



Santa Clara Valley Chapter

January 2001

Volume 44, Number 5

Wednesday, January 10

A Joint Meeting with the American Ceramic Society

**Beyond Silicon: Microfabrication with
Metals, Plastics, and Ceramics**

John T. Hachman and Alfredo M. Morales
Microsystems Processing Department
Sandia National Laboratories, Livermore, CA

5:30 pm Social/Networking.....6:15 pm Dinner.....7:30 pm Speaker

Meeting Location:
WYNDHAM GARDEN HOTEL
1300 Chesapeake Terrace
Sunnyvale
(408)747-0999

Dinner Cost: ASM Members \$18, Students \$8, Guests \$20
Meal Choices: Steak, Crusted Cod, or Vegetarian

RESERVATIONS REQUIRED:
Jim Knowles (650) 728-3786 or jim@grandkauai.com
\$2 late fee after noon on Monday, January 8

January Meeting Sponsor:  **Laser Kinetics**

January 10 is also ASMI-SCV Fellows Night - see inside for more information...



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About the Topic

Beyond Silicon: Microfabrication with Metals, Plastics, and Ceramics

Modern macroscopic devices achieve novel functionalities by combining components made from metals, plastics, and ceramics. In contrast, microelectromechanical systems (MEMS) are fabricated mainly from silicon and a few metals resulting in limited functionality. In order to increase the range of materials available for MEMS, our group has developed and combined different microfabrication and materials processing techniques. For example, we have established a complete LIGA (x-ray-based lithography) program to electroform high aspect ratio metal microparts or microstamps. LIGA devices are typically ten to hundreds of microns in height resulting in mechanical components that can generate and transmit useful forces and torques. The height of LIGA devices also makes them ideal components for optical and RF communication systems. A combination of LIGA, polishing, and electroforming enables the fabrication of three-dimensional metal cavities with micron size features on the internal surface. Such cavities have applications as microwave resonance cavities and microbellows for actuation. LIGA-fabricated microstamps are used to produce plastic replicates by either hot embossing or injection-compression molding. Plastic microparts are desirable as economic microfluidic components for portable analytical and medical instrumentation. LIGA produced plastic micromolds are used to fabricate nanocomposite and ceramic microparts. The incorporation of ceramics into MEMS will allow the exploitation of materials properties such as high temperature inertness, photochromism, chemical and biological compatibility, piezoelectricity, and magnetism. We are currently developing micromolding and surface chemistry techniques for metal nanoparticles. This will allow the fabrication of microparts from engineering metals not available through aqueous electroforming such as stainless steel, aluminum, titanium, and brass. In this talk we will present an overview of our current microfabrication baseline process, research, and applications.

About the Speakers


John T. Hachman and Alfredo M. Morales, Sandia National Laboratories

John T. Hachman is Distinguished Technologist. He has been at Sandia for 26 years and for 20 years he has worked at the Sandia Electroplating Facility. John has worked on multiple weapons programs skillfully applying processes such as electroforming, anodizing, and electrojoining. He is currently responsible for plating LIGA gold masks and for electroforming and planarizing microparts.

Alfredo M. Morales is Senior Member of Technical Staff. Before joining Sandia, he obtained a Ph.D. from the department of Chemistry at Harvard University where he developed new synthetic and analytical methods for nanowires and nanotubes. His current research involves the developments of new tools, materials, and applications for microfabrication.

January Meeting Sponsor

ASMI-SCV would like to thank **Laser Kinetics** for sponsoring our January meeting. Laser Kinetics develops, designs, and supervises the fabrication of laser processing systems for advanced technology and commercial applications. We appreciate Laser Kinetic's support, which enables us to provide quality technical programming to our membership at a reasonable cost.



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Meeting Location

As usual, the SCV meeting will be held at the Wyndham Gardens Hotel. **From points south:** travel north on Lawrence Expressway, pass over 237, and make the first left (Moffett Park Drive), and then the first left onto Chesapeake Terrace. **From points east or west:** take the Caribbean Drive (Lawrence Expressway North) exit off 237, take the first left at Moffet Park Drive, and then left on Chesapeake Terrace. Once you are on Chesapeake, simply proceed to the end where you'll find The Wyndham Gardens Hotel.



ASMI-SCV Fellows to be Honored at January Meeting

Each year ASM International honors a group of distinguished materials technologists for their career achievements by awarding them the title of ASM Fellow. These are individuals who have made great scientific and engineering contributions to their companies and universities, and their advancements have been a benefit to the technological community in general. Each year we at ASMI-SCV express our appreciation of their accomplishments by inviting them to be our guests at the January meeting. This is our way of thanking them for their inspiration and hard work, and for their willingness to share their expertise with their colleagues in the local community. The Santa Clara Valley Chapter Fellows are:

Edmund C. Burke.....	1970	Charles A. Rau.....	1984
Robert I. Jaffee.....	1970	Ramaswamy Viswanathan..	1985
Oleg D. Sherby.....	1970	Prodyot Roy.....	1986
Gerald M. Gordon.....	1975	Jeffrey Wadsworth.....	1987
Walter E. Littman.....	1975	Elliot H. Rennhack.....	1988
Raymond W. Fenn.....	1976	C. Sheldon Roberts.....	1988
Claus G. Goetzel.....	1976	Charles M. Packer.....	1989
Thomas E. Tietz.....	1976	Richard E. Lewis.....	1991
Roger A. Perkins.....	1977	John C. Shyne.....	1991
Frank A. Crossley.....	1978	Elliott Willner.....	1991
William D. Nix.....	1978	Joshi Anne.....	1992
Howard G. Nelson.....	1980	Tai-Gang Nieh.....	1992
Anthony T. Cape.....	1981	Kenneth Challenger.....	1993
Joseph C. Danko.....	1983	Donald A. Shockey.....	1993
Alfred Goldberg.....	1983	Alvin J. Jacobs.....	1997
Roger H. Richman.....	1983	Donald R. Leseur.....	1997
William C. Coons.....	1984	John Stringer.....	1998

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The ASM International Foundation Announces...

Materials Camp 2001

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QUESTION: Do you know a high school student with an interest in engineering?

QUESTION: Want to help a young person explore the amazing world of materials science?

QUESTION: Concerned about where the next generation of materials specialists will come from?

If you answered “YES” to any of these questions, we have an answer for you: **MATERIALS CAMP!**

Due to an overwhelming response, the ASM International Foundation is pleased to announce its second year sponsorship of Materials Camp USA! The first Materials Camp was so successful that the Foundation Board has decided to continue the program, and expanding it to two camps this year: MATERIALS CAMP USA- East (location: Materials Park, Ohio) to be held August 6 to 12, and MATERIALS CAMP USA-WEST (location and dates: to be announced). All programs will be conducted in collaboration with the renowned ASM Materials Engineering Institute.

This unique program, limited to students entering their junior or senior year of high school will feature highly interactive, lab-based activities tailored to individual student interest areas. In addition, Materials Camp USA-EAST participants will benefit from a tremendous learning environment: ASM’s new \$3 million MEI Training Center, located at ASM’s headquarters in Materials Park, Ohio.

To complete the learning experience, evening social activities will also include a materials theme! And, to cap it all off, students will “graduate” during ASM Chapter Leadership Days, enabling them to attend the weekend’s events, where they be able to meet and network with ASM, ASM Foundation and Chapter leaders and Board members.

“Thank you so much for allowing me to have this great experience. I will never forget all the memories I have made at this Camp. All the teachers were wonderful ... they taught us so much about the field of materials science ...” - **Cara Lynn Santillo**

**Student participant, 2000
(Beaver Valley Chapter)**

“... The camp exceeded even my best expectations. The students’ level and enthusiasm was second to none. I really believe the students had an extremely positive experience. I know I did.” - **John Baker**

**R. J. Lee Instruments
Volunteer Instructor**

All expenses (tuition, travel, hotel, meals, etc.) for each participant will be paid for by the ASM International Foundation.

ASM members are encouraged to nominate prospective students. For more information, to get an application/nomination form, or request a copy of the 8 minute video “THE JOURNEY BEGINS” please call 1-800-336-5152, ext. 5533.

Visit www.asminternational.org/foundation, for photos and full details.

All nominations will be forwarded to the ASM Action in Education Team for final selection. A maximum of 30 students will be accepted for each session (60 total).

Deadline for nominations is **31 March 2001**

(Struers)


Congratulations to Local ASMI Awards Recipients!

ASMI-SCV salutes the following members of our local materials science community who have been recognized by ASM International in the 2000 Awards Program:

David T. Danielson , University of California, Berkeley - George A. Roberts Scholarship Program. This Scholarship Program was established in 1995 through a generous contribution from Dr. George A. Roberts, Past President of ASM and Retired CEO of Teledyne, to the ASM Foundation as an expression of his commitment to education and the materials science and engineering community. The scholarships are awarded to outstanding undergraduate members of ASM at the junior or senior level who demonstrate exemplary academic and personal achievements, interest and potential in metallurgy or materials science and engineering. Ten scholars are selected each year. The recipients are presented with a certificate and check for \$6,000 towards educational expenses for one academic year.

Prof. William D. Nix, Lee Otterson Professor of Engineering, Department of Materials Science & Engineering, Stanford University - Alpha Sigma Mu Lecture. In order to recognize outstanding achievement in the careers of professionals connected with materials, Alpha Sigma Mu has organized an annual lecture to be given by a distinguished member of the materials community. This lectureship recognizes excellent scholarship and achievement in materials science and engineering. Professor Nix's lecture is titled, " Mechanical Properties of Thin Films."

Prof. Oleg D. Sherby, Professor Emeritus, Department of Materials Science and Engineering, Stanford University - Albert Sauveur Achievement Award. This award, established in 1934 in honor of a distinguished teacher, metallographer and metallurgist, recognizes pioneering materials science and engineering achievements that have stimulated organized work along similar lines to such an extent that a marked basic advance has been made in the knowledge of materials science and engineering. Professor Sherby is cited "for demonstrating that high temperature deformation is controlled by atomic mobility and applying this finding to the design of new materials and the prediction of creep behavior and superplastic properties."



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Other Local Events

Jan 9 - American Electroplaters and Surface Finishers Society - "Open Discussion on Waste Reduction", Carol Eden, United Airlines. 7:00 pm, Spin-a-Yarn Restaurant, 45915 Warm Springs Blvd., Fremont. *Contact Dave Wiley at (510) 708-3318*

Jan 10 - ASM Golden Gate Chapter (joint with AWS) - "Gases in Industrial Heat Treating", *Contact Lisa Thomas at (510) 549-3300 ext. 6 or lisathomas@bearinc.com for details.*

Jan 25 - SAMPE Northern California Chapter - 25th Annual 1-day Composites Workshop, David's Restaurant and Conference Center, Santa Clara, CA. *Visit www.sampe.org/chapevents.html for program details and registration information.*

Feb 23 - The SVEC Engineers Week Banquet, 5:30 pm, Santa Clara Marriott Hotel. *Visit www.svec.org for more information.*

Also, visit the following website for a listing of other Bay Area science events:

<http://www.supercalendar.com/view.php?a=813>

*Know of an event that should be listed here?
Contact Scott Dickerson at (408) 584-1013 or scott_dickerson@AMAT.com*

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SVEC Engineers Week Banquet

As the culmination of National Engineering Week, the Silicon Valley Engineering Council (SVEC) will be holding their annual Engineering Week Banquet on February 23, 2001. This is the event where the SVEC announces their annual Hall of Fame Inductees as well as the annual scholarship winners. The event is a great chance to connect with the local engineering community. More importantly, it is a chance to support the theme of Engineering Week, which, of course, is to inspire young people to pursue a career in the engineering profession!

Furthermore, the SVEC is looking for corporate partners to help sponsor scholarships, other Engineering Week activities, and special projects.

If you'd like to attend the banquet or find out more about sponsorship, visit www.svec.org.

SJSU Open University Course


MatE 234 - Microelectronic Packaging Materials Science

Course Description: The fundamental objective of this course is to educate packaging engineers on the importance of materials science principles, and how these play a key role in the design, manufacture, performance, and quality assurance of microelectronic packages. The classes of materials (polymers, ceramics, and metals) and their structure-processing-properties relationships and relevance in packaging will be studied. Topics will include phase diagrams, diffusion and mass transfer, bonding and soldering, corrosion, materials testing, materials characterization, and failure analysis. Fabrication methods (molding, stamping, deburring, etc.) will also be covered. Students are encouraged to bring with them topics of interest for class discussion and coverage.

Times: Jan 27 ~ May 26, 2001 (Saturdays) 9 a.m. - noon

Enrollment Info: For those not enrolled in SJSU's graduate program, this course may be taken through SJSU's Open University. The cost is approximately \$500 + cost of textbook and instructional materials. To enroll, please contact the SJSU Continuing Education Office at (408) 924-2670. Enrollment during the first class period will also be facilitated.

Instructor & further information - contact: Dr. Guna Selvaduray at SJSU; Tel: (408) 924-3874; email: gunas@email.sjsu.edu



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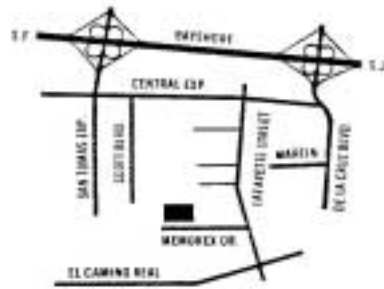
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Special Appointment - Silicon Valley Engineering Council (SVEC) Representative

Ed Kaminski	Retired	(408) 241-4842	kipski@prodi.gy.net
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Special Thanks to our ASMI-SCV Sustaining Members:

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Should your company be an ASMI-SCV Sustaining Member? Call Bob Elliott at (408)984-1146

2000-2001 Technical Program

Sept. 13	Magnetic Recording Technology: Trends and Challenges <i>Tom Albrecht, IBM Research</i>	Past Chair's Night
Oct. 11	Optimization of Processing and Properties of Medical Grade Nitinol Wire <i>Alan Pelton, NDC-Cordis</i>	
Nov. 8	The Science and Technology of Bulk Metallic Glasses <i>Bill Johnson, California Institute of Technology</i>	
Dec. 13	Recovery of the Challenger Shuttle Data Tapes <i>Richard Bradshaw, IBM</i>	Companion's Night
Jan. 10	Beyond Silicon: Microfabrication with Metals, Plastics, and Ceramics <i>John Hachman & Alfredo Morales, Sandia National Laboratories</i>	SCV Fellow's Night Joint ACerS
Feb. 21	Advances in Metallography <i>George Vander Voort, Buehler</i>	Joint AWS
Mar. 14	Process Induced Failures and Modeling <i>Speaker TBD</i>	Joint SME
Apr. 18	Jet Engine Fragment Barrier Materials <i>Don Shockey, SRI</i>	Joint SAMPE
May 9	The Wright Stuff: Materials Considerations in Building the Wright Flyer <i>Walter M. Griffith, FASM</i>	Awards Night