFAS at Yokota Air Base, joined AOARD in April. Mr. Makishima will be the Project Manager for the Window-on-Science (WOS) Program as well as manager for the AOARD database.

Departures from AOARD include Mr.Yoshi Erikawa and Ms. Joanne Maurice. Mr. Erikawa left AOARD at the end of March, his contributions in establishing and upgrading the AOARD database were invaluable.

Ms. Maurice moved in April to the AFRL Sensors Directorate at WPAFB, OH. In her six years at AOARD, Joanne developed extensive research portfolios in wideband gap materials, laser processing, high power microwaves, and novel photonic materials.

Terence J. Lyons, M.D., M.P.H.
Director

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Munitions Directorate Chief Scientist Visits Japan

The Munitions Directorate Chief Scientist, Dr. Robert L. Sierakowski, visited Japan with Mr. Kenneth Edwards (AFRL/MNAV) and Dr. Ted Sumrall (AOARD) during the period of 2-8 March 2003. During this trip, a number of academic institutions were visited including, the University of Electro-Communications (UEC), Yokohama City Medical University, Ritsumeikan University, and Tohoku University. Additionally, he attended the International Conference on Low Energy Antiproton Physics, held 3-7 March in Yokohama, Japan.

During his visit to Prof. Aoyama's Laboratory at UEC in Chofu, Japan, Dr. Sierakowski was able to observe firsthand the micro hopping robots, which UEC is under contract to develop for AFRL. One application for the robots is for rapid location of survivors of collapsed buildings from natural disasters and terrorist attacks. Owing to the small size of the robots, they should be able to penetrate rubble better and faster than larger robots. The accompanying figure shows two of the robots under development at UEC. Professor Aoyama visited AFRL/MN during April 2003 on a Windows on Science visit.

Additional information on the visits to Yokohama City Medical University and Ritsumeikan University can be found in articles on page 5 and page 7, respectively.

Dr. Sierakowski displays miniature robots under development at UEC.

U.S.-Korea Workshop on Metallic Structural Materials

Conference: US-Korea Workshop on Advances in Metallic Structural Materials, 21-23 January 2003, Kihei, Maui, Hawaii. The idea to hold a joint U.S.-Korea workshop on structural metals originated with Dr. Craig Hartley, Program Manager, Metallic Structural Materials, AFOSR, and was prompted by his favorable impressions of Korean metallurgical research gathered during a visit to Korea in the Spring of 2002. Dr. Lee Semiatin of ML and Prof. Chong Soo Lee of POSTECH in Korea headed the Technical Organizing Committee. Funding for the workshop was provided by the Office of the Secretary of the Air Force (SAF). The Workshop took place at the Maui High Performance Computing Center, which is part of the Directed Energy Directorate. Logistical details were arranged by AOARD.

The primary objective of the workshop was to provide a forum for sharing of recent basic research results. A second objective was to foster interactions between U.S. and Korean scientists that may lead to future cooperative programs funded by the U.S. Department of Defense and Korean National Agencies. All of the 60 attendees were invited, and most of the 55 practicing scientists (28 from the U.S. and 27 from Korea) presented their recent work. Approximately one-third of the U.S. attendees were from the AFRL. Most of the remainder were from universities; three others represented Department of Energy National Laboratories, two the Department of Defense, and one each the Army and Navy research offices in Tokyo. The Korean attendees were primarily from universities. In addition, five came from government-funded laboratories, and Dr. Hak Min Kim, Managing Director of the National Research and Development Program, Korea Institute of Science and Technology Evaluation and Planning, also participated.

The Korean economy is highly dependent on structural metals. Korea leads the world along with Japan in production of ships, boasts the second largest and possibly most progressive steel company (POSCO), and embraces vibrant automotive, aerospace, and electronics manufacturing concerns. Within Asia, only Japan covers metals technology so thoroughly. U.S. and Korean researchers share interests in lighter alloys, including those based on titanium, aluminum, and magnesium. Given that neither country now devotes sufficient resources to address all of the pressing concerns in structural metals research and development, collaboration on carefully selected projects appears to be sensible.

The Workshop's technical program was divided into a keynote session and four topics distributed over six oral sessions and one poster session. In the opening session, overviews of basic research being conducted in the U.S. and Korea were given by Dr. Craig Hartley and Dr. Hak Min Kim, respectively. Dr. Hartley described research in the areas of microstructure stability, processing, material properties, characterization, and simulation and modeling. This research is being conducted at the AFRL, at various extramural contractors, and at overseas organizations under contracts through AOARD and EOARD. In particular, he discussed the AFOSR research theme known as MEANS (Materials Engineering for Affordable New Systems). The objective of MEANS is to promote rapid and effective materials development through techniques such as those that couple models of material behavior to design software. Dr. Kim gave an overview of metals research and development in Korea. Approximately $27M is devoted annually to metals research and development, which constitutes 25% of the total allotted for all materials and 1.5% allotted for all research and development. There are approximately 9200 people now employed in materials research. Specific national research thrusts focus on nanomaterials and next-generation displays. Programs to exploit dual-use technologies are also in place.

Topic 1 - Deformation Mechanisms and Modeling: This session addressed micromechanisms of deformation, formation of defect substructures, and internal-state-variable models to describe deformation mechanisms quantitatively. Such information is important for a fundamental description of small deformations that may occur under service conditions and for large deformations that are imposed during deformation processing of structural components.

Topic 2 - Severe Plastic Deformation and Modeling of Large Strain Deformation: This session examined current work related to the physics and modeling of large deformation, such as that which may occur during equal-channel angular extrusion or metal cutting. This discussion was complemented by summaries dealing with the modeling of texture evolution during large-strain deformation via crystal-plasticity finite-element methods, as well as Monte-Carlo simulation of microstructure evolution due to processes such as recovery, recrystallization, and grain growth.

Topic 3 - Fracture and Fatigue and Related Modeling: This session dealt with several topics of current interest in the area of fatigue. Fatigue failures continue to plague aerospace structures and to be responsible for many necessary repairs. Papers included new ways to monitor propagation of fatigue cracks and to improve prediction of fatigue life.

Session 4 - Advanced Materials: The final oral sessions in the workshop examined advances in emerging materials and related processes. The emerging materials included intermetallics (e.g., gamma titanium aluminides), discontinuously reinforced composites, nanophase metals, and amorphous alloys. Each of these materials offers a set of properties, including, for example, excellent creep or corrosion resistance that may be advantageous in a variety of aerospace applications.

Poster Session: Poster presentations during the workshop provided an opportunity for the attendees who were unable to give oral briefings to present their recent results in an informal, collegial atmosphere. The themes of the posters were identical to those of the oral sessions and the posters complemented and expanded upon the specific topics that had been presented.

The Workshop closed with group discussions aimed at formulating a list of research topics, each of which could serve as the foundation for a joint program involving both U.S. and Korean scientists. Several compelling topics and possible participants for each program were identified. Many collaborations are likely to emerge, with at least a few funded through AOARD. Plans for raising additional funding, in both the U.S. and Korea, were also discussed. To further link U.S. and Korean research in light alloys, a second workshop is planned to be held in Korea in 2004. (Goretta and Semiatin)

General News

Site Visit: Institute of Science (IISc), Bangalore, India, February 2003. IISc is India's premier center of technical education and academic research. Its nearly 500 faculty are balanced by approximately 1700 graduate students. Many of the faculty were educated in the West and most participate in state-of-the-art research projects. IISc is divided into six academic divisions (Biological Sciences, Chemical Sciences, Electrical Sciences, Information Sciences, Mechanical Sciences, and Physical and Mathematical Sciences). Each division comprises several departments and centers.

Only a small fraction of IISc's facilities were visited. The Department of Computer Science and Automation is a leading center of postgraduate education and research in India. The Department's vision for the next decade is to be a leader in conceptualizing and realizing the promises of information technology and to maintain a high-quality research profile in the science and engineering of computing and automation. The Department of Aerospace Engineering includes in its portfolio excellent work in composite materials analysis and testing. The Department of Metallurgy and the Materials Research Centre each conducts excellent work in ceramics, lightweight alloys, and composite materials. Work in the Department of Physics includes excellent solid-state and device studies. (Park/Goretta)

Webpage: http://www.iisc.ernet.in/

Aerospace and Mechanical

Site Visit: Institute of Field Robotics (FIBO), King Mongkut's University of Technology, Bangkok, Thailand, February 2003. FIBO was founded in 1995 and charged with missions in education, basic and applied research, industrial support, and public service. Its research portfolio embraces programs in locomotion and manipulation, intelligent systems and control, human/machine interfaces, and manufacturing technology, and the focus includes both software and hardware. Current staffing consists of 7 Ph.D.-level researchers, 25 M.S. students, and 4 Ph.D. students. During the visit, a research proposal, "Maintaining Controllability, Observability, and Stability in a Neuro-Fuzzy System," was submitted to AOARD. (Park)

Webpage: http://fibo.kmutt.ac.th/

Workshop: Advanced Fluid Information-2002, Tokyo Japan, December 2002. This second University of Tohoku-hosted AFI conference focused on bringing together experimental and computation fluid dynamics communities that deal with large data sets. The goal was to support efforts to integrate methods used by these two different communities. Papers were presented from Japan, the U.S., Sweden, and France. The third AFI will be held in the U.S., in conjunction with a Symposium on Transdisciplinary Fluid Integration, in November 2003. (Nowack)

Webpage: http://www.ifs.tohoku.ac.jp/afi

Computation and Communication

Site Visit: Institute of Technology - Madras (IIT-M), Chennai, India, February 2003. IIT-M is one of seven IITs in India. These schools accept only a very small fraction of applicants, each of whom is highly qualified, and feature high ratios of faculty plus staff to students. IIT-M comprises approximately 380 faculty and 3000 students. Current research funding of approximately 100,000,000 rupees ($2.2M) is distributed among 13 academic departments and three research centers.

Several Engineering Departments (Aerospace, Chemical, Electrical, Metallurgical, and Ocean) and the Composites Technology Centre were visited. The visit was arranged in part through IIT-M's Centre for Industrial Consultancy and Sponsored Research. Several research programs at IIT-M are at the forefront of technology. Particular strengths were observed in MEMS technology, traditional metallurgy, and testing of ocean-based structures. (Lyons/Park/Goretta)

Webpage: http://www.iitm.ac.in/first.shtml

Conference: US-Japan Future of Artificial Intelligence Workshop, 13-15 December, 2002, Izu, Japan. This invitation-only workshop was held at IBM Amagi Homestead, a retreat facility of IBM-Japan. Prof. Edward Feigenbaum initially conceived this workshop for the purpose of assessing the current state of AI research, and formulating guidance for future research directions. The four-member steering committee (Edward A. Feigenbaum of Stanford Univ., Setsuo Ohsuga of Waseda Univ., Hiroshi Motoda of Osaka Univ., Koji Sasaki of AdIn Research, Inc.) selected 30 panelists, 10 from the U.S. and 20 from Japan. The panelists were divided into seven sub-panel groups:

1. Foundations of AI: The future of logical knowledge representation and logical reasoning by computer.

2. Discovery: Machine learning and knowledge discovery, and the future of those research areas.

3. Human-Computer Interface: Human-Computer Interaction and AI, for example in Computer Supported Cooperative Work (CSCW).

4. AI Systems: Scaling up AI systems into large systems such as multi-tasking systems, possibilities of super-intelligent-systems as an extension of expert system capabilities, and integration of different methods for problem solving.

5. Human-Level Intelligence: Computational models of "emotional" processing – are they important? Possibilities of "human-level intelligence" as an AI vector, creativity: AI and computational models of creativity, and the importance of coupling the "robotics" work of AI with its "cognitive" work, *i.e.* "putting a mind in a robot."

6. Knowledge Processing: Ontologies, semantic web and intelligent web services, and knowledge management in organizations.

7. Synthesis, Summaries, Responses and Other Topics: Contemporary definition of AI, opportunities missed by not coupling closer with neuroscience – to the science of how the human brain works, and topics such as "dissident views" and "what have we missed?"

Notable panelists included Dr. Ron Brachman, Director of the DARPA Information Processing and Dr. Eric Horvitz, Group Manager, Adaptive Systems & Integration Group, Microsoft Research. AOARD plans to publish a final report of the workshop; it will include an executive summary, presentation materials, discussion transcripts and sub-panel summaries. The workshop was a great success with many enthusiastic responses from panelists, and the panelists unanimously recommended a follow-on workshop in two years. This workshop has received strong endorsement from NSF (USA) and Ministry of Economy, Trade, and Industry (Japan). Additional support came from AFOSR/NM, AFOSR/AOARD, ARO-FE, and ten Japanese corporations: Canon, Inc., Fujitsu Laboratories Ltd., Fuji Xerox Co., Ltd., Hitachi, Ltd., IBM Japan, Ltd., NEC Corporation, NTT DoCoMo, Inc., AdIn Research, Inc., Alliance Group, Inc., and Advanced BioMedicare Research Inc. (Park)
Webpage:http://www.geocities.co.jp/Technopolis-Mars/5176/

Conference: 2002 IEEE International Conference on Data Mining (ICDM-02), 9-12 December 2002, Maebashi, Japan. This AOARD-supported conference received 350 submissions from 36 countries, with 73 papers accepted for regular track presentation. Although the U.S. led with the highest number of submissions (94), Asian countries had a strong showing, with 109 submissions for the region: Australia (24), China (31), Japan (22), Taiwan (32). Among the highlights was a keynote talk by Fields Medal recipient Prof. Steve Smale of the University of California at Berkeley titled, "Dealing with Data and the Mathematics of Learning," which focused on an algorithm based on linear algebra going back to Gauss, and its modern form via Tihkonov and Poggio. He presented an elegant mathematical formulation for the supervised learning model. The best paper award for the conference was titled "Convex Hull Ensemble Machine" by Prof. Yongdae Kim. Prof. Kim's paper reported on preliminary results of his on-going AOARD sponsored research to develop a statistical theory of machine learning. (Park)

Webpage: http://www.cs.uvm.edu/~xwu/icdm-03.html

Electronics and Physics

Conference: 2nd Workshop on Mechano-Electromagnetic Properties of Composite Superconductors, 3-5 March 2003, Kyoto, Japan. Superconducting tapes and wires based on low-temperature and high-temperature materials are being developed throughout the world, including in the Propulsion

and Materials and Manufacturing Directorates. For all superconductors, applications are generally limited by mechanical, rather than electrical performance. This workshop assessed the current state of understanding of the effects of mechanical loading on conductor performance.

Specific conductor materials covered included multifilamentary composite wires and tapes based on Nb or Bi compounds; coated-conductor composites of Y-Ba-Cu-O, Re-Ba-Cu-O, and MgB_2; and bulk-crystal composites of Y-Ba-Cu-O and Re-Ba-Cu-O. Important discussions focused on the superior performance under stress of Nb_3Al to Nb_3Sn (and the fact that Nb_3Al is now produced by only a single Japanese supplier), strain tolerance of Ag-sheathed Bi-based conductors (generally about 0.4%), the strain tolerance of coated conductors (also approximately 0.4%), the need for composite reinforcing for bulk high-temperature superconductors, and primary goals for future work. The Workshops attendees (56 total, 37 from Japan) worked in concert to detail admirably how complex the phenomena under study are and how much more needs to be learned and applied. (Goretta)

Webpage: http://www.mtl.kyoto-u.ac.jp/groups/osamura-gMEM03/

Site Visit: The University of Electro-Communications; Chofu-city, Tokyo, 24 February 2003. The university consists of three divisions, Faculty of Electro-Communications, Graduate School of Electro-Communications, and Graduate School of Information Systems. In addition, since 1999, the university has housed the Institute for Laser Science, in which various basic technologies for controlling the coherence of light and atoms have been developed, especially for applications in laser nuclear fusion. We visited two professors; Prof. K. Hakuta and Prof. T. Kimura. Both professors and their research groups have been actively engaged in challenging contributions to new concepts of opto-electronic devices.

Prof. Hakuta is an old friend of Dr. Park, and he shares a common interest with Dr. Mario Fajardo of AFRL/MN in applications of solid hydrogen. He has investigated optical processes with quantum interferences from the viewpoint of control of optical responses with quantum coherence. He has adapted solid hydrogen driven by a strong-coupling field and discussed the processes for both resonant and far-off-resonance L-type three-level systems. Some recent topics include: slow-light nonlinear optics at low-light levels, parametric generation with maximal coherence, the normal mode for matched pulse generation and sub-femtosecond light pulse generation. A new concept of quantum storage was envisioned by using tapered optical fiber immersed into solid hydrogen.

A visit to Prof. Kimura was requested by Dr. Gernot Pomrenke of AFOSR/NE. His research interest has been focused on effects of rare earth elements on semiconductor and insulator materials. He has observed strong enhancement of the Er-related 1.54 mm emission from Er-doped porous Si. The Er-O-Si crystalline matrices exhibited self-organized superlattice structure of 1 nm scale and suggested the possibility of 1.54 mm optical wave-guide with self-optical amplification. He also explained the development of green (545 nm) LED using Er-doped ZnO crystal prepared by sol-gel method. Finally, Ga(As,P) Fibonacci lattice structure was realized by atomic layer epitaxy and a novel fractal behavior was observed. (Miyazaki and Park)

Webpage: http://www.uec.ac.jp/

Site Visit: Surface & Interface Studies Group, Department of Physics, University of Pune, Pune, India, 6 February 2003 (Dr. S. K. Kulkarni)

Dr. Kulkarni's research group is involved in the chemical synthesis, characterization, surface chemistry, and interface physics of a variety of materials and coatings. Current research interests include nanoparticles of group II-VI semiconductors including CdS, ZnS, PbS, ZnO, *etc.*, doping of semiconductor nano-particles with metallic ions, metal nanoparticles, doped and undoped oxide particles, SiO_2 and polymer particles, core-shell and multishell particles, and aerogels. The Group also has several active outside collaborators including Max Planck Institute and the University of Wurzburg. (Lyons & Brewer)

Human and Biological Systems

Site Visit: Sensor Ecology Laboratory, University of Queensland, Brisbane, Australia, March 2003. Dr. Justin Marshall and his team take advantage of the excellent marine animal subjects available in the Great Barrier Reef. Dr. Marshall is a winner of the prestigious L'Oreal Color in Art and Science prize.

His work includes developing and understanding of animal coloration in the context of the environment, and the color receptor systems of predators. Among the animal color systems studied, is the amazing Mantis Shrimp, which has the most complex color vision system of any known animal. Some species of mantis shrimp have 16 different photo-receptor types, including 12 for color analysis (including 4 in the UV), as well as color filters and 4 polarization receptors. It is thought they may even be able to detect circularly polarized light. (Nowack)

Webpage: http://www.vthrc.uq.edu.au/ecovis/

Site Visit: Yokohama City Medical University, Yohohama, Japan, March 2003 (Prof. Richard Goris). Professor Goris is an expert in the visual and infrared sensory systems of pit vipers. Interestingly, pit vipers are capable of fusing both the visual and IR signals into a single image. His current research involves cooling function and specialized structure of the capillary vessels in the pit organs. Further details are available in ASL 22 (http://www.tokyo.afosr.af.mil/ASL/novasl.htm), and ASL 31 (http://www.tokyo.afosr.af.mil/ASL/asl31.htm), and AFOSR Research Highlights-Jul/Aug 01: (http://www.afosr.af.mil/ pdfs/JulAug2001RH.pdf) (Lyons and Sumrall)

Site Visit: Agharkar Research Institute, Pune, India, 6 February 2003 (Dr. V. S. Rao, Director and Dr. K. Paknikar). The Agharkar Research Institute is an autonomous research and post-graduate teaching center under the Indian Department of Science and Technology (DST). With a staff of approximately 165, including 80 research personnel, and an annual budget of $1.5M, research areas include microbial, animal, and plant sciences. In addition to microbiology, facilities support molecular genetics, genotoxicity testing, and chemical analysis. Of particular interest was Agharkar's expertise in characterizing specialized micro-organisms with applications in resource recovery (*e.g.*, metal extraction), control of corrosion, waste treatment, *etc*. (Lyons & Brewer)

Webpage: http://www.aripune.org/index1.asp

Study Report, World Technology Evaluation Center, 26 January – 1 February 2003: AOARD assisted the World Technology Evaluation Center (WTEC) in assessing Japan's efforts in biosensing. The goal of this WTEC study is to determine the worldwide status and trends in biosensing R&D. The study panelists gathered information on this topic in Japan and U.S. They will critically analyze and compare the research in the United States with that being pursued in Japan and Europe. During this week, they visited 18 sites in Japan and the group will visit additional sites in Europe in March 2003.

The information will serve the following purposes: (1) Identify good ideas overseas worth exploring in U.S. R&D programs, (2) clarify research opportunities and needs for promoting progress in the field generally, (3) identify opportunities for international collaboration, and (4) evaluate the relative position of foreign research programs relative to those in the U.S. so as to maximize technical progress in the field.

The National Institutes of Health, the National Science Foundation, the National Aeronautics and Space Administration, the U.S. Department of Agriculture and other agencies of the U.S. Government requested this study. (Brewer)

Webpage: http://www.wtec.org/

Materials Science

Conference: 3rd Symposium on Frontier Carbon Technology; Science Museum, Tokyo; 20-21 February 2003. The Frontier Carbon Technology (FCT) project was started in 1998, sponsored by New Energy and Industrial Technology Development Organization (NEDO). The Fine Ceramic Center (JFCC) has organized the project and managed the collaboration of 17 universities, national institutes, and private sectors. The participants totaled 70 researchers, with a net budget of about $60M.

An overview of the whole project were presented by Prof. Yoshikawa (Institute of Technologists). The project's accomplishments are as follows:

1. Synthesis of novel materials: The synthesis of C_3N_4 and BCN by CVD, large-scale production of carbon nanotubes (CNT), and superconductivity of C_{20}.
2. Synthesis of mechanically functional materials: Low wear and low friction films of Diamond-Like Carbon (DLC), high-temperature resistant film coating by boron carbide (B_4C), and oxidation resistant protective coating by cubic BN:Al.
3. Electronic functional materials: Fabrication of high quality diamond film and sharp electron emission array (current density > 15 A/cm^2), and CVD synthesis of large-area single crystal diamond plates (6" diameter).

The project ended this March. Two new projects will start next year under support of NEDO; one is CNT technologies, and the other is diamond semiconductor technologies. The latter project will be in collaboration with three private sector companies (Toshiba, Kobe Iron Steel, and Sumitomo Electric), and aims at developing high-frequency active devices operating at high temperature. (Miyazaki)

Webpage:
http://unit.aist.go.jp/carbon-center/new/new0004.htm

Site Visit: National Metal and Materials Technology Center (MTEC), Bangkok, Thailand, February 2003. MTEC is one of three National Centers established by Thailand's Ministry of Science, Technology and Environment. (The two other Centers concentrate on electronics/information technology and biotechnology, and a fourth Center to address nanotechnology is scheduled to open in 2004.)

MTEC's mission to support Thailand's industrial and research establishment received an unusually broad charter. MTEC serves as a funding agency for academic research, conducts in-house R&D, provides support services to industry, and offers expert consulting on request. Such wide coverage of science and technology is at this point an ambitious, but unproven experiment in state enterprise. The governmental portion of the current funding is approximately 90%. MTEC's staff of approximately 280 includes 58 with Ph.D. degrees. Several students are also employed.

The technological focus mirrors that of Thailand as a whole: materials production, design and manufacturing, renewable energy, medical applications, and agriculture. Facilities include 10 well-equipped laboratories and a pilot plant. Programs in biomaterials and corrosion testing and control are of direct interest to the AFRL. Examples include biomaterials research using shrimp-derived chitin to produce plastics and instrumented testing of stress-corrosion cracking. (Lyons/Goretta/Park)

Webpage: http://www.mtec.or.th/

Conference: 2nd International Conference on Platform Science and Technology for Advanced Magnesium Alloys, Osaka, Japan, 26-30 January 2003. Magnesium alloys have low densities and very high specific stiffnesses and strengths, but can be difficult to process. This conference focused on technologies required for further development of Mg alloys for automotive, aerospace, energy, electronics, and social-construction industries. Topics included alloy development, physical and mechanical properties, corrosion control, processing, joining, recycling, and new functionalities.

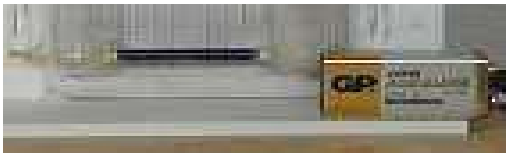
Mg research has recently undergone a renaissance. Significant advances in the 1950s and 1960s in production, use, and understanding of Mg alloys were followed by a relative paucity of research in the ensuing decades.

The exceptional properties of Mg alloys have now fueled a resurgence in their study, but because of an interregnum during which relatively few advances were made, Mg alloys remain behind, for example, Ti and Al alloys in terms of sophistication of microstructural manipulation and, most probably, optimization of properties. (Goretta)

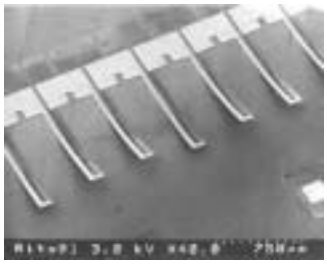
Webpage: http://www.knt-ec.com/event/pstam/

Micro & Nano Systems

Site Visit: Science Solutions International Laboratory, Inc. (SSIL); Tokyo, Japan, 3 March 2003. This venture company is developing a range of devices that draw on the nuclear engineering background of the staff. Under development is a low-cost miniature (cigarette pack size) distributed α-particle sensor. While the system technology involves a modified commercial sensor and geo-location methods, the key to the device is a unique electro-osmotic pump. The pump has a capacity of 10-100 mL/min and requires low power. Distributed safety monitoring of nuclear systems is the target application. (Pokines)



Site Visit: Ritsumeikan University, Kusatsu Japan, Professor Susumu Sugiyama, March 2003. Prof. Sugiyama is engaged in research in the field of micro-thermopiles. In order to obtain a higher-performance efficiency, a thermopile without a membrane (and having self-standing structure) is under development, as shown in the figure below. The absorbed heat transfers from hot contacts to cold contacts through the thermopile and no other conductive heat transfer occurs between the hot and cold contacts. This helps maximize the temperature difference. See also ASL 26 (http://www.tokyo.afosr.af.mil/ASL/asl26.htm) (Sumrall)



Conference: Nano Tec 2003 + Future; Makuhari Messe, Chiba, Japan, 26-28 February 2003. The above international congress and exhibition on nanotechnology were organized by the following three government agencies: New Energy and Industrial Technology Development Organization (NEDO), Japan External Trade Organization (JETRO), and National Institute of Advanced Industrial Science and Technology (AIST). Twenty-six organizations from 13 overseas countries also supported them, and over 3500 participants from 25 countries and regions attended the congress.

The following 5 sessions were held in parallel:

1. Special Ceremony: Special lectures by 2 Nobel Laureates (Dr. Tanaka, and Prof. H. Stomer).
2. Nanotech Summit: Lectures on national policies and strategies by representatives of each country.
3. Technical Symposium: Introduction of recent topics of nanotechnology, especially materials, biotechnology, information technology (IT), medical treatment, and metrology.
4. Business Forum: Presentations and panel discussions by business executives. Business plan contest was held by researchers and entrepreneurs.
5. Open Session: Oral and poster presentations on nanotechnology.

The recognition that nanotechnology would play a leading role in social and economic progress was confirmed, and the need for an international coordination of nanotechnology activities was identified. Several high priority issues were described such as promotion of international cooperation, definition of measurement/evaluation methods, preparation of standard materials and nanotechnology standards, examination of measures to promote investment, technological innovation and industrialization of R & D projects, education and mentoring of talented persons, and environment and safety.

Approximately 25,000 participants attended the exhibition consisting of 47 booths and demonstrating future images of society arising from nanotechnology. Among the foreign countries participating, large parts of attendees and speakers were from China, Taiwan, and Korea, confirming the activities of research and development in these East Asia countries.

From the standpoint of practical applications of nanotechnology, Drug Delivery System (DDS) such as nanostructured polymeric micelle, and several other nanomedicines are within our reach. Evolution of this technology into environment and chemistry fields has made great progress. Physical devices, such as electronic active devices, are far behind, due to lack of "bottom-up" technologies.

Two international events on nanotechnology are scheduled in future:

- Nano Forum, Trieste (Italy), 10 – 12 Dec 2003 (by Dr. R. Tomellini).
- World Nanotechnology Future: From Vision To Commercialization, Washington D.C., U.S., Spring 2005 (by Dr. M. Roco). (Miyazaki)

Webpage: http://www.nedo.go.jp

Symposium: Nano-Mechanics of Atoms and Molecules; Shimadzu Corp., Tokyo, Japan, 6 February 2003. A research project on Nano-Mechanics of Atoms and Molecules was organized as a Grant-in-Aid for Scientific Research Priority Areas (B) by the Ministry of Education, Culture,

Sports, Science, and Technology (MEXT) from 1999 to 2003. The number of total research members was 32 and net budget was $5M.

The present symposium was held as the final open forum of the project. The aims of the project were to develop (1) an atomically resolved force spectroscopy which creates a three-dimensional map of the force distribution on an atomic scale, (2) a method to discriminate the force mechanism between atomic and molecular species, (3) mechanical methods to analyze atomic and molecular species, (4) methods to control atomic and molecular force mechanisms by modifying atoms and molecules at the tip apex of a force probe, and (5) mechanical methods to control individual atoms and molecules.

The project consisted of five groups covering both theory and experimental research. Distinguished progress was made in the mechanical observation of atoms and molecules, three dimensional mapping of atomic force (Atomic Force Spectroscopy), control of atomic force, and measurement of mechanical response.

Another new project will be established starting next year, and continuing where the first project ended. The aims of it will be the mechanical manipulation of individual atoms and mechanical assembly of atom by atom. Definite goals are: [atomic wire] $2L < 10$ nm and $n > 50$, [atomic cluster] $2R < 1$ nm and $n > 50$, where L: girth of wire, R: radius of cluster, and n: atom number. (Miyazaki)

Webpage:
http://www-e2.ele.eng.osaka-u.ac.jp/NanoDynamics/index.html

Symposium: Japan Nano 2003, Waterfront, Tokyo, Japan, 3-4 February 2003. The first nanotechnology symposium, JAPAN NANO 2003, was organized by NANONET under support by Japan Science and Technology Corporation (JST). Total attendees were about 1600. Two plenary talks were presented by two Nobel Prize laureates;

- Quantum Physics and Advanced Technology: Coupled Players in the Nano-Area (Prof. L. Esaki).
- Japanese Nanotechnology Agenda and Activities (Dr. H. Shirakawa).

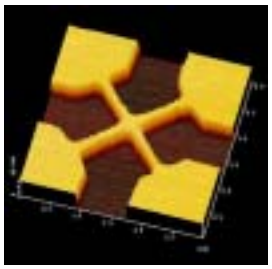
The symposium was grouped into five sessions, and 15 invited lectures were presented for different topics, such as nano-bio technology, nano-IT devices, nano-metrology, nano-handling, nano- materials and nano-IT platform. The nano-bio technology addresses the most advanced phases for applications. The examples presented were a Pinpoint Drug Delivery System (DDS) and microchip analysis (μTAS). Applications to physical devices are far behind and applications to environmental issues are not well understood.

The JAPAN NANO looks not only toward completion of scaling technology, but also towards the creation of new concepts: macroscopic evolution of new physics, enhancement of bridging between materials and devices, and improvement of global collaboration. (Miyazaki)

Webpage: http://www.nanonet.go.jp/

Conference: IEEE The Sixteenth Annual International Conference on Micro Electro Mechanical Systems (MEMS 2003); Kyoto International Conference Hall, Kyoto, Japan, 19-23 January 2003. The yearly meeting focused on traditional MEMS areas such as actuator and sensor devices, and emphasized the growing field of nanoscience. The use of low-cost thick photoresists to form "tall" three-dimensional structures was highlighted by talks from Waseda University, Japan, Georgia Tech, U.S.A., and KAIST, Korea. Regional paper authorship for MEMS2003 was 48.9% Asia, 38.5% U.S.A., and 12.6% Europe, these numbers are similar to the last time the conference was held in Japan (MEMS2000 47.2% Asia, 33.3% U.S.A., 19.5% Europe).

The prospects for mature technology, such as the high-resolution thermal inkjet presented by Fuji Xerox Co., Ltd. Japan was tempered by the statement from Dr. Neylon of Colibrys, S.A., Switzerland that MEMS fabrication industry is suffering from overcapacity. Drs. Toriyama and Sugiyama of Ritsumeikan University, Japan presented unique sensor technology at the meeting. The researchers presented a Si sensor based on nanowires – an increase of 54.8% in the piezoresistance coefficient was established in comparison with more traditional systems. The potential outcome of the result is a radical increase in sensor sensitivity. (Pokines)



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DATE	CONFERENCE	PLACE
May 7-11, 03	ICIAM 2003 The 5th International Congress on Industrial and Applied Mathematics (Mathematics)	Sydney, Australia
May 11-15, 03	**7th International Conference on Organic Nonlinear Optics (ICONO7) / International Conference on Organic Photonics and Electronics (ICOPE 2003)**	**Sorak National Park, Korea**
May 11-16, 03	3rd World Conference on Photovoltaic Energy Conversion	Osaka, Japan
May 12-15, 03	IEEE International Symposium on Cluster Computing & the Grid (CCGrid 2003)	Tokyo, Japan
May 12-16, 03	**International Conference on Shape Modeling & Applications (SMI 2003)**	**Seoul, Korea**
May 12-16, 03	3rd World Conference on Photovoltaic Energy Conversion (WCPEC 3)	Osaka, Japan
May 12-17, 03	IEEE International Conference on Robotics and Automation (ICRA 2003)	Taipei, Taiwan
May 14-16, 03	**The 6th IEEE International Symposium on Object-Oriented Real-Time Distributed Computing (ISORC-2003)**	**Hakodate, Japan**
May 16-19, 03	33rd International Symposium on Multiple-Valued Logic (ISMVL 2003)	Tokyo, Japan
May 18-23, 03	**The 4th International Conference on Intelligent Processing and Manufacturing of Materials (IPMM'03)**	**Sendai, Japan**
May 19-22, 03	SAE "Spring" Fuels & Lubricants Meeting	Yokohama, Japan
May 19-22, 03	**7th Southeast Asian Ergonomics Society and 4th Malaysian Ergonomics Conference (SEAMEC 2003)**	**Kuching, Malaysia**
May 19-23, 03	The 7th International Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS 2003)	Nara, Japan
May 20-24, 03	**The First International Congress on Bio-Nanointerface**	**Tokyo, Japan**
May 25-28, 03	IEEE International Symposium on Circuits and Systems (ISCAS 2003)	Bangkok, Thailand
May 25-30, 03	**The 5th International Conference on Nitride Semiconductors (ICNS-5)**	**Nara, Japan**
May 26-28, 03	5th International Conference on Stochastic Structural Dynamics (SSD-03)	Hangzhou, China
May 26-29, 03	4th International Conference of Physical and Numerical Simulation of Materials Processing	Shanghai, China
May 26-30, 03	The 7th Asian Symposium on Visualization (7ASV)	Singapore
May 28-30, 03	Third International Conference on Fatigue of Composites (ICFC 3)	Kyoto, Japan
May 28-Jun 2, 03	International Symposium on Different Structural Biology 2003 (ISDSB2003)	Tsukuba, Japan
Jun 1-5, 03	7th International Conference on Properties and Applications of Dielectric Materials (ICPADM 2003)	Nagoya, Japan
Jun 1-6, 03	**The Fifth Pacific Rim Conference on Lasers and Electro-Optics (CLEO/PR)**	**Taipei, Taiwan**
Jun 2-4, 03	The 3rd International Conference on Computational Science	Melbourne, Australia
Jun 3, 03	The 9th International Conference on Radiation Curing (Red Tech Asia 2003)	Yokohama, Japan
Jun 2-5, 03	**30th IEEE International Conference on Plasma Science (ICOPS 2003)**	**Jeju, Korea**
Jun 6-9, 03	Optical Amplifiers and Their Application (OAA2003)	Otaru, Japan
Jun 8-9, 03	2003 Silicon Nanotechnologies Workshop	Kyoto, Japan
Jun 10-12, 03	Symposium on VLSI Technology	Kyoto, Japan
Jun 11-13, 03	The 7th International Symposium on Sputtering and Plasma Process	Kanagawa, Japan
Jun 11-13, 03	International Symposium on Macro-, Micro- and Nano-Mechanics of Materials	Hong Kong, China
Jun 12-14, 03	Symposium on VLSI Circuits	Kyoto, Japan
Jun 15-18, 03	JSME-IIP/ASME-ISPS Joint Conference on Micromechatronics for Information and Precision Equipment (IIP/ISPS Joint MIPE)-2003	Yokohama, Japan

Jun 16-18, 03	2003 JSME-IIP/ASME-ISPS Joint Conference on Micromechatronics for Information and Precision Equipment	Yokohama, Japan
Jun 23-25, 03	International Conference on Advances in Structural Engineering	Sydney, Australia
Jun 24-29, 03	International Conference on Heterogeneous Materials Mechanics	Chongqing, Three Gorges, China
Jun 25-27, 03	Third International Symposium on Turbulence and Shear Flow Phenomena	Sendai, Japan
Jun 25-27, 03	Scientific Submarine Cable 2003 (SSC03) Workshop	Tokyo, Japan
Jun 26-27, 03	The International Conference on Genome	Yokohama, Japan
Jun 27-Jul 02, 03	IEEE International Symposium on Information Theory 2003 (TSFP-3)	Yokohama, Japan
Jun 29-Jul 4, 03	2003 IEEE International Symposium on Information Theory (ISIT2003)	Yokohama, Japan
Jun 30-Jul 3, 03	**The 5th Asian Computational Fluid Dynamics Conference**	**Busan, Korea**
Jun 30-Jul 11, 03	XXIII General Assembly of the International Union of Geodesy and Geophysics (IUGG)	Sapporo, Japan
Jul 6-11, 03	STRINGS 2003 (Mathematics)	Kyoto, Japan
Jul 6-11, 03	XIX International Congress of Genetics	Melbourne, Australia
Jul 7-9, 03	**International Conference on Epithelial Technology for Tissue Engineering (ICETTE)**	**Singapore**
Jul 7-11, 03	**International Superconducting Electronics Conference**	**Sydney, Australia**
Jul 7-11, 03	The16th International Vacuum Microelectronics Conference	Osaka, Japan
Jul 7-11, 03	5th International Congress on Industrial and Applied Mathematics	Sydney, Australia
Jul 7-11, 03	10th International Symposium on the Physical and Failure Analysis of Integrated Circuits (IPFA2003)	Singapore
Jul 8-11, 03	**The sixth International Conference on Information Fusion (FUSION 2003)**	**Cairns, Australia**
Jul 9-11, 03	The Tenth International Workshop on Active-Matrix Liquid-Crystal Displays-TFT Technologies and Related Materials (AM-LCD'03)	Tokyo, Japan
Jul 9-11, 03	Computer Graphics International Conference (CGI 2003)	Tokyo, Japan
Jul 13-26, 03	XXVth IAU General Assembly. The International Astronomical Union.	Sydney, Australia
Jul 14-17, 03	Modeling and Simulation Society of Australia and New Zealand, CSIRO Land and Water (MODSIM 2003)	Queensland, Australia
Jul 14-18, 03	2nd International Conference on Autonomous Agents & Multiagent Systems (AAMAS-2003)	Melbourne, Australia
Jul 14-18, 03	The 11th International Conference on Modulated Semiconductor Structures (MSS11)	Nara, Japan
Jul 14-18, 03	The 15th International Conference on Electronic Properties of Two-Dimensional Systems (EP2DS-15)	Nara, Japan
Jul 14-18, 03	**The Second International Joint Conference on Autonomous Agents and Multi-Agent Systems**	**Melbourne, Australia**
Jul 15, 03	Europe-US-Japan Symposium on Ultrafast Photonic Technology	Chiba, Japan
Jul 15-18, 03	Interopt 2003	Chiba, Japan
Jul 16-17, 03	10th Femtosecond Technology Conference (FST2003)	Chiba, Japan
Jul 16-20, 03	International Symposium on Computational Intelligence in Robotics and Automation (CIRA 2003).	Kobe, Japan
Jul 20-24, 03	IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM2003)	Kobe, Japan
Jul 20-25, 03	The 24th International Symposium on Shock Waves	Beijing, China
Jul 22-26, 03	**The 5th Pacific Rim Conference on Lasers and Electro-Optics (CLEO/PACIFIC RIM 2003)**	**Taipei, Taiwan**
Jul 26-31, 03	**21st International Conference on Photochemistry (ICP21)**	**Nara, Japan**
Jul 27- Aug 1, 03	19th International Colloquium on the Dynamics of Explosions and Reactive Systems	Hakone, Japan

Jul 29- Aug 1, 03	IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI 2003)	Tokyo, Japan
Jul 31-Aug 7, 03	28th International Cosmic Ray Conference	Tsukuba, Japan
Aug 13-18, 03	Thirteenth International Heat Transfer Conference	Sydney, Australia
Aug 16-19, 03	AusBiotech	Adelaide, Australia
Aug 17-21, 03	6th International Symposium on Antennas, Propagation & EM Theory (ISAPE-2003)	Beijing, China
Aug 19-22, 03	International Symposium on Speed-up and Service Technology for Railway and MAGLEV Systems (STECH2003)	Tokyo, Japan
Aug 24-29, 03	**The XVth Triennial Congress of the International Ergonomics Association, Symposium on: Cognitive Ergonomics – World-Wide Perspectives**	**Seoul, Korea**
Aug 24-29, 03	World Congress on Medical Physics and Biomedical Engineering - WC2003.	Sydney, Australia
Aug 24-29, 03	The 11th International Symposium on Phototrophic Prokaryotes (ISPP2003 TOKYO)	Tokyo, Japan
Aug 25-29, 03	18th IAVSD Symposium	Atsugi, Japan
Aug 25-29, 03	**World Engineering Anthropometry Resource (WEAR) Workshop**	**Seoul, Korea**
Aug 26-28, 03	International Conference on Computational Mesomechanics (Mesomechanics 2003)	Tokyo, Japan
Sep 1-5, 03	18th International Radiocarbon Conference. Rafter Radiocarbon Laboratory of the Institute of Geological and Nuclear Sciences.	Wellington, New Zealand
Sep 2-6, 03	The 13th International Conference on Positron Annihilation	Kyoto, Japan
Sep 3-5, 03	**Australian International Conference on Radar (RADAR 2003)**	**Adelaide, Australia**
Sep 3-5, 03	IEEE 9th International Software Metrics Symposium (Metrics 2003)	Sydney, Australia
Sep 8-11, 03	2003 International Workshop on Acoustic Echo and Noise Control (IWAENC2003)	Kyoto, Japan
Sep 8-12, 03	The 25th International Conference on Free Electron Laser	Tsukuba, Japan
Sep 10-12, 03	International Conference on Advanced Technology in Experimental Mechanics 2003 (ATEM '03)	Nagoya, Japan
Sep 16-18, 03	2003 International Conference on Solid State Devices and Materials (SSDM2003)	Tokyo, Japan
Sep 16-25, 03	The 12th Mathematical Society of Japan, International Research Institute (12th MSJ-IRI),"Singularity Theory and its Applications"	Sapporo, Japan
Sep 21-27, 03	The International Conference on Marine Biotechnology	Chiba, Japan
Sep 24-26, 03	The 11th International Conference on Terahertz Electronics (THz2003)	Sendai, Japan
Sep 29-Oct 2, 03	The 5th International Meeting of Pacific Rim Ceramic Societies (PacRim 5)	Nagoya, Japan
Sep 29- Oct 10, 03	The 28th International Conference on Infrared and Millimeter Waves (2003IR&WW Waves)	Shiga, Japan
Oct 8-13, 03	**The 8th IUMRS International Conference on Advanced Materials (IUMRS-ICAM 2003)**	**Yokohama, Japan**
Oct 7-9, 03	**The 14th International Conference on Adaptive Structures and Technologies**	**Seoul, Korea**
Oct 7-10, 03	International Symposium on Mixed & Augmented Reality (ISMAR 2003)	Tokyo, Japan
Oct 9-11, 03	**Forum on Materials Education and Research Strategy**	**Yokohama, Japan**
Oct 12-15, 03	IEEE Intelligent Transportation Systems Conference (ITSC 2003)	Shanghai, China
Oct 13-17, 03	International Conference on Intelligent Agent Technology. Web Intelligence Consortium (WIC) (IAT 2003)	Beijing, China
Oct 13-17, 03	The 16th International Conference on Optical Fiber Sensors (OFS-16)	Nara, Japan
Oct 14-16, 03	**37th Annual IEEE International Carnahan Conference on Security Technology**	**Taipei, Taiwan**
Oct 14-17, 03	**IEEE Technical Conference on Convergent Technologies for the Asia-Pacific (TENCON2003)**	**Bangalore, India**
Oct 17-22, 03	The 8th Asian Foundry	Bangkok, Thailand
Oct 19-23, 03	IEEE International Telecommunications Energy Conference (INTELEC 2003)	Yokohama, Japan
Oct 20-22, 03	The 5th International Conference on Fracture & Strength of Solids	Sendai, Japan
Oct 22-26, 03	International Symposium on New Perspectives in Shell and Spatial Structures	Taipei, Taiwan
Oct 27-29, 03	16th International Symposium on Superconductivity (ISS 2003)	Tsukuba, Japan

Oct 28-31, 03	2003 International Microprocesses and Nanotechnology Conference (MNC 2003)	Tokyo, Japan
Oct 28-31, 03	14th International Conference on Methodologies for Intelligent Systems (ISMIS-2003)	Maebashi, Japan
Oct 29-31, 03	The 9th Microoptics Conference (MOC'03)	Tokyo, Japan
Nov 1-5, 03	The 3rd China International Conference on High Performance Ceramics	Shenzhen, China
Nov 2-6, 03	**The Third International Conference on Light Materials for Transportation Systems (LiMAT 2003)**	**Honolulu, Hawaii**
Nov 2-7, 03	International Gas Turbine Congress 2003 Tokyo	Tokyo, Japan
Nov 3-6, 03	International Symposium on Optical Memory 2003 (ISOM '03)	Nara, Japan
Nov 3-7, 03	11th Asia-Pacific Conference on Non-Destructive Testing	Seoul, Korea
Nov 3-8, 03	3rd International Symposium on Slow Dynamics in Complex Systems	Sendai, Japan
Nov 4-7, 03	2003 Asia-Pacific Microwave Conference (APMC '03)	Seoul, Korea
Nov 4-7, 03	3rd Asia-Pacific Conference on Environmental Electromagnetics (CEEM 2003)	Zhejiang, China
Nov 9-13, 03	**XVth International Symposium on the Reactivity of Solids**	**Kyoto, Japan**
Nov 9-13, 03	International Conference on Power Engineering-03 (ICOPE-03)	Kobe, Japan
Nov 10-14, 03	30th International Symposium on Remote Sensing of Environment	Honolulu, Hawaii
Nov 16-20, 03	The 7th International Conference on Atomically Controlled Surfaces, Interfaces and Nanostructures	Nara, Japan
Nov 17-19, 03	**Twelfth International Conference on Composite Structures (ICCS 12)**	**Melbourne, Australia**
Nov 18-20, 03	**4th International High Energy Materials Conference & Exhibit**	**Pune, India**
Nov 18-21, 03	**Japan International SAMPE Symposium and Exhibition**	**Tokyo, Japan**
Dec 1-3, 03	International Symposium on Micro-Mechanical Engineering -Heat Transfer, Fluid Dynamics, Reliability and Mechatronics (ISMME 2003)	Tsukuba, Japan
Dec 7-11, 03	The 4th International Conference on Fluid and Thermal Energy Conversion	Bali Island, Indonesia
Dec 7-12, 03	**International Conference on Materials for Advanced Technologies (ICMAT 2003)**	**Singapore**
Dec 8-12, 03	Congress on Evolutionary Computation (CEC 2003)	Canberra, Australia
Dec 16-20, 03	The Twelfth International Workshop on the Physics of Semiconductor Devices	Chennai, India
Dec 17-19, 03	**International Workshop on Advanced Smart Materials and Smart Structures Technology**	**Honolulu, Hawaii**
2003	Pacific Rim Radio Frequency Radiation Conference (Moved from Nov 4-7, 2002)	Bangkok, Thailand
Jan 2-4, 04	Second BSME-ASME International Conference on Thermal Engineering	Dhaka, Bangladesh
Jan 5-7, 04	17th National and 6th ISHMT-ASME Heat and Mass Transfer Conference	Tamil Nadu, India
Jan 12-16, 04	**Mechanical Behavior of Systems at Small Length Scale**	**Bangalore, India**
Apr 4-9, 04	18th International Congress of Acoustics (18th ICA)	Kyoto, Japan
May 16-21, 04	7th World Biomaterials Congress	Sydney, Australia
May 31- Jun 3, 04	International Conference on Multiphase Flow (ICMF-2004)	Yokohama, Japan
Jun 7-10, 04	24th CIMAC Congress 2004 in Kyoto (CIMAC KYOTO 2004)	Kyoto, Japan
Jun 20-23, 04	International Symposium on New Frontier of Advanced Si-based Ceramics and Composites	Gyeongju, Korea
Jun 29- Jul 2, 04	**7th International Conference on Work with Computing Systems (WWCS-2004)**	**Kuala Lumpur, Malaysia**
Jul 25-28, 04	47th IEEE Midwest Symposium on Circuits and Systems (MWSCAS)	Hiroshima, Japan
Aug 29- Sep 3, 04	24th Congress of the International Council of the Aeronautical Sciences (ICAS 2004)	Yokohama, Japan
Dec 17-19, 04	International Conference on Recent Advances in Composite Materials	Varanasi, India

Points of Contact at AOARD

Tel/Fax: +81-3-5410-4409/4407

Or

Unit 45002, APO AP 96337-5002
DSN: 315-229-3212
Fax: 315-229-3133

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Dr. Terence Lyons: terence.lyons@aoard.af.mil
LtCol Thomas Erstfeld: thomas.erstfeld@aoard.af.mil
LtCol Mark Nowack: mark.nowack@aoard.af.mil
Dr. Edward Feigenbaum: ed.feigenbaum@aoard.af.mil
Dr. Kenneth Goretta: ken.goretta@aoard.af.mil
Dr. Misoon Mah: misoon.mah@aoard.af.mil
Dr. Takao Miyazaki: takao.miyazaki@aoard.af.mil
Dr. Tae-Woo Park: tae-woo.park@aoard.af.mil
Dr. Brett Pokines: brett.pokines@aoard.af.mil
Dr. Theodore Sumrall: theodore.sumrall@aoard.af.mil
Col John Brewer, USAFR: john.brewer@aoard.af.mil
Mr. Julian Jaime: julian.jaime@aoard.af.mil
TSgt Michael Adams: michael.adams@aoard.af.mil