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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 US 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 US Government, US Air Force, or AFOSR positions.

Highlights

The Annual Tri-Service Reception held at the New Sanno Hotel on May 17th was a tremendous success. Co-sponsored by Army Materiel Command Office for International Cooperative Programs (Far East), the Office Of Naval Research International Field Office (Asia), the Army Research Office-Far East, and AOARD, the event was attended by over 250 research managers and scientists. The diverse group included representatives from several embassies, Japanese academia, Japanese industry, Japanese government, the Japan Defense Agency, the Japan Space Agency (NASDA), as well as representatives from the U.S. Embassy including, DOE, NSF, and U.S. industry.

The U.S. Air Force Technology Cooperation Team (TCT) was organized by JUSMAG-K to explore new areas for cooperation, including the identification of potential R&D investment opportunities in Korea. The schedule was very full, as the 27-member team visited 37 sites in Korea in only 9 days in April 2002. Included among the team members were Mr. Greg Beckham, from SAF/IA, and Dr. Robert Sierakowski, the AFRL/MN Chief Scientist. The trip established an excellent networking opportunity and many potential initiatives R&D initiatives were identified. For more information, see the article in this newsletter.

AOARD welcomes a new employee – Ms. Fumiko Kano. A Level II Certified Contracting Specialist, Ms. Kano comes to AOARD from the 374th Contracting Squadron, Yokota AB, Japan. She is a graduate of Tokyo Gakugei University in Koganei, Japan.

AOARD is proud of its two Award Winners this past Quarter. The AFOSR NCO of the Quarter for January-March 2002 was TSgt Michael Adams. The Civilian Professional of the Quarter for January-March 2002 was Mr. Julian Jaime.

Check out the AOARD website for information on AOARD Programs, the AFOSR Broad Area Announcements, list of upcoming conferences in Asia, AOARD Asia Science Letter, and information on traveling to Japan. The website also features links to U.S. Government R&D Organizations, Japanese R&D Organizations, and Universities in Asia. Please take a look: <http://www.nmjc.org/aoard>.

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

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Features

U.S. Air Force Technology Cooperation Team (TCT) visits scientific sites in Korea, April 2002

The U.S. Air Force Technology Cooperation Team (TCT) was organized by the Defense Cooperation in Armaments (DCA) Directorate in the Joint U.S. Military Affairs Group in Korea (JUSMAG-K) to pursue specific USAF areas of interest and identify ROK S&T strengths/focus areas. The thirteen US-based Team Members included Mr. Greg Beckham, the Deputy Chief of Armaments Cooperation Division (SAF/IA) and Dr. Robert Sierakowski (AFRL/MN Chief Scientist). The fourteen Asia-based Team Members included Mr. Chris Goethert (U.S. Embassy S&T), representatives from USFK, ONR (Tokyo), and Lockheed Martin (Tokyo), as well as Col Paul McQuain, LtCol Paul Yamaguchi, and LtCol Eugene Yim from JUSMAG-K (Defense Cooperation).

The team was very successful in exploring new areas for cooperation and potential R&D investment opportunities including new Cooperative Development & Production Programs, Potential New or Expanded Data Exchange Annexes, Engineering and Scientist Exchange Program (ESEP) candidates, and Foreign Comparative Test Program Candidates.

They visited over 20 sites in Korea, including the Ministry of Science and Technology, Samsung Advanced Institute of Technology, Samsung Thales R&D Center, Korea Aerospace Research Institute, Kwangju Institute of Science and Technology, Radio Research Lab, Korea Research Institute of Chemical Technology, Korea Institute of Machines and Materials, Agency for Defense Development, Seoul National University, Korea Advanced Institute of Science and Technology, Pohang University of Science and Technology, Hannam University, Inha University, Hanyang University, and Korea University.

A wide range of potential research areas were explored including command & control, magnetic resonance imaging, metallic materials including tungsten, thin film growth, EMF bioeffects, below ground imaging/ground penetrating radar, optically active polymers, microscale heat transfer, nano-indentation, display technologies, automatic control research, aging aircraft, smart structures, carbon fiber composites, chem/bio decontamination, and UAVs. (Lyons)

Aerospace and Mechanical

Conference: Mechanics and Materials in Design, The Fourth International Conference, Nagoya, Japan, 5-8 June 2002. This conference (1) traces its roots to Mechanics in Design, a conference organized by Prof. S. A. Meguid of the University of Toronto and held in Toronto in 1996. A second conference was held in Nottingham in 1998. The scope of the series was then expanded to include additional attention to materials issues and, in 2000, Mechanics and Materials in Design was held in Orlando. Materials research was added because it was thought that rapid and significant advances in new materials offer more promise for structural improvements than do optimized mechanics-based designs. The recent conference in Nagoya included nearly 100 attendees and 110 presentations.

Plenary lectures were presented by Prof. Meguid, on the role of computational mechanics in engineering and bioengineering, and by Prof. S. Kitipornchai, on the topic of nonlinear numerical modeling of transmission towers. Talks and posters focused on materials and processing (six sessions), computational mechanics (four sessions), computational techniques (one session), intelligent manufacturing (four sessions), intelligent design (two sessions), and advanced mechanical testing (one session).

Among the many exciting developments were improved modeling of vibrations in structures, analysis of the properties of shape-memory polyurethane foams, manufacture of polymer concrete bodies that exhibit exceptional properties for machine-tool applications, manufacture of polymers with significantly improved damping properties, and improved understanding and properties of polymer-clay nanocomposites. Conference papers will be published in selected journals. (Goretta)

1. <http://133.66.140.25/m2d/>

Symposium: 1st International Symposium of Environmentally Compatible Propulsion System for Next-Generation Supersonic Transport; TEPIA Hall, Tokyo; 21-22 May 2002. The era of supersonic transportation is expected to come in the 21st century. Revolutionary technologies, quite different from those existing today, must be developed in order to realize a practical, environment-friendly, economical propulsion system for supersonic civil transport. The Super/Hyper-sonic Propulsion System (HYPR) was started 10 years ago, under MITI's Industrial Science and Technology Frontier Program. Research and development has been conducted on propulsion system technologies that will enable the aircraft to fly at Mach speeds between 0 and 5.

The 5-year ESPR (1) project, started in 1995 as the successor to the HYPR program, has involved R&D collaboration by national institutes, private enterprises and foreign companies.

The target product of ESPR is an environmentally friendly engine system that makes optimal use of CO₂ / NO_x / Noise Reduction technologies. Specifications call for a turbofan engine with a thrust of 347 kN, that can be used for a 4-engine supersonic transport (SST). The SST would be capable of speeds up to Mach 2.2 and a range of 10,200 km, with 300 passengers [400-ton takeoff gross weight].

The purpose of the 1st International Symposium is to report on various research about analysis and rig tests, and on the achievements made through March 2002. The presentations were classified into five types of sessions: Noise Reduction (6 papers), NO_x Reduction (7 papers), CO₂ Reduction (14 papers), Engine System (5 papers), and general lectures by foreign jet engine companies (4 papers).

Two invited lectures were

- “NASA’s Perspective on 21st Century Turbine Technology Leadership” (Dr. Shaw, NASA Glenn Research Center)
- “Supersonic Research with Experimental Airplanes” (K. Sakata, NAL)

One highlight was a presentation by Dr. Omi of IHI, entitled “ESPR Target Engine Cycle Study for Next Generation SST [session #S-5]. Optimization studies of engine parameters such as bypass ratio, exhaust jet velocity at takeoff, specific fuel consumption, and so on, have been done and data was presented. Applications of advanced materials and advanced cooling air reduction technologies were assumed for this target engine. Optimum condition for the target engine was found to be the bypass ratio 1.05 and the exhaust jet velocity 600 m/s.

(Miyazaki)

1. <http://www.espr.jp/>

Computation and Communication

News: “World’s Fastest Supercomputer Lives in Japan”

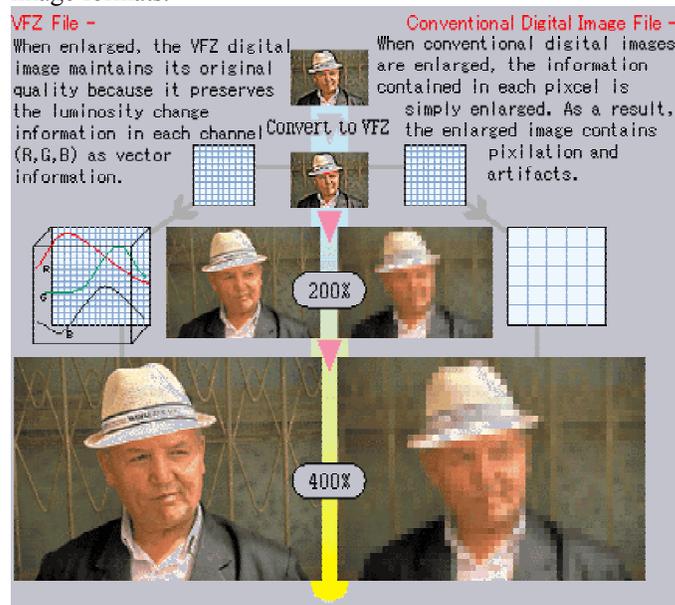
According to the New York Times, Japan now claims the title to the world’s fastest supercomputer (1). In fact, the new computer, known as the NEC Earth Simulator, is nearly five times faster than the previous world leader. Installed in Yokohama, the computer will be used for analysis of climate change, such as global warming and weather and earthquake patterns.

1. <http://zdnet.com.com/2100-1103-887876.html>

Site visit: Celartem Technology Inc., Osaka, Japan: Dr. Feigenbaum of AOARD visited Celartem Technology (1) to discuss imaging software. The company has recently developed a novel image storage and compression format, called Vector Format for Zooming (VFZ), and security applications for the unique Protected Archives Distribution System (PADS). The tool makes the following possible:

- Flawlessly converts images between file formats and zoom image areas up to 1200% with no change to original colors shading with no pixilation effect.
- Perfectly controls the use of individual images by users with respect to access, quality level, resizing ratio, saving and printing.
- Efficiently and easily archives, distributes, repurposes, secures, and manages image databases of all sizes.

The photo below shows a comparison of VFZ and conventional image formats.



Another feature of VFZ is that the process is based on a 3-D vector format and makes it possible to enlarge an image without an appearance of block noise through the use of vector information for color changes.

As for the strong security functions, the PADS Controller controls all distribution and supervises the usage of each image, using a mutual check system between it and VFZ client side products. The software system has been successfully adopted by preservation archivists at the Louvre Museum. They are using it to digitally preserve and archive the museum’s extensive collection of priceless artworks.

For more information, see the website or email them at info@celartem.com.

(Miyazaki and Park)

1. <http://www.celartem.com>

Workshop: TAO Open Forum 2002, Tokyo: 28-29 May 2002: The Telecommunication Advanced Organization of Japan (TAO) (1) was established in 1992 under full support from Ministry of Posts and Telecommunications. Objectives of TAO have been to serve as a bridge between basic research and applied research about communication and broadcasting technologies, maintaining research centers and conducting

pioneering research by orchestrating researchers in industry, government, and academia.

Seventy-one presentations and ten exhibits were provided this year. Four noteworthy sessions were organized; Gigabit Networks (including Photonic Networks), Next Generation Broadband Internet, Security in IT, and Merging of Broadcasting and Communications Network.

Highlighted presentations were as follows;

- #1 R&D of Gigabit Network (Prof. Saito, Tokyo Univ.) The Japan Gigabit Network (JGN) was established for research and development of Japanese network systems. The network system has been used for development of super high-speed network technology and advanced applications where high quality vision and 3-D imagery are highly utilized. Extension to IPv6 systems is also being considered.
- #9 R&D of Information and Communications Technologies for Intelligent Transport System (ITS) (Prof. Shiratori, National Information Research Institute) The ITS is based on advanced technologies such as systems engineering, information management, networking and terminal design. Several fundamental technologies have been developed so far, such as wireless agents, communication systems merging photonics with wireless devices, and wireless multi-mode terminal technology. A coordinated experimental demonstration has been conducted to substantially test developed technologies.
- #13 Global Multimedia Mobile Satellite Communications System (Prof. Yasuda, Waseda Univ.) The Next generation Low – Earth – Orbit (LEO) system consists of an Optical Interorbit Communications Network that will be established through space using numerous satellites. It globally covers the Earth's surface and implements an ubiquitous service network. In 2006, after the completion of phase I and II R&D, a demonstration will be conducted using equipment mounted on a MDS-3 satellite.
- #15 Stratospheric Platform (SPF) (Dr. Oikawa, SPF, National Aerospace Laboratory) The Stratospheric Platform was selected as “the Millennium Project” in 2000. The SPF project has two missions; (1) Communications and Broadcasting, and (2) Earth Observation. To this end, the National Aerospace Laboratory (NAL) is developing a solar – powered airship system for use as a key flight vehicle, and TAO and the Communications Research Laboratory (CRL) will conduct airship – based missions for communications, broadcasting and earth observation. Flight tests at a stratospheric altitude, for technical demonstration of the platform system, will be scheduled in 2004.
- #19 Advanced Remote Display Project of 3-D Moving Image (Prof. Honda, Chiba Univ.) Multidimensional digital signal processing for human friendly stereoscopic television has been developed in conjunction with polynocular stereo imaging.
- #27 Realistic Communication by Multifaceted Display Network (Prof. Hirose, Tokyo Univ.) Common virtual space was established using a network of multiple

immersion multi-display (CAVE display). Immersion Projection Technology (IPT) was made realistic by immersion telecommunications using a stereo video avatar. (Miyazaki)

1. <http://www.shiba.tao.go.jp/>

Electronics and Physics

News: Japan Semiconductor Firms Form Joint R&D Corp., 11 July 2002: As reported in the Japanese media, all 11 of Japan's leading semiconductor firms – including NEC, Toshiba, Fujitsu, Hitachi, Mitsubishi, Matsushita Electric, Oki Electric, Sharp, and Sony Corps. – have pooled resources to found a new R&D JV, Advanced SoC Platform Corporation (ASPLA). In an effort to revive Japan's preeminent position in the world computer chip market, the firms have committed to capitalize ASPLA at about \$18M by Spring 2003. According to ASPLA, in order for Japan to succeed in the emerging global chip market, Japanese industry must achieve unification wherever possible, sharing immense research expenses and jointly developing technology and processes for all to share rather than compete. The new R&D unit will target next-generation 90-nm width semiconductor features, the next beyond the current 130-nm width state-of-the-art. (Maurice)

Site Visit: Institute for Laser Technology, Osaka, Japan; 25 June 2002: The Institute was founded in 1987 by retired professors from Osaka University. Its mission is to take laser-based projects from basic research through to practical application. An initial focus on fusion and fission technologies has broadened to include many possible applications of lasers. The Institute is divided into the following Groups: Laser Beam Propagation, Laser Processing, Laser Biology, Laser Environmental Measurement, and Theory and Simulation. Approximately half of the Institute's funding comes from private sources.

The visit was hosted by Dr. Shigeaki Uchida, who is the Chief Researcher of the Laser Beam Propagation project. His work includes use of lasers to trigger—and eventually control—lightning emission from clouds, use of lasers to detect flaws in concrete structures, and study of laser-ablation processes. Remarkable progress has been made in each of these areas of research and development. (Goretta)

Symposium: Annual symposium of JAERI [Toward Creation and Synthesis]; Tokyo Kokusai Forum, Tokyo; 14 June 2002: The Japan Atomic Energy Research Institute (JAERI) ([1](http://www.jaeri.go.jp/)) aims at developing innovative technologies such as advanced exploitation of atomic energy, achievement of higher safety in nuclear facilities and extensive utilization of radiation.

This year, three main fields were overviewed and future plans also proposed. An invited lecture was delivered by Prof. Matsui of Tokyo University, entitled “Future of Mankind and Life on Earth”. Highlights included:

- Comprehensive research on innovative nuclear reactor and nuclear safety (K. Souda, JAERI). Reduced-moderation Water Reactor converts U-238 into Pu-239 and is able to utilize Uranium resources effectively. The High-temperature Gas-cooled Reactor (HTGR) makes it possible to produce hydrogen for use as an oil substitute. The JAERI constructed a High-temperature Engineering Test Reactor (HTTR) and has been conducting R&D, aiming at thermal power of 30 MW and nominal outlet coolant temperature of 950 °C. The High-temperature Proton Accelerator Project includes the construction of several research facilities for exploiting basic sciences, clarifying the origin of the universe and investigating nuclear structure and nuclear force. JAERI and High Energy Accelerator Research Organization (KEK) have been collaborating for the project.
- Advanced Photon Science and Synchrotron Radiation Science (Y. Kato, JAERI) One of main objectives at the Kansai Research Establishment lies in the development of a compact laser system with ultra short pulses and ultra high peak power, called a “Table-Top Terawatt” or “T-cube” laser. Developing a PW (trillion watt) class high-peak power laser is the goal as a device that can drive not only hard X-ray lasers but also particle accelerators. Tunable wavelength coherent X-ray or gamma ray sources, such as the Free Electron Laser (FEL) are also being pursued using high quality electron beam technology based on the superconductor Linac. The Spring-8 facility (Super Photon Ring 8 GeV) was jointly constructed by KAERI and RIKEN in 1997. It is expected to contribute to discovery of materials having new functions, development in medical diagnosis and new medicines and investigation of the origin of life and progress in nanotechnologies.
- Environmental Science Research (T. Adachi, JAERI) Experimental and numerical studies on the behavior of radionuclide in atmospheric, terrestrial and oceanic environment laser beams have been conducted to solve and forestall environmental problems resulting from nuclear engineering. A sophisticated analytical method, System for Prediction of Environmental Emergency Dose Information Multi-modal Pack (SPEEDI-MP), has been under development.

JAERI is now confronted with two important issues; unification with Japanese Nuclear Cycle Development Institute, and participation in the International Thermonuclear Experimental Reactor (ITER) Project. (Miyazaki)

1. <http://www.jaeri.go.jp/>

Conference: Conference on Laser/Quantum Electronics & Devices (LQE & ED 2002), Imadegawa Campus of Doshisha University, Kyoto, Japan, 13-15 June 02: Sponsored by the Institute of Electronics, Information and Communication Engineers (IEICE) and the committee of the upcoming International Conference of Nitride Semiconductors (ICNS-5), LQE & ED 2002 is the premier domestic Japanese meeting on nitride semiconductor research. It convened in

Kyoto over a 3-day period of independent sessions with total participants topping 400. Topics discussed and reported included: the present status of optoelectronic and electron devices composed of nitride semiconductors, the characteristics and issues with each, devices based on GaN substrates, crystal growth, device fabrication, and process technology. In addition to nitride wide-bandgap materials, there were contributions on GaInNAs for long wavelength lasers, on sub-band transitions in nitride semiconductor compound materials, and on various applications of nitride semiconductor devices, including optical disk, light emitting, and medical.

On efforts towards formation of bulk GaN substrates, several groups reported:

- NEC kicked off the meeting with the status efforts there on bulk single crystal growth via solution and freestanding substrates via vapor phase epitaxy (VPE). The solution technique yields high quality bulk crystal but with growth rates too slow, especially along the required crystal axis. As discussed, this is due to thermodynamic and kinetic restrictions. For the time being, NEC’s efforts have turned towards VPE and crack control during subsequent substrate separation (stress relief/control via optimizing composition and layer thickness).
- Researchers at Doshisha U. use a hybrid-plasma sputter technique to achieve polycrystalline and textured GaN. Their chamber features a multi-cusped magnetic field to confine N₂ plasma. Molten Ga spread over the sputtering target there reacts with the bombarding N ions. After hours of irradiation, the Ga converts to GaN flakes or disk-like crusts, with the use of either a stainless or molybdenum Ga holder, respectively.
- Reports on the formation of thick, freestanding epitaxial GaN films by lattice-matching to other substrates, besides NEC’s work (above), include work at Nikko Materials, where NdGaO₃ (NGO) is used, and at the National Institute for Materials Science (in Tsukuba) using ZrB₂. Other studies were cited with comparisons made to yet other candidate substrates and substrate separation issues.
- The Akasaki-Amano group (Meijo U., Nagoya) reports improvements on the sophisticated mixed-crystal technology developed there since 1986. Their latest method is to grow AlGaIn through low-temperature (LT) AlN interlayers on a triangular facet formed by selective growth using an SiO₂ mask. It combines the LT buffer layer approach, epitaxial lateral overgrowth (ELO), and a defect-blocking, periodically-patterned derivative SiO₂ mask. GaN is first grown on a sapphire substrate by ELO and then patterned into periodic slots by the mask. Then interlayered with LT-AlN, this allows subsequent selection of single-crystal nucleation areas with the result of thick, high-quality, crack-free layers of AlGaIn layers for efficient UV devices. The growth technique allows dynamic control of the buffer layer at the interface in mismatched systems, and, as a new “substrate idea,” is a promising candidate for nitride epitaxial growth.
- Two papers from the Akasaki Research Center at Nagoya U. describe MOVPE growth of GaN/AlGaIn on Si (111) substrates.

Device highlights:

- Among several topics from Sony, one is the announcement of a new GaN blue laser with improved noise characteristics, low threshold current, low power consumption at high-temperature, high-energy operation, and very low loss. The new laser is based on a design improvement that incorporates an undoped AlGaIn layer near the structure's active layer. The modified structure decreases internal loss arising from optical absorption in the adjacent p-type (blocking and cladding) layers. The device exceeds 15,000 hrs under 60°C and 30 mW continuous-wave operation and is suitable for next-generation optical disks.
- Also from Sony is announcement of blue-violet 400-nm 2-beam lasers, now available for laser printing applications. These lasers are fabricated by ELO GaN, on a sapphire substrate. Each laser is driven independently, the laser strips electrically isolated for 0% crosstalk at 60°C, 4 mW operation.
- NEC reports 2 high power, high power density AlGaIn/GaN heterojunction field-effect transistors (HFETs) with the highest reported CW powers for GaN FETS to date: 1) 1.48W for Ka-band, and 2) 43.4W L-band. The FETS are grown on SiC substrates.
- Nichia reports optimized blue and UV LDs for mass production with broadened emission wavelengths (365-480 nm). (Maurice)

International Congress on Advanced Laser Materials Processing (LAMP 2002), Osaka University Convention Center, Osaka, Japan, 27-31 May 2002:

About 400 researchers from 19 countries participated in LAMP'02, a meeting devoted to the science and technology of advanced laser processing. Consisting of the 3rd International Symposium on Laser Precision Microfabrication (LPM'02) and the 1st International Symposium on High Power Laser Macro Processing (HPL'02), LAMP'02 covered both precision microfabrication and high-power laser macro-processing. It spanned the fundamental aspects of laser-material interaction, state-of-the-art laser materials processing, and next-generation topics for fundamental scientists, users, and laser manufacturers. Parallel to these main sessions were special ones on (1) tailored materials properties, (2) high power laser diodes, (3) ultrafast pulse laser processing, and also a technical exhibit. Because advances in laser processing technology have enabled rapid growth of the field and increasing use of the technology in both standard manufacturing and highly specialized materials processing, LAMP'02 topics spanned materials processing (glass, ceramic, semiconductor, metal, and alloys), surface treatment, modification, and restructuring, and application areas from heavy industry and biomedicine.

Highlights:

- An exciting paper on the topic of laser manipulation of bio/biomimetic materials was presented by Prof. S. Juodkazis (U. of Tokushima, Japan). This group has implemented self-arranged biostructures, so-called microtubules, which are flexible biopolymers featuring a large Young's modulus, for use as springs, cantilevers, and rails in molecular biomachinery and

as general nanotechnology tools. They also demonstrate laser trapping and manipulation techniques. For example, paramagnetic microspheres are DNA-anchored to glass for measurement of DNA elastic properties and gold particles attached to the DNA are then laser manipulated to determine the DNA's spring constant. Motion of the molecule can also be controlled in this way.

- In the tailored materials session, several topics drew discussion. Prof. J. Mazumder (U. of Michigan), described how Direct Materials Deposition (DMD) can be used in conjunction with other techniques to, for example, deposit difficult alloys and to design and achieve materials with desired performance -- e.g., a negative coefficient of thermal expansion in a ductile metal. Germany presented topics on thermoplastics -- both tailored thermoplastics for laser activation and use of the laser to tailor properties of thermoplastics -- and laser-joining of dissimilar materials.
- On MEMS and microdevices, Dr. H. Helvajian (the Aerospace Corporation) presented 3-D micromachining of microturbines, transitioned technology, and Dr. A. Pique (NRL) presented laser-induced forward transfer direct-write sensor and microbattery systems, a DARPA and ONR project.
- Prof. D. Hall (Heriot-Watt Univ., UK) presented significant property extensions of the planar waveguide CO₂ laser via operation in the so-called "ultra-super-pulse" mode. In this mode, pulse duration is cut to sub 50 μs and peak power enhanced by 35X CW power. He described applications for electronics, optics manufacturing, and surface treatments.
- The status of large national and multinational initiatives was presented by Japan and the European community. A main driver for the large EU FEMTO project is bioapplications, especially in tissue processing. Other than this, ultra-fast laser pulses are being applied for smoothing of materials and for the micromachining of hard materials. Though a highly successful project to enhance Euro technology, however they see an "industrial system" -- a real technology driver -- as still being a few years away.

LAMP'02 was organized by Osaka University, RIKEN -- the Institute of Physical and Chemical Research (Japan), and several Japanese laser and physics academic societies. It was AFOSR and AOARD supported. (Maurice)

Site Visit: Photonic Science Technology (PST) and Chitose Institute of Science & Technology, Chitose, Hokkaido, Japan, 15-16 May 2002:

Professor Douglas Edsall (ONRIFO-Tokyo) and Joanne Maurice (AOARD) were hosted by Professors Naoya Ogata and Soichi Kobayashi on a recent visit to their institutes. The visit centered on learning more about a novel optical-fiber vibration sensor system recently developed by Dr. Kobayashi, PST President and CIST Professor. Prof. Kobayashi's new sensor is fiber-optic and thus applicable in niche precision vibration instrumentation where

immunity to electrical interference, size, weight, and/or the fiber's natural non-reactiveness are factors. The device is applicable to underwater acoustic sensing in the fishing market and for submarines, for biomedical purposes and in aeronautics. Lockheed Martin in the US has been shipped samples and is considering incorporation of PST's device in accelerometers on their airplanes.

The novel system is based on an ultra-thin optical fiber – a mere 2 μ m thick! – encased in a stainless steel tube and therein allowed to vibrate, its ends, stabilized. (Usual fibers of similar sensor schemes are 125 μ m thick.) Conventional solid-state emitters and detectors are used. Basically, light from a 1550 nm diode is launched into and recovered from the device. At this (longer) wavelength, the propagated mode is very sensitive to bending losses due to vibration: microbending of the fiber causes light to exit it, reducing the transmission intensity in the form of an emitted optical signal, which is then easily detected by optoelectronic transformers. The dynamic range of the sensor is 2000 Hz, with 100 Hz the lowest detectable frequency. Its sensitivity is –50 dbm/10g. PST says the device is stable, reliable, and survivable in most any environment.

PST was established in 2000 under the auspices of the World Photonics Consortium (PWC)/Photonics Valley Project in Japan (PWC-related article in ASL 19). It has nine employees and currently offers tapered and rounded-end optical fibers, v-groove fibers, and vibration sensors. Products underway include optical waveguides, fiber-coupling waveguides, and fiber array. (Maurice and Edsall)

Human Systems

Conference: 8th International Conference on Functional Mapping of the Human Brain (HBM 2002), Sendai, JAPAN; 2-6 June 2002: Although this is only the 8th annual conference (1), the conference has grown to include over 1300 presentations and over 1300 attendees. This conference emphasized the synthesis of methodological breakthroughs with cognitive neuroscience research, and included clinical applications and patient-based research.

The Japanese expect applications of human brain mapping to extend beyond medical applications to include both educational and robotics/AI applications. HBM2002 was partially supported by AOARD and featured the presentation of AOARD-sponsored research on Near Infrared Spectroscopy (NIRS). (Lyons)

1. <http://www.idac.tohoku.ac.jp/HBM2002/>

Conference: The 8th International Meeting on DNA Based Computers (DNA 8), Hokkaido University, Sapporo, Japan; June 10-13, 2002 Biomolecular computing has emerged as a multi-disciplinary field involving molecular biology, chemistry, mathematics, physics and computer science. DNA8 (1) included 23 oral and 12 poster

presentations covering a wide variety of topics including algorithms and applications, analysis of laboratory techniques/theoretical models, computational processes in vitro and in vivo, DNA-computing based biotechnological applications, DNA devices, error evaluation and correction, in vitro evolution, models of biomolecular computing, molecular design, nucleic acid chemistry, and simulation tools. Interfaces with nano-technology include such areas as DNA nanotubes and interfaces with biotechnology include such areas as gene expression profiling, molecular breeding, gene computing, molecular design of proteins, tissue engineering, and toxin detection. U.S. funding contributors included AFOSR, DARPA, NIH, and NSF. Japanese funding sources included the Japan Science and Technology Corporation (JST). (Lyons)

1. <http://hagi.is.s.u-tokyo.ac.jp/dna8/>

Material Science and Structures

Site Visit: National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan; 10 June 2002. The AIST (1) in Tsukuba is comprised of many Research Centers and Institutes. The visit was confined to laboratories at the Nanoelectronics Research Institute, the Energy Electronics Institute, and the Institute for Materials and Chemical Process. Most of the tours and discussions focused on superconducting technology, although some time was spent on photolysis of oxide films. The facilities are exceptional, with the laboratories containing a wide range of state-of-the-art equipment for production of thin-film and bulk superconductors and for characterization of microstructures and superconducting, physical, and mechanical properties.

Recent developments include producing a variety of multilayers and high-quality off-axis films for devices, use of metallorganic chemical vapor deposition and pulsed laser deposition to produce large-area films for fault-current limiters, use of metallorganic deposition to produce low-cost films with high critical current densities, and novel introduction of effective flux-pinning centers in thin superconductor films. (Goretta)

1. <http://www.aist.go.jp/>

Contract awarded: "Mass Determination of Charged Clusters Generated during Thermal Evaporation of Metals," Prof. Doh Yeon Kim, Seoul National University, Seoul, South Korea, June 2002. Prof Kim and his colleague Prof. Nong Moon Hwang have for some time been studying thin-film growth. In processes such as thermal evaporation, they have observed that a significant fraction of the vapor phase exists in the form of charged clusters rather than individual atoms or ions. In this project, they will investigate growth of metallic films by thermal evaporation and chemical vapor deposition. During the growth processes, techniques will be

applied to determine the fraction of vapor that is present as a charged cluster and to measure the mass distributions of the clusters that are present. Effects of cluster size and charge will also be correlated with evolution of film microstructures. (Goretta)

Site Visits: University Materials Science and Engineering Research, Central, Western and Southern Regions, Japan: June 2002. Japanese universities are, in general, blessed with strongly funded research programs, abundant state-of-the-art equipment, and large and talented teams of faculty and students. Visits were paid to a few schools and in each case limited to one or two laboratories that may be of interest to the AFRL.

In brief, at Kagoshima University, Prof. Hiroshi Okada in the Department of Mechanical Engineering focuses primarily on numerical modeling of various problems related to mechanical properties and composites. He is developing techniques based on boundary-element and superposition approaches. These techniques should allow for efficient and effective modeling of complex systems.

At Yamaguchi University, Prof. Takashi Yamamoto of the Faculty of Science is working primarily on modeling of polymer processes such as synthesis and crystallization. This work provides insight into fundamental properties and can lead to accelerated development of new materials.

At Osaka Prefecture University, Prof. Kenji Higashi studies alloy development and mechanical properties of metals. His work is among the most-cited in the world, and includes a new emphasis on use of atomic-scale modeling to predict structures and properties of new materials. Also at Osaka Prefecture University, Profs. Motoaki Adachi and Shigeki Tsukui of the Research Institute for Advanced Science and Technology work on a variety of experimental approaches to development of nanostructured metals and ceramics, thin-film fuel cells, and high-temperature superconductors. A recent advance includes production of nanoscale SiO₂ particles with very tight dimensional control.

Also at Osaka University, Prof. Koichi Niihara and his colleagues are working on a very wide range of projects related to development of ceramic- or polymer-based composites with nanoengineered structures. Current efforts include successful processing and characterization of several new classes of composites that exhibit exception properties. Their initial focus was on mechanical performance, but they are now also producing novel composites with tailored magnetic, optical, or electronic properties.

At Kanazawa Institute of Technology, Prof. Yasushi Miyano and his colleagues are studying the durability of fiber composites. Their efforts include substantial testing with custom-designed equipment and modeling of properties. Prof. Miyano has developed a model of superposition of properties that allows for accurate predictions of durability from optimized experimental campaigns.

At Yokohama National University, Prof. Naoyuki Amemiya of the Department of Electrical and Computer Engineering includes in his studies AC losses in high-temperature superconductors. His work combines experiments and modeling, with incorporation of transport-current and magnetic field effects. Also at Yokohama National University, Prof. Michiko Yoshihara studies oxidation of metals. She has for many years worked with Dr. Young-Won Kim on oxidation of new Ti-based alloys. (Goretta)

Window-on-Science Visit: Prof. Kenong Xia, Department of Mechanical and Manufacturing Engineering, University of Melbourne, Melbourne, Australia, 28 April - 7 May 2002. Prof. Xia was hosted at the AFRL/ML, WPAFB, by Dr. Young-Won Kim. He presented a seminar entitled “Creep behavior and mechanisms in fully lamellar Ti-44Al-1Mn-2.5-Nb and Ti-44Al-1Mn-2.5Nb-0.15Gd alloys.” Subsequent discussions with researchers at WPAFB centered on ways to produce fine uniform lamellar microstructures in TiAl intermetallics in order to enhance creep resistance. Gd additions have been shown to be effective in creating such microstructures. Possible collaborations aimed at understanding and optimizing the effects of alloying with Gd were discussed. Prior to visiting WPAFB, Prof. Xia presented a paper at the 3rd International Symposium on Structural Intermetallics (1), Jackson, WY, 28 April – 2 May 2002. (Goretta)

1. <http://www.tms.org/Meetings/Specialty/ISSI3/ISSI3-Home.html>

Window-on-Science Visit: Prof. T. K. Ramamurthy, Department of Aerospace Engineering, Indian Institute of Science, Bangalore, India, 28 April 2002. Prof. Ramamurthy was hosted at WPAFB by Dr. Ajit Roy. He presented two seminars to researchers from MLLN, MLBCM, the Air Force Institute of Technology, and the University of Dayton Research Institute: “Axi-symmetric cracks under mixed mode loadings” and “Delamination tolerance studies in laminated composite panels.” Discussions with the various researchers identified common interests in high-cycle fatigue and fretting, joints in aerospace structures, mechanics of composites, contact problems, and porous structures. Complementary approaches and skills were identified and plans for collaboration were discussed. (Goretta)

Contract awarded: “Development of Ultrafine-Grained Ti and Ti-6Al-4V Alloy by Equal Channel Angular Extrusion,” Prof. Dong H. Shin, Hanyang University, Ansan, South Korea, April 2002: The contractor will investigate the effects of equal-channel angular extrusion (ECAE) on the microstructure and properties of Ti and the Ti-6Al-4V alloy. The goals of the work are to: (1) develop a model of strain accommodation during the extrusion process; (2) investigate the effects of microstructure on the deformation responses of the metal and alloy; (3) design and optimize processing routes to produce ultrafine-grained Ti and Ti-6Al-4V; and (4) measure and evaluate resulting mechanical properties. ECAE holds tremendous promise for producing

exceptionally strong metals and alloys, but to date, has not been successfully applied to Ti and its alloys. This work will address the fundamentals of the process and will seek to use the knowledge gained to control processing and microstructure so that high-strength materials can be reliably made. POC: Dr. Lee Semiatin (AFRL/MLLM). (Goretta)

Conference: Bulk Metallic Glasses II, Keelung, Taiwan, 24-28 March 2002. Bulk metallic glasses are a relatively new and exciting class of metals with unique properties for structural and functional applications. The goal of this conference was to provide a forum to discuss recent progress in fundamentals and applications of bulk metallic glasses. As with the first conference in this series, which was held in Singapore on 24-28 September 2000, organizational details were expertly handled by the United Engineering Foundation (<http://www.engfnd.org>). The conference was cosponsored by several technical organizations, including the Tri-Services Offices in Tokyo. There were approximately 60 attendees, primarily from Asia and the U.S. Plenary talks, which focused on mechanical properties, were provided by Profs. W. L. Johnson of the California Institute of Technology and A. Inoue of Tohoku University. The conference featured oral sessions on Thermal Stability; Mechanical Properties; Nanocrystallization and Pressure Effects; Alloying Effects and Mechanical Properties; Thermodynamics and Kinetics; Inhomogeneous Deformation and Shear Bands; Homogeneous Deformation; Composite, Chemical and Magnetic Properties;

Simulation; and Processing (1). Conference papers will be published in the *Journal of Intermetallics*. (Goretta)

1. <http://www.engfnd.org/2an.html>

Micro Systems

Conference: International Workshop on Nanophysics and Nanotechnology (IWONN '02), Hanoi Vietnam, 20-21 June 2002: President of the National Center for Natural Science and Technology, Nguyen Van Hieu opened the workshop with the hope of future international interaction. Researchers from Australia, Korea, Japan and the United States joined over 100 researchers from Vietnam (e.g. Institute of Material Science, Vietnam National University, Hanoi University of Technology, Institute of Physics, Institute of Tropical Technology) for the first nano-tech workshop in Hanoi. Topics included overviews of international nano-research as well as local presentations on carbon nanotubes, silicon micro-fabricated devices, and nanocrystalline material. Topics such as corrosion resistance, solar power, and magnetic materials were presented. These areas echo past specialization areas that reflect special strengths or challenges in Vietnam and are areas where nano-technology is targeted for application. The conference was supported AOARD, ONR-IFO, and ARO-FE. (Pokines)

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DATE	CONFERENCE	PLACE
Sep 1-6, 02	The 13th International Conference on Ion Beam Modification of Materials (IBMM2002)	Kobe, Japan
Sep 2-4, 02	The 7th Asian Symposium on Information Display (ASID '02)	Singapore, Singapore
Sep 3-6, 02	Optical Technology and Image Processing for Fluids and Solids Diagnostics	Beijing, China
Sep 3-6, 02	The IEEE 5th International Conference on Intelligent Transport Systems	Singapore
Sep 4-6, 02	2002 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD2002)	Kobe, Japan
Sep 8-13,02	The 8th International Conference on Nuclear Microprobe Technology and Applications (ICNMTA2002)	Gunma, Japan
Sep 8-13, 02	8th International Conference on Quasicrystals (ICQ8)	Bangalore, India
Sep 9-13, 02	9th International Conference on Accelerator Mass Spectrometry (AMS-9)	Nagoya, Japan
Sep 10-12, 02	9th IEEE International Conference on Mechatronics and Machine Vision in Practice 2002	Chiang Mai, Thailand
Sep 10-14, 02	The International Conference of Polycrystalline Semiconductors 2002	Nara, Japan
Sep 11-14, 02	8th International Workshop on Shock Tube Technology	Bangalore, India
Sep 12-13, 02	Semiconductor Technology Academic Research Center (STARC) 2002 Symposium	Yokohama, Japan
Sep 16-19, 02	4th International Symposium on Humidity and Moisture (ISHM2002)	Taipei, Taiwan
Sep 17-20, 02	2002 International Conference on Solid State Device and Materials (SSDM2002)	Nagoya, Japan
Sep 17-20, 02	The Third Asian Pacific Laser Symposium (APSL2002)	Osaka, Japan

Sep 18-20, 02	11th International Plastic Optical Fibers Conference 2002 (POF2002)	Tokyo, Japan
Sep 22-25, 02	6th International Symposium on Optical Storage (ISOS2002)	Wukan, China
Sep 23-27, 02	The 10th International Conference on Environmental Ergonomics (ICEE 2002)	Fukuoka, Japan
Sep 24-28, 02	7th International Conference on Semisolid Processing of Alloys and Composites	Tsukuba, Japan
Sep 25-26, 02	Research and Development in IT 2002 (CoRDIT 2002)	KelanaJaya, Malaysia
Sep 25-27, 02	8th International Conference on Virtual Systems and Multimedia (VSMM 2002)	Gyeongju, Korea
Sep 25-27, 02	Minerals Engineering 2002	Perth, Australia
Sep 25-27, 02	The 4th Asian Control Conference	Singapore
Sep 25-28, 02	International Conference on Structural Integrity and Fracture (SIF2002)	Perth, Australia
Sep 25-28, 02	Fifth International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI2002)	Tokyo, Japan
Sep 26-28, 02	International Optoelectronic Expo & Forum 2002 (IOEF2002)	Weifang, China
Sep 29-Oct 3, 02	6th International Conference on Mechatronics Technology	Kitakyusyu, Japan
Sep 29-Oct 3, 02	Australasian Ceramic Society Conference (Austceram 2002)	Perth, Australia
Sep 29-Oct 3, 02	9th Asian Pacific Confederation of Chemical Engineering and 30th Annual Australasian Chemical Engineering Conference (APCChE 2002 and Chemeca 2002)	Christchurch, New Zealand
Sep 30-Oct 4, 02	3rd Asia-Pacific Surface Interface Analysis Conference (APSIAC'02)	Tokyo, Japan
Sep 30-Oct 4, 02	The XVI International Conference on Particles and Nuclei (PANIC 02)	Osaka, Japan
Oct 3-4, 02	2002 International Symposium on Empirical Software Engineering (ISESE 2002)	Nara, Japan
Oct 6-8, 02	3rd Chitose International Forum on Photonics Science & Technology	Hokkaido, Japan
Oct 6-10, 02	IEEE/PES Transmission and Distribution Conference and Exhibition 2002: Asia Pacific	Yokohama, Japan
Oct 9-11, 02	JSASS 16th International Sessions in 40th Aircraft Symposium	Yokohama, Japan
Oct 10-11, 02	24th International Symposium on Dry Process (DPS2002)	Tokyo, Japan
Oct 14-18, 02	Photonics Asia	Shanghai, China
Oct 14-18, 02	2nd Asia-Pacific Optical and Wireless Communications (APOC2002)	Shanghai, China
Oct 15-17, 02	11th International Symposium on Semiconductor Manufacturing (ISSM2002)	Tokyo, Japan
Oct 15-18, 02	The 10th JSME Materials and Processing Conference (M&P 2002)	Honolulu, Hawaii
Oct 20-23, 02	IEEE International Symposium on Micromechatronics and Human Science (MHS 2002)	Nagoya, Japan
Oct 21-23, 02	Asian Symposium on Biomedical Optics and Photomedicine	Sapporo, Japan
Oct 21-24, 02	AsiaTrib 2002 International Conference	Cheju, Korea
Oct 21-25, 02	4th International Symposium on Control of Semiconductor Interfaces (ISCSI-4)	Karuizawa, Japan
Oct 21-25, 02	Joint 1st International Conference on Soft Computing and Intelligent Systems & 3rd International Symposium on Advanced Intelligent Systems (SCIS & ISIS 2002)	Tsukuba, Japan
Oct 23-25, 02	Seventh IEEE/IEICE International Symposium on High Assurance Systems Engineering (HASE 2002)	Tokyo, Japan
Oct 23-27, 02	Third International Asia-Pacific Symposium on Remote Sensing of the Atmosphere, Ocean, Environment, and Space	Hangzhou, China
Oct 28-29, 02	Geopolymers 2002	Melbourne, Australia
Oct 28-31, 02	The 17th IEEE Region 10 International Conference on Computers, Communications, Control and Power Engineering (IEEE TENCON'02)	Beijing, China
Oct 28-Nov 2, 02	International Symposium on Bio-Trace Elements 2002 (BITREL2002)	Yamanashi, Japan
Oct 29-31, 02	Small Engine Technology Conference (SETC)	Kyoto, Japan
Oct 29-31, 02	WHO, EMF Biological Effects and Standards Harmonization Meeting	China
Oct 27-Nov 1, 02	The Seventh International Conference on Technology of Plasticity	Yokohama, Japan
Oct 30-Nov 1, 02	3rd International Conference on Optics-photonics Design & Fabrication (ODF2002)	Tokyo, Japan
Nov 3-7, 02	The Sixth International Symposium on Micro Total Analysis System (mTAS)	Nara, Japan
Nov 5-8, 02	International Topical Meeting on Microwave Photonics (MWP2002)	Hyogo, Japan
Nov 6-8, 02	International Symposium on Cyber Worlds: Theories and Practices	Tokyo, Japan

Nov 6-8, 02	2002 International Microprocesses and Nano-Technology Conference (MNC2002)	Tokyo, Japan
Nov 7-8, 02	The 3rd International Workshop on ITS Telecommunications (ITST2002)	Seoul, Korea
Nov 9-22, 02	2002 Asia-Pacific Microwave Conference (APMC2002)	Kyoto, Japan
Nov 11-13, 02	Heli Japan 2002 AHS International Meeting on Advanced Rotorcraft Technology and Life Saving Activities	Tochigi, Japan
Nov 11-13, 02	15th International Symposium on Superconductivity 2002 (ISS2002)	Yokohama, Japan
Nov 12-13, 02	International Workshop on Power MEMS	Tsukuba, Japan
Nov 12-14, 02	The 3rd International Symposium on Advanced Science Research Advances in the Physics of f-electron Systems	Ibaraki, Japan
Nov 12-15, 02	International Symposium on Alcohol Fuels (ISAF XIV)	Phuket, Thailand
Nov 12-15, 02	5th JFPS International Symposium on Fluid Power	Nara, Japan
Nov 13-15, 02	Exhibition MICROMACHINE 2002	Tokyo, Japan
Nov 14-15, 02	Sixth Composites Durability Workshop (CDW-6)	Tokyo, Japan
Nov 17-20, 02	The 8 th Pacific Rim Biotechnology Conference	Auckland, New Zealand
Nov 17-21, 02	5 th JSME-KSME Fluid Engineering Conference	Nagoya, Japan
Nov 17-21, 02	Shotcrete for Underground Support IX	Hayama, Japan
Nov 18-22, 02	9th International Conference on Neural Information Processing (ICONIP02)	Singapore
Nov 18-22, 02	4th Asia-Pacific Conference on Simulated Evolution and Learning	Singapore
Nov 18-22, 02	International Conference on Fuzzy Systems and Knowledge Discovery	Singapore
Nov 19-22, 02	2002 Asia-Pacific Microwave Conference (APMC 2002)	Kyoto, Japan
Nov 19-23, 02	2 nd International Symposium on Advanced Ceramics	Shanghai, China
Nov 24-28, 02	First International Conference on Information Technology Applications (ICITA 2002)	Bathurst, Australia
Nov 25-26, 02	Australasian Workshop on Structural Health Monitoring	Clayton, Australia
Nov 26-28, 02	2002 Interim International Symposium on Antennas and Propagation (ISAP I-02)	Yokosuka, Japan
Nov 27-29, 02	Seventh International Conference on Manufacturing	Bangkok, Thailand
Nov 27-29, 02	International Symposium on Innovative Materials Processing by Controlling Chemical Reaction Field (IMP2002)	Miyagi, Japan
Dec 2-3, 02	Third Australian Conference on Laser Diagnostics in Fluid Mechanics and Combustion	Brisbane, Australia
Dec 2-5, 02	IUPAC Polymer Conference on the Mission and Challenges of Polymer Science and Technology (IUPAC-PC2002)	Kyoto, Japan
Dec 2-6, 02	The Sixth Asia-Pacific Symposium on Engineering Plasticity and its Applications	Sydney, Australia
Dec 2-6, 02	The 15 th Australian Joint Conference on Artificial Intelligence (AI'02)	Canberra, Australia
Dec 4-6, 02	The Ninth International Display Workshops (IWD'02)	Hiroshima, Japan
Dec 4-7, 02	International Congress on Biological and Medical Engineering	Singapore
Dec 9-12, 02	IEEE International Conference on Data Mining (IEEE ICDM-2002)	Maebashi, Japan
Dec 9-13, 02	APAM 2002 International Conference	Hsin-chu, Taiwan
Dec 10-12, 02	The 5 th International Conference on Nano-Molecular Electronics (ICNME2002)	Kobe, Japan
Dec 11-13, 02	IAPR Workshop on Machine Vision Applications (MVA2002)	Nara, Japan
Dec 14-15, 02	The Future of Artificial Intelligence Workshop	Shizuoka, Japan
Dec 15-18, 02	8 th Asian Conference on Solid State Ionics	Langkawi, Malaysia
Dec 15-18, 02	Intelligent Systems and Applications ISA 2002	Shanghai, China
Dec 16-18, 02	The 2nd International Conference on Structural Stability Dynamics (ICSSD 02)	Singapore
Dec 16-19, 02	6 th International Conference/Exhibition on High Performance Computing (HPC-Asia 2002)	Bangalore, India
Dec 28-30, 02	International Symposium on Experimental Mechanics	Taipei, Taiwan
Jan 6-10, 03	10 th International Symposium on Deep Seismic Profiling of Continents and their Margins (IASPEI) (SEISMIX 2003)	Taupo, New Zealand
Jan 13-15, 03	1 st International Symposium on Information Technology in Engineering	Sydney, Australia

Jan 15-17, 03	6 th International Topical Workshop on Contemporary Photonic Technologies (CPT 2003)	Tokyo, Japan
Jan 19-23, 03	16 th IEEE International Micro Electro Mechanical Systems Conference (MEMS 2003)	Kyoto, Japan
Jan 21-24, 03	Topical Workshop in Heterostructure Materials (TWHM'03)	Okinawa, Japan
Jan 22-30, 03	2 nd International Conference on "Platform Science and Technology for Advanced Magnesium Alloys"	Osaka, Japan
Jan 24-26, 03	The 8 th International Symposium on Artificial Life and Robotics (AROB)	Oita, Japan
Jan 26-30, 03	2nd International Conference on "Platform Science and Technology for Advanced Magnesium Alloys" (PSTAM 2003)	Osaka, Japan
Feb 2-8, 03	International Society for Plant Pathology (ICPP 2003)	Christchurch, New Zealand
Feb 3-7, 03	3 rd World Congress on Medicinal and Aromatic Plants (WOCMAP III)	Chiang Mai, Thailand
Feb 4-7, 03	Australian Computer Science Week 2003 (ACSW 2003)	Adelaide, Australia
Feb 4-7, 03	Fourth Australasian User Interface Conference (AUIC2003)	Adelaide, Australia
Feb 10-14, 03	Conference on Permutation Patterns	Dunedin, New Zealand
Feb 11-14, 03	International Conference on Computer Graphics and Interactive Techniques in Australia and South East Asia	Melbourne, Australia
Feb 18-21, 03	The 3 rd International Display Manufacturing Conference & Exhibition	Taipei, Taiwan
Feb 19-22, 03	International Display Manufacturing Conference (IDMC 2003)	Taipei, Taiwan
Feb 2003	12th Australian Electrichemistry Conference (12AEC)	Hobart, Australia
Mar 1-4, 03	International Conference on Fuzzy Information Processing: Theories and Applications	Beijing, China
Mar 2-7, 03	Fifth International Workshop on Nonlinear Waves and Chaos in Space Plasmas. Indian Institute of Geomagnetism.	Maharashtra, India
Mar 5-8, 03	19th International Conference on Data Engineering	Bangalore, India
Mar 10-11, 03	Multi-lingual Information Management (RIDE-MLIM'2003)	Hyderabad, India
Mar 11-13, 03	8th Atmospheric Sciences and Application to Air Quality (ASAAQ 2003)	Tsukuba, Japan
Mar 13-15, 03	The 3rd International Conference on Numerical Analysis in Engineering (NAE2003)	Batam Island, Indonesia
Mar 16-19, 03	8th International Symposium on Plasticity and Impact Mechanics	New Delhi, India
Mar 21-23, 03	IEEE 2003 International Conference on Computational Intelligence for Financial Engineering (CIFEr2003)	Hong Kong, China
Mar 26-28, 03	8th International Conference on Database Systems for Advanced Applications	Kyoto, Japan
Apr 2-4, 03	FEF-03 Finite Elements on Flow Problems	Nagoya, Japan
Apr 6-10, 03	IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'2003)	Hong Kong, China
Apr 6-10, 03	International Conference on Acoustics, Speech and Signal Processing (ICASSP)	Hong Kong, China
Apr 9-11, 03	International Ceramic Exhibition 2003, Concurrent Conference: 2nd Fulrath Memorial Symposium on Advanced Ceramics	Tokyo, Japan
Apr 14-16, 03	ISCA Workshop on Spontaneous Speech Processing and Recognition.	Tokyo, Japan
Apr 15-19, 03	21st AIAA International Communications Satellite Systems Conference & Exhibit (AIAA ICSSC-21)	Yokohama, Japan
Apr 20-23, 03	Eleventh International Conference on Nuclear Engineering (ICONE-11)	Tokyo, Japan
May 3-5, 03	First International Conference on Smarandache Geometries (Mathematics)	Gold Coast, Australia
May 7-11, 03	ICIAM 2003 The 5th International Congress on Industrial and Applied Mathematics (Mathematics)	Sydney, Australia
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 12-17, 03	IEEE International Conference on Robotics and Automation (ICRA 2003)	Taipei, Taiwan
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	Sendai, Japan

	of Materials (IPMM'03)	
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 26-30, 03	The 7th Asian Symposium on Visualization (7ASV)	Singapore
May 26-28, 03	5th International Conference on Stochastic Structural Dynamics (SSD-03)	Hangzhou, China
May 28-30, 03	Third International Conference on Fatigue of Composites (ICFC 3)	Kyoto, Japan
Jun 1-5, 03	7th International Conference on Properties and Applications of Dielectric Materials (ICPADM 2003)	Nagoya, Japan
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 15-18, 03	JSME-IIP/ASME-ISPS Joint Conference on Micromechanics for Information and Precision Equipment (IIP/ISPS Joint MIPE)-2003	Yokohama, Japan
Jun 23-25, 03	International Conference on Advances in Structural Engineering	Sydney, Australia
Jun 25-27, 03	Third International Symposium on Turbulence and Shear Flow Phenomena	Sendai, Japan
Jun 27-Jul 02, 03	IEEE International Symposium on Information Theory 2003 (TSFP-3)	Yokohama, Japan
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 7-11, 03	5 th International Congress on Industrial and Applied Mathematics	Sydney, Australia
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 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	Conference on Lasers & Electro-Optics & The Pacific Rim Conference on Lasers and Electro-Optics (CLEO/PACIFIC RIM 2003)	Taipei, Taiwan, Republic of China
Jul 29- Aug 1, 03	IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI 2003)	Tokyo, Japan
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 25-29, 03	18th IAVSD Symposium	Atsugi, Japan
Aug 24-29, 03	World Congress on Medical Physics and Biomedical Engineering - WC2003.	Sydney, Australia
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 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 10-12, 03	International Conference on Advanced Technology in Experimental Mechanics 2003 (ATEM '03)	Nagoya, 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 29-Oct 2, 03	The 5th International Meeting of Pacific Rim Ceramic Societies (PacRim 5)	Nagoya, Japan
Oct 8-13, 03	The 8th IUMRS International Conference on Advanced Materials	Yokohama, Japan
Oct 7-10, 03	International Symposium on Mixed & Augmented Reality (ISMAR 2003)	Tokyo, Japan
Oct 8-10, 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 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
Nov 2-7, 03	International Gas Turbine Congress 2003 Tokyo	Tokyo, 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	3rd Asia-Pacific Conference on Environmental Electromagnetics (CEEM 2003)	Zhejiang, China
Nov 9-13, 03	International Conference on Power Engineering-03 (ICOPE-03)	Kobe, Japan
Nov 16-20, 03	The 7th International Conference on Atomically Controlled Surfaces, Interfaces and Nanostructures	Nara, Japan
Nov 19-21, 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	4th International Conference on Fluid and Thermal Energy Conversion	Bali Island, Indonesia
Dec 8-12, 03	Congress on Evolutionary Computation (CEC 2003)	Canberra, Australia
2003	Pacific Rim Radio Frequency Radiation Conference (Moved from Nov 4-7, 2002)	Bangkok, Thailand
Apr 4-9, 04	18th International Congress of Acoustics (18th ICA)	Kyoto, Japan
May 16-21, 04	7th World Biomaterials Congress	Sydney, Australia
Jun 7-10, 04	24th CIMAC Congress 2004 in Kyoto (CIMAC KYOTO 2004)	Kyoto, Japan
Jul 25-28, 04	47th IEEE Midwest Symposium on Circuits and Systems (MWSCAS)	Hiroshima, 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 Mark Nowack: mark.nowack@aoard.af.mil

Dr. Edward Feigenbaum: ed.feigenbaum@aoard.af.mil

Ms. Joanne Maurice: joanne.maurice@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. Kenneth Goretta: ken.goretta@aoard.af.mil

LtCol John Brewer, USAFR: john.brewer@aoard.af.mil

Mr. Julian Jaime: julian.jaime@aoard.af.mil

TSgt Michael Adams: michael.adams@aoard.af.mil