

# TMS 2006

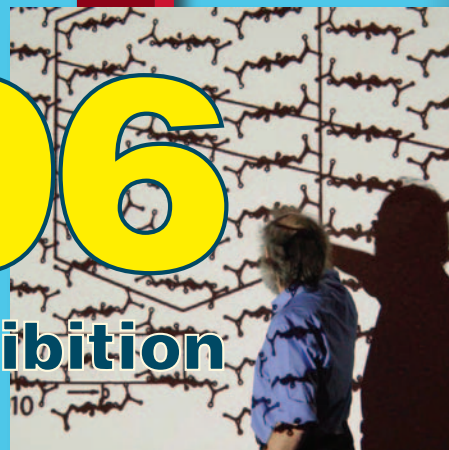
## 135th Annual Meeting & Exhibition

■ *Linking science and technology for global solutions*

*March 12-16, 2006  
Henry B. Gonzalez Convention Center  
San Antonio, Texas, USA*

***Designed for Today's Professional in  
Minerals, Metals & Materials:***

- *Light Metals*
- *Structure, Extraction, Processing and Properties*
- *Emerging Materials*



March 12-16, 2006

Henry B. Gonzalez Convention Center  
San Antonio, Texas, USA

## Top 5 Reasons to Attend

1. More than 245 Technical Sessions Targeted to Your Interests
2. Daily Networking Opportunities With Colleagues Who Share Your Interests
3. Collected Proceedings Bringing Greater Value to Your Experience
4. Access to Professionals in Your Field From 60 Countries
5. Events Offering Education and Enjoyment!

*More Reasons to Attend on Pages 3 to 43!*

## NEW in 2006

- **Collected Proceedings on CD-ROM**  
Choose from Light Metals;  
Structure, Extraction, Processing and Properties; or  
Emerging Materials. (Page 36)
- **Materials Library Exhibit**  
*On Location From London's King's College* (Page 25)
- **Furnace Systems Technology Workshop**  
*Practical Programming in the Exhibit Hall* (Page 10)
- **Women in Science Breakfast Presentation**  
*The Road Less Traveled is Changing* (Page 24)
- **Poster Contest for Students**  
*Earn Cash Prizes!* (Page 32)



*TMS Annual Meeting & Exhibition...linking science and technology for global solutions...brings professionals from industry, government and academia from 60 countries together for technical interchange to attain solutions in the minerals, metals and materials fields. Through intense learning and networking opportunities, attendees advance their individual work and their profession.*

*The 2006 annual meeting builds on successes of the previous year's programming with an eye toward what the future will demand of science and engineering professionals. Thus, the technical programming has been organized into three main topics:*

**I: Light Metals**

**II: Structure, Extraction, Processing and Properties**

**III: Emerging Materials**

*Likewise, this advance brochure is organized primarily into four sections:*

**Light Metals**

**Structure, Extraction, Processing and Properties**

**Emerging Materials**

**Shared Interest**

*Each section includes the symposia and related programming--plenary sessions, short courses, workshops, lectures and events--specific to its main topic. The "Shared Interest" section also includes information on the exhibition, special events, social functions, registration and housing.*

*Peruse this advance brochure and take the next step to avail yourself to this once a year opportunity—Register for TMS 2006! (See page 37.)*

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Technical Program Committee

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DIVISION REPRESENTATIVE

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*U.S. Air Force*

TMS STAFF LIAISON

**Christina Raabe**

Technical Sessions

Technical sessions begin on Monday, March 13, end on Thursday, March 16, and are held at the Henry B. Gonzalez Convention Center. Abstracts are available in print in the November 2005 issue of *JOM* and online at [www.tms.org/annualmeeting.html](http://www.tms.org/annualmeeting.html).



## **"The Aluminum Fabrication Industry: Global Challenges and Opportunities"**

**Monday, March 13, 8:30 a.m. to noon**

**Dieter Braun**, *President, Automotive Sector, Hydro Aluminium Deutschland GmbH, Germany*

**"The Importance of the Automotive Industry for the Future Application of Aluminum Components"**

**Patrick Franc**, *President, ARCO Aluminum Inc., USA*

**"What are the Challenges and Opportunities for the Rolled Can Sheet Industry?"**

**Steven Demetriou**, *Chairman of the Board & CEO, Aleris International Inc., USA*

**"Innovations in Recycling, Continuous Casting and Rolling of Aluminum Products"**

**Helmut Wieser**, *Group President, Alcoa Inc., USA*

**"Driving Demand and Cost in a Global Market"**

**Kevin Greenawalt**, *President, Novelis North America, Novelis Corporation, USA*

**"Innovative and Sustainable Products for the Aluminum Industry"**

**Thomas A. Brackmann**, *President, Nichols Aluminum, USA*

**"The Impact of Alloy Specifications on Aluminum Fabrication and Products - A Future View"**

**Ding Haiyan**, *Board Chairman, Southwest Aluminum (Group) Company Limited; President Assistant, Chinalco, China*

**"Developing Aluminum Fabrication in Chinalco: Challenge and Opportunity"**

**Subodh Das**, *President & CEO, Secat Inc., USA*

**Moderator**



Dieter Braun



Kevin Greenawalt



Patrick Franc



Thomas A. Brackmann



Steven Demetriou



Ding Haiyan



Helmut Wieser



Subodh Das

Rolling, continuous casting and extrusion present many challenges in today's worldwide aluminum fabrication industry. Turning those challenges into opportunities is the subject of this plenary session. Eight corporate leaders from around the world continue the discussion begun at last year's standing-room-only plenary session, "The Role of Technology in the Global Primary Aluminum Industry Today and in the Future," heading downstream from the cast house to the fabricated product in the 2006 session.

## **"Cast House Operations"**

**Monday, March 13**

Learn from aluminum cast house professionals about the day-to-day technology issues associated with cast house operation, efficiency and quality improvement, including:

- Crack reduction measures
- Energy control
- Scrap rate and scrap flow control
- Alloying and grain refiner practice
- Melt cleanliness
- Cost reduction projects
- Cast quality control (in- and off-line)
- Efficiency improvement projects

## **"A Century of Nickel Alloy Discovery and Innovation"**

**Monday, March 13**

The year 2006 is the 100th anniversary of the development of Monel metal. To mark this anniversary, this symposium uncovers the history of the development of alloys over the last 100 years:

- Evolution of Wrought Age Hardenable Superalloys
- Evolution of Solid Solution Nickel-Base Alloys for Corrosion Applications
- A Century of Discoveries, Inventors and New Nickel Alloys
- Evolution of Cast Nickel-Base Superalloys
- A Century of Monel Metal 1906-2006

This session concludes with a panel discussion about current material problems and future material requirements in several industries, and a question-and-answer session.

## TOPIC I: LIGHT METALS

### Alumina and Bauxite

*...the mining and refining of the raw materials that become aluminum*

Sessions:

- Bayer process fundamentals and chemistry
- Bauxite mining
- Design of refineries
- Safety and environmental aspects

### Carbon Technology

*...the anode and cathode used in aluminum reduction*

Sessions:

- Anode raw materials and properties
- Plant design and operation, including paste, baking furnace and rodding room
- Anode quality and performance
- Carbon cathode materials and performance

### Aluminum Reduction Technology

*...the conversion of alumina into aluminum*

Sessions:

- Cell design and operation
- Cell modernization and productivity increase, process control, modeling of cell design
- Environmental aspects
- Inert anodes

*See related short course on aluminum smelting, page 8.*

### Recycling

*...the processes and products involved in metals recycling*

Sessions:

- Optimization of physical, aqueous, and thermal processing of scraps and waste
- Environmental and economic impacts
- Life-cycle analysis of materials
- Properties and applications of recovered materials

### Cast Shop Technology

*...the melting and metal treatment of aluminum*

Sessions:

- Shape casting
- Grain refinement
- Modeling, control, and automation
- Safety

*See related EPD luncheon lecture, page 20.*

### Cast House Operations

*...efficiency and quality improvement in the casthouse*

Sessions:

- Crack reduction measures, scrap rate and scrap flow control
- Alloying and grain refiner practice
- Melt cleanliness
- Cost reduction and efficiency improvement projects

## **TOPIC I: LIGHT METALS**

### **The James Morris Honorary Symposium on Aluminum Wrought Products for Automotive, Packaging, and Other Applications**

*...the downstream fabrication of aluminum alloys and products*

Sessions:

- Progress in research, development, testing, and application
- End uses

*See related short course on heat treatment, page 9.*

### **Magnesium Technology 2006**

*...all aspects of magnesium production, properties, and application*

Sessions:

- Primary production and market
- Alloy development
- Manufacturing processes
- Applications and research programs

### **Simulation of Aluminum Shape Casting Processing: From Alloy Design to Mechanical Properties**

*...the modeling of aluminum casting process and products*

Sessions:

- Casting process design and simulation
- Microstructure modeling and simulation
- Prediction of mechanical performance
- Influence of processing on final performance

*See related short course on heat treatment, page 9.*

### **Titanium Alloys for High Temperature Applications - A Symposium Dedicated to the Memory of Dr. Martin Blackburn**

*...recent developments and advancements in the use of titanium alloys at temperatures above 900°F (480°C)*

Sessions:

- Ti alloys for high temperature oxidation, burn, and/or creep resistance
- Ti matrix composites
- Ti-based intermetallic alloys
- Joining technologies

### **Solidification Modeling and Microstructure Formation: A Symposium in Honor of Professor John Hunt**

*...the fundamentals of solidification processing*

Sessions:

- Macrosegregation
- Measurement of thermophysical properties
- Twin roll casting
- Microporosity formation

*See related honorary dinner for John Hunt, page 11.*

### **Furnace Systems Technology Workshop: Emerging Technologies and Energy Efficiency**

*...new approaches to melting and process heating*

*See related workshop on furnace systems technology, page 10.*

## TMS2006 Annual Meeting &amp; Exhibition

## Two-Day Course

**“Aluminum Smelting Cell Retrofitting and Cell Operations”**

Saturday, March 11, noon to 8 p.m.

Sunday, March 12, 8:30 a.m. to 5 p.m.

**Includes plant tour of Alcoa Rockdale Operations****Cost - Advance Registration**

\$525 Members; \$610 Nonmembers

**Speakers****Jeffrey T. Keniry**, Director, Alumination Consulting Pty. Ltd., Mt. Macedon, VIC, Australia**Dagoberto Schubert Severo**, Director, PCE Engineering, Port Alegre, Brazil**Alton T. Tabereaux**, Manager, Technical Support, Alcoa, U.S.A.**Barry Welch**, Associate Director, Centre for Electrochemistry and Mineral Processing, University of New South Wales; and Director, Welbank Consulting**Who Should Attend?**

Managers, supervisors, engineers and scientists employed in research or operations associated with aluminum smelting

**About the Course**

Obtaining optimum performance of a smelting cell requires careful management of the dynamics of the cell that results from the interaction between the cell's mass and energy balances as they change with cell operating practices. It also requires accurate diagnostics of the potential onset of abnormal conditions and correct remedial action.

Economic drivers for modern smelter operations generally dictate that productivity and, hence, line current maximization are key performance indicators. With the changes introduced to maximize productivity, some of the control and remedial actions applied for low productivity cells are no longer appropriate.

**The course provides:**

- An understanding of the interaction between operating practice, cell mass and energy balance
- Analysis of practices, pitfalls and options available for increasing productivity and associated economic analysis
- Demonstration of limits and instability in inappropriate retrofit upgrades through dynamic cell modeling
- An appreciation of the impact of time and location of measurements of bath height, metal depth, cell chemistry and temperature
- Case studies of achieving operating improvements with the “right” approach
- An example of successfully merging emission variability, cell dynamics and superheat measurements to improve performance (by Martin Iffert of Trimet)

**About the Speakers**

**Jeffrey T. Keniry** is director of Alumination Consulting Pty. Ltd. in Mt. Macedon, VIC, Australia, which specializes in process development and support to the international smelting industry. His career has spanned more than 20 years in aluminum smelting operations and technology development. His previous positions included technical manager at New Zealand Aluminium Smelters Ltd. and general manager of smelting research with Comalco Aluminium Ltd.

**Dagoberto Schubert Severo** is director of PCE Engineering, a consulting company he founded in Porto Alegre, Brazil, in 1993. In addition to having more than 40 clients in automotive, petrochemical, mining and railroad companies, PCE has also developed expertise in the aluminum field, working with pot thermal balance, MHD and stability analysis, anode furnace thermal and combustion simulation. Severo has authored technical papers presented at several world-wide conferences. He graduated from Federal University of Rio Grande do Sul, Brazil, as a mechanical engineer in 1988.

**Alton T. Tabereaux** is manager of technical support at Alcoa Primary Metals. He previously worked in research and development at Reynolds Metals Company for 26 years. An acclaimed leader in cell diagnostics and operations, Tabereaux is a regular contributor to the work of the TMS Light Metals Division. He teaches in the TMS Industrial Aluminum Electrolysis course as well as the international course on Process Metallurgy of Aluminum held in Norway each year. Holding 15 U.S. patents, Tabereaux has published over 50 technical papers and was the editor of *Light Metals 2004*. He graduated with a doctorate in chemistry from the University of Alabama in 1971.

**Barry Welch** is a visiting professor, and associate director of the Centre of Electrochemistry and Mineral Processing, at the University of New South Wales as well as principal consultant of Welbank Consulting Ltd. His career has been associated with the aluminum smelting industry for 45 years – a blend of practical experience, and research and development of technology. He has directed a diverse range of projects, from electrode properties, designs and alternatives to operational practices and cell performance improvements. The recipient of 11 Best Paper awards and the TMS Light Metal's Distinguished Technical Contribution Award in 2000, Welch has also been recognized for outstanding contributions to industry and electrochemistry. He is published widely, including reference texts for industry including *Light Metals 1998*.

**See page 37 to register for this course.**



## ■ Linking science and technology for global solutions

### One-Day Course

### “Heat Treatment for Wrought and Cast Aluminum Alloys”

Sunday, March 12, 8:30 a.m. to 5 p.m.

#### Cost - Advance Registration

\$475 Members; \$560 Nonmembers

#### Speakers

**Murat Tiryakioglu**, *Professor of Engineering,  
Robert Morris University*

**James T. Staley Sr.**, *Consultant*

#### Who Should Attend?

Metallurgists, scientists, engineers, and technicians employed in either research or operations at facilities where cast or wrought aluminum alloy products are heat treated; operations both as producers and users are covered.

#### About the Course

The course combines theory with many practical examples. Learn about:

- Principles of precipitation hardening and alloy tempers in aluminum alloys
- Heat treatment metallurgy for precipitation hardenable alloy systems
- Simple kinetic equations to predict quenching and aging effects on properties
- Natural and artificial aging, and the influence of cold work on aging kinetics

Contents of the course include solution heat treatment of castings with emphasis on homogenization and rounding of Si particles and effects of time and temperature. Discussion of the important step of quenching covers quench sensitivity; water quenching and geometry; and effects of quench on residual stress, distortion, corrosion, strength and fracture toughness. Examples are taken from 3XX, 2XXX, 7XXX and 6XXX alloys. Interactions between quenching and aging are also covered with examples of natural aging and effects of time and temperature of artificial aging provided. Examples of the contrasting effects of cold work prior to aging are shown as well, and reasons for the behaviors are presented. Multi-step aging treatments are also discussed with emphasis on low-high temperature aging of Al-Si castings.

#### About the Speakers

**Murat Tiryakioglu** is a professor of engineering at Robert Morris University and has served as a consultant to companies such as Sumitomo, Tyco and Alcoa. He is the founder of the Advanced Manufacturing Institute at Western Kentucky University, where he conducted research on heat treatment of aluminum alloys. Tiryakioglu previously worked at Tiryakioglu Metals Company Inc. and The Boeing Company on aluminum castings and heat treatment. He received his doctorate in metallurgy and materials from the University of Birmingham, UK.

**James T. Staley Sr.** recently retired after 35 years in R&D and operations at Alcoa. While there, he developed extensive experience in developing and applying heat treatments for aluminum alloy products. Staley led teams which wrote the chapters on metallurgy of heat treatment and general principles of precipitation hardening in *Aluminum: Properties and Physical Metallurgy* and *Heat Treatment of Aluminum* in an ASM International metals handbook. He continues to teach the metallurgy of heat treatment to Alcoa employees. Staley was awarded the James Douglas Gold Medal for distinguished achievement in nonferrous metallurgy by AIME and is a Fellow of ASM International. He received his doctorate from Drexel University.

*See page 37 to register for this course.*

**More light metals-related workshops, lectures and honorary dinners on the following pages!**

# TMS2006 Annual Meeting & Exhibition

## Furnace Systems Technology Workshop

### "Practical Knowledge for Improved Process Performance"

Monday, March 13 through Wednesday March 15

#### Sponsored by TMS Light Metals Division

Specially Designed for Cast House and Melt House Managers, Plant Engineers and Operations Personnel

Learn about the fundamentals of process technology and the equipment involved in melting and process heating applications for aluminum and other nonferrous metals.

Benefit from focused presentations by industry experts and from follow-up discussions with commercial exhibitors:

- Identify cost and time-saving opportunities.
- Reduce fuel consumption.
- Increase efficiency.
- Lower maintenance costs.

#### Presenting Companies

Bloom Engineering	Hauck Manufacturing	Mechatherm	Thermcon Ovens B.V.
EMP/Pyrotek	Kromshroder	Praxair	Thorpe Technologies
Harbison Walker	Maerz-Gautschi	Seco Warwick	

#### Program

Monday, March 13

#### Session 1: Combustion Process

- 2:00 p.m. "Basics of Combustion" by Don Whipple, Bloom Engineering Co. Inc.
- 2:45 p.m. "Burner Types" by Jack Marino, Hauck Manufacturing Co. Inc.
- 3:30 p.m. "Fuel to Air Ratio Control Systems" by Brian Hall, Kromshroder Inc.
- 4:15 p.m. "NOx/CO Emissions" by Frank Beichner, Bloom Engineering Co. Inc.

Tuesday, March 14

#### Session 2: Melters and Holders

- 8:30 a.m. "Liquid Metal Furnaces in Aluminium Casthouses: Direct Charged Melting Furnaces" by Oliver Moos, Maerz-Gautschi Industrieofenanlagen GmbH
- 9:15 a.m. "Well Charged Melters" by Christopher Emes, Mechatherm International Ltd.
- 10:00 a.m. "Multiple Chamber Melters" by Jan De Groot, Thermcon Ovens B.V.
- 10:45 a.m. "Use of Rotary Furnaces in Aluminum Recycling" by David Roth, MDY LLC

#### Session 3: Process Furnaces

- 2:00 p.m. "Homogenizing Furnaces" by John Allen, Thorpe Technologies Inc.
- 2:45 p.m. "Heat Treatment of Aluminum-Strip Coils - Furnace Designs and Concepts" by William Weyand, Seco Warwick Corporation
- 3:30 p.m. "Pit-Chamber Furnaces Versus Pusher-Type Furnaces for the Preheat and Soak of Aluminum Rolling Slabs" by Oliver Moos, Maerz-Gautschi Industrieofenanlagen GmbH
- 4:15 p.m. "Delacquering Systems" by Robert F. Jenkins, Thorpe Technologies Inc.

Wednesday, March 15

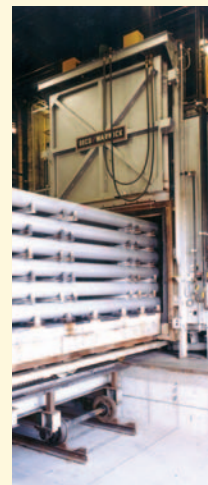
#### Session 4: Additional Furnace Considerations

- 8:30 a.m. "Refractory Selections for Aluminum Cast Houses" by John Sutton and Stan Smith, Harbison Walker Refractories Co.
- 9:15 a.m. "Melting Applications with Oxy-Fuel Firing" by Sho Kobayashi, Praxair Inc.
- 10:00 a.m. "Metal Circulation" by Alan Peel, EMP Technologies Inc.
- 10:45 a.m. "Flame Control and Furnace Control" by Steve Ogonek, Kromschroder Inc.

#### Registration

\$100 - includes admission to the three-day workshop, the exhibition (details on page 27), and the aluminum plenary session (details on page 5). Preregistrants receive a printed copy of the presentations and supporting product information.

See registration form on page 37.



**Light Metals Division Luncheon Lecture**  
**“Design Drives Consumption:  
The Revolution in Metal  
Packaging Design”**

**Wednesday, March 15, Noon to 2 p.m.,  
Henry B. Gonzalez Convention Center**

**by Edward B. Martin, CCL Container**

**About the Topic**

Attendees learn about:

- New innovative designs driving consumer products companies to utilize better metal packaging
- How and why rigid aluminum bottle packaging has displaced glass and plastic packaging in segments of the beverage industry and other markets
- A market that has traditionally utilized metal packaging but now is using new designs and shapes to drive industry growth

The common thread weaving through this presentation is that the world is evolving, and the end-use consumer will pay more for relevant value.

**About the Speaker**

**Edward B. Martin** is the vice president of sales and marketing for CCL Container. He has helped to diversify the company's business mix over the past seven years while continuing to grow its core aluminum aerosol container business. Martin has worked in the packaging industry for more than 20 years with experience in manufacturing management and planning in addition to sales and marketing. Prior to joining CCL Container, he was the national accounts manager for Tenneco Packaging Paperboard Pkg. Division.

Martin serves on the board of directors of both the Consumer Specialty Products Association (CSPA) and the National Aerosol Association (NAA). He is also a member of the Rochester Institute of Technology's (RIT) School of Packaging Science Industry Advisory Board. Martin holds a master's degree in international business from the University of Connecticut.

**Luncheon tickets may be purchased on the registration form on page 37.**



Edward B. Martin

**Honorary Dinner**

**Professor John Hunt Honorary Dinner**

**Monday, March 13**

In conjunction with the symposium “Solidification Modeling and Microstructure Formation: A Symposium in Honor of Professor John Hunt”

Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Materials Processing and Manufacturing Division, TMS Solidification Committee

**Dinner tickets are \$65 each and may be purchased on the registration form on page 37.**

**The Light Metals  
Collected Proceedings  
CD-ROM includes  
symposia, keynote  
presentations, additional  
resources and featured  
presentations. Select  
your CD on the  
registration form on  
page 37.**

## TOPIC II: STRUCTURE, EXTRACTION, PROCESSING AND PROPERTIES

### Computational Thermodynamics and Phase Transformations

*...modeling methods and results for materials structures at a fundamental level*

Sessions:

- Atomic kinetics processes
- Atomic modeling based alloy thermodynamics
- Atomic modeling of solid-liquid structures
- Thermodynamic models
- Phase field models
- Alloy models and thin films

### Phase Stability, Phase Transformation and Reactive Phase Formation in Electronic Materials V

*...materials science in electronic interconnections*

Sessions:

- New process for Cu interconnects and semiconductor materials
- 3-D, fine pitch and high temperature/low temperature interconnects in electronics packages
- Electromigration in leaded and lead-free solder joints
- Phase simulation and interface reactions in solder joints
- Damage structures: Ni plating, tin whiskers and thermal cycling

### Hume-Rothery Symposium: Multi-Component Alloy Thermodynamics

*...modeling and experimental verification in multi-component alloys*

Sessions:

- Alloy physics
- Alloy thermodynamics: experiment and modeling
- Alloy design and properties
- Kinetics and microstructural modeling

*See related Hume-Rothery lecture, page 19.*

### Phase Transformations in Magnetic Materials

*...microstructural evolution of relevant systems*

Sessions:

- Magnetic nanocrystals and nanoparticles
- Magnetic shape memory alloys and information storage
- Processing and characterization

### Multi-Component/Multi-Phase Diffusion Symposium in Honor of Mysore A. Dayananda

*...fundamentals and application of diffusion*

Sessions:

- Phenomenology
- Modeling and simulation
- Metals and alloys
- Intermetallics and ceramics
- Industrial applications
- Surfaces and interfaces

*See related honorary dinner for Mysore A. Dayananda, page 21.*

### Point Defects in Materials

*...fundamentals of 1-D microstructural features*

Sessions:

- New techniques
- Mechanical and boundary properties
- Bulk metal diffusion
- Thermodynamics



## **TOPIC II: STRUCTURE, EXTRACTION, PROCESSING AND PROPERTIES**

### **Wechsler Symposium on Radiation Effects, Deformation and Phase Transformations in Metals and Ceramics**

*...the impact of irradiation on microstructure and performance*

Sessions:

- Irradiation effects
- Irradiation microstructure/microchemistry
- Dislocations/obstacles/channeling
- Irradiation pressure vessels
- Irradiation in facilities and techniques
- Shape memory alloys

*See related honorary dinner, page 21.*

### **Characterization of Minerals, Metals and Materials**

*...techniques for characterizing materials across a broad spectrum of systems and processes*

Sessions:

- Advances in methodologies
- Extraction and processing applications
- Ceramic and refractories
- Structural engineering materials
- Composites and other materials
- Mineralogical studies

*See related short course on digital imaging, page 19.*

### **Surfaces and Interfaces in Nanostructured Materials II**

*...unique aspects of surfaces and interfaces at the nanoscale*

Sessions:

- Nanostructured metals and oxides
- Liquid phase and biological interactions
- Nanoscale powders, tubes and composites
- Coatings, films, multi-layers and arrays

### **The Brandon Symposium: Advanced Materials and Characterization**

*...integration of theory and experiment as elucidated by various characterization methods*

Sessions:

- Grain boundary theory and experiments
- Interfaces - theory and experiments
- Atom probe
- Small length scales and microstructures
- Microstructure and properties

*See related honorary dinner for David Brandon, page 21.*

### **3-Dimensional Materials Science**

*...characterization and quantification of microstructure in three dimensions*

Sessions:

- Microstructure representation
- 3-D representation and computation
- X-ray methods
- Quantitative characterization
- 3-D atom probe
- Serial sectioning

*See related tutorial, page 18.*

### **Materials Processing Fundamentals**

*...broad aspects of process modeling in a range of applications*

Sessions:

- Process modeling
- Solidification and deformation processing
- Smelting and refining
- Powders and composites

*See related EPD distinguished lecture, page 20.*

**TOPIC II: STRUCTURE, EXTRACTION, PROCESSING AND PROPERTIES****Separation Technology for Aqueous Processing**

*...advances in technology, including selective precipitation, solvent extraction, ion exchange and membrane technologies*

Sessions:

- Leaching
- Solvent extraction
- Electro diffusion

**Sampling, Sensors and Control for High Temperature Metallurgical Processes**

*...integration of factors for processes utilizing molten metals, mattes, slags, salts and gases*

Sessions:

- Smelting
- Metal casting
- Melting

**Granulation of Molten Materials**

*...processing methods and process performance of materials in granulated form*

Sessions:

- Molten materials
- Mattes and slags
- Atomization

**The James Morris Honorary Symposium on Aluminum Wrought Products for Automotive, Packaging, and Other Applications**

*...the downstream fabrication of aluminum alloys and products*

Sessions:

- Automotive alloys
- Continuous casting
- Fundamental studies
- Processing-related studies

**Advances in Furnace Integrity**

*...coordinated approaches in furnace design and maintenance for improved life and increased process intensity*

Sessions:

- Measurement systems
- Furnace design
- Operating improvements

**Simulation of Aluminum Shape Casting Processing: From Alloy Design to Mechanical Properties**

*...the modeling of aluminum casting process and products*

Sessions:

- Casting process design and simulation
- Microstructure modeling and simulation
- Prediction of mechanical performance
- Influence of processing on final performance

*See related short course on heat treatment, page 17.*

## **TOPIC II: STRUCTURE, EXTRACTION, PROCESSING AND PROPERTIES**

### **Solidification Modeling and Microstructure Formation: A Symposium in Honor of Professor John Hunt**

*...the fundamentals of solidification processing*

Sessions:

- Macrosegregation
- Measurement of thermophysical properties
- Twin roll casting
- Microporosity formation

*See related honorary dinner for John Hunt, page 21.*

### **Fatigue and Fracture of Traditional and Advanced Materials: A Symposium in Honor of Art McEvily's 80th Birthday**

*...the full range of fatigue and fracture testing, modeling and application in an 11-session symposium*

Sessions:

- Crack initiation and growth
- Thermomechanical and environmental effects
- Damage processes

*See related honorary dinner for Art McEvily, page 21.*

### **The Rohatgi Honorary Symposium on Solidification Processing of Metal Matrix Composites**

*...advancements in all aspects of cast metal matrix composites*

Session:

- Overview of developments in cast MMCs
- Processing and microstructure of MMCs
- Properties of MMCs
- Modeling and nanocomposites
- Advanced applications of MMCs

*See related honorary dinner for Pradeep Rohatgi, page 21.*

### **Processing and Mechanical Response of Engineering Materials**

*....coupling of processing and mechanical properties at various length scales*

Sessions:

- Nano behavior of materials
- Nano processing for nano-grain materials
- Mechanical behavior of materials
- Processing of materials
- Steady state deformation of materials
- Modeling of material behavior

*See related Institute of Metals/Mehl lecture, page 20.*

### **Deformation and Fracture from Nano to Macro: A Symposium Honoring W.W. Gerberich's 70th Birthday**

*...testing and modeling of mechanical behavior across length scales*

Sessions:

- Fracture, fatigue, wear and adhesion
- Materials properties: testing and techniques
- Nanoscale materials
- Length scales
- Macroscopic mechanical behavior
- Simulations of mechanical behavior
- Environmental and material alloying effects

*See related honorary dinner, page 21.*

### **Materials Design Approaches and Experiences II**

*...methods and outcomes across materials systems*

Sessions:

- Superalloys
- Light alloys
- Steels and titanium alloys
- New tools

**TOPIC II: STRUCTURE, EXTRACTION, PROCESSING AND PROPERTIES****Titanium Alloys for High Temperature Applications - A Symposium Dedicated to the Memory of Dr. Martin Blackburn**

*...recent developments and advancements in the use of titanium alloys at temperatures above 900°F (480°C)*

## Sessions:

- Ti alloys for high temperature oxidation, burn, and/or creep resistance
- Ti matrix composites
- Ti-based intermetallic alloys
- Joining technologies

**A Century of Nickel Alloy Discovery and Innovation**

*...the history and future of alloy development*

## Sessions:

- Crack reduction measures
- Energy control
- Scrap rate and scrap flow control
- Alloying and grain refiner practice
- Melt cleanliness
- Cost reduction projects
- Cast quality control (in- and off-line)
- Efficiency improvement projects

**Effects of Water Vapor on High-Temperature Oxidation and Mechanical Behavior of Metallic and Ceramic Materials**

*...the focused topic of response of materials to this specific environment*

## Sessions:

- Behavior of alloys: chromia-formers and low alloy additions
- Coatings and ceramics

**Select your CD-ROM of Structure, Extraction, Processing and Properties proceedings on the registration form on page 37.**



**One-Day Course**

**“Heat Treatment for Wrought and Cast Aluminum Alloys”**

**Sunday, March 12, 8:30 a.m. to 5 p.m.**

**Cost - Advance Registration**

\$475 Members; \$560 Nonmembers

**Speakers**

**Murat Tiryakioglu**, *Professor of Engineering,  
Robert Morris University*

**James T. Staley Sr.**, *Consultant*

**Who Should Attend?**

Metallurgists, scientists, engineers, and technicians employed in either research or operations at facilities where cast or wrought aluminum alloy products are heat treated; operations both as producers and users are covered.

**About the Course**

The course combines theory with many practical examples. Learn about:

- Principles of precipitation hardening and alloy tempers in aluminum alloys
- Heat treatment metallurgy for precipitation hardenable alloy systems
- Simple kinetic equations to predict quenching and aging effects on properties
- Natural and artificial aging, and the influence of cold work on aging kinetics

Contents of the course include solution heat treatment of castings with emphasis on homogenization and rounding of Si particles and effects of time and temperature. Discussion of the important step of quenching covers quench sensitivity; water quenching and geometry; and effects of quench on residual stress, distortion, corrosion, strength and fracture toughness. Examples are taken from 3XX, 2XXX, 7XXX and 6XXX alloys. Interactions between quenching and aging are also covered with examples of natural aging and effects of time and temperature of artificial aging provided. Examples of the contrasting effects of cold work prior to aging are shown as well, and reasons for the behaviors are presented. Multi-step aging treatments are also discussed with emphasis on low-high temperature aging of Al-Si castings.

**About the Speakers**

**Murat Tiryakioglu** is a professor of engineering at Robert Morris University and has served as a consultant to companies such as Sumitomo, Tyco and Alcoa. He is the founder of the Advanced Manufacturing Institute at Western Kentucky University, where he conducted research on heat treatment of aluminum alloys. Tiryakioglu previously worked at Tiryakioglu Metals Company Inc. and The Boeing Company on aluminum castings and heat treatment. He received his doctorate in metallurgy and materials from the University of Birmingham, UK.

**James T. Staley Sr.** recently retired after 35 years in R&D and operations at Alcoa. While there, he developed extensive experience in developing and applying heat treatments for aluminum alloy products. Staley led teams which wrote the chapters on metallurgy of heat treatment and general principles of precipitation hardening in *Aluminum: Properties and Physical Metallurgy* and *Heat Treatment of Aluminum* in an ASM International metals handbook. He continues to teach the metallurgy of heat treatment to Alcoa employees. Staley was awarded the James Douglas Gold Medal for distinguished achievement in nonferrous metallurgy by AIME and is a Fellow of ASM International. He received his doctorate from Drexel University.

**See page 37 to register for this course.**

**See the following pages  
for more short courses,  
lectures and honorary  
dinners related to  
structure, extraction,  
processing and properties!**

### Half-Day Tutorial "3-Dimensional Materials Science"

Sunday, March 12, 1 to 5 p.m.

**Cost - Advance Registration**  
\$100 Members; \$250 Nonmembers

#### Speakers

**Marc De Graef**, Carnegie Mellon University

**Jonathan E. Spowart**, Air Force Research Laboratory

**Michael D. Uchic**, Air Force Research Laboratory

#### Who Should Attend?

Scientists who are interested in the practical aspects of acquiring three-dimensional microstructural data by means of serial sectioning techniques, and the subsequent visual representation of this data, benefit from this course.

#### About the Course

The ability to characterize a material microstructure in 3-D is a critical methodology for developing unbiased structure-property relationships. Mechanical serial sectioning is a well-established technique for obtaining 3-D microstructural data from standard metallographic specimens. In its simplest form, the process involves the careful removal of a layer of material, followed by imaging of the freshly-created surface. This is repeated many times in order to build up a series of 2-D images (slices) as the specimen surface recedes.

Course attendees learn about two experimental serial sectioning methods: manual and automated metallographic sectioning and dual beam focused ion beam scanning electron microscopy. The tutorial presents:

- State-of-the-art advances in both serial sectioning methods
- Practical issues of sample preparation and optimization of imaging and slicing/milling conditions
- An overview of the most important image processing steps needed to convert a stack of 2-D images to a complete 3-D dataset as well as several methods to visually represent the 3-D data



Marc De Graef



Jonathan E. Spowart



Michael D. Uchic

#### About the Speakers

**Marc De Graef** is currently professor and co-director of the J. Earle and Mary Roberts Materials Characterization Laboratory at Carnegie Mellon University. His research interests lie in the area of microstructural characterization of structural intermetallics and magnetic materials. His work focuses on two areas: the development of experimental and modeling techniques for the quantitative study of magnetic domain configurations in a variety of materials, including ferromagnetic shape memory alloys, magnetic thin films and patterned structures; and on the acquisition and representation of the 3-D character of microstructures. Work in this area includes Monte-Carlo simulations to reconstruct microstructures numerically, and principal component analysis of microstructures in superalloys. De Graef received his doctorate in physics from the Catholic University of Leuven (Belgium).

**Jonathan E. Spowart** has worked for the past five years on the microstructure-properties relationships of metallic composite materials. His work first began as an on-site contractor with UES Incorporated, but it continues as an Air Force civilian within the Metallic Composites Group of the Air Force Research Laboratory/MLLMD. Spowart is the co-inventor of Robo-Met.3D, a fully-automated (robotic) serial sectioning device (U.S. patent pending). He received his doctorate in materials science and metallurgy at the University of Cambridge.

**Michael D. Uchic** works with the Metals Development Group of the Materials & Manufacturing Directorate of the Air Force Research Laboratory. For the past four years, his research efforts have focused on the development of new experimental methods to rapidly assess both the microstructure and mechanical properties of aerospace metals. These techniques rely heavily on the use of micromachining via Focused Ion Beam microscopes. Uchic earned his doctorate in materials science and engineering.

**See page 37 to register for this course.**

**One-Day Course**  
**Scientific Digital Imaging**

**Sunday, March 12**

**Co-sponsored by**  
**Microscopy Society of America**

**Cost - Advance Registration**  
\$475 Members; \$560 Nonmembers

**Speaker**  
**John Mackenzie,**  
*North Carolina State University*

**Who Should Attend?**

Metallurgists, scientists, engineers and technicians who wish to transition from photographic to digital imaging, or who are not getting digital results that match the quality of photographic recording, find this course valuable.

**About the Course**

The workflow for digital imaging in the modern scientific laboratory is still a work in progress. This course uses Adobe Photoshop as the core program in defining this workflow. Learn about:

- Acquiring the best digital image and addressing resolution issues
- Manipulating digital images in Adobe Photoshop for a variety of uses
- Creating publication quality prints and using gamma correction with ease
- The best technologies for archiving image data, including image formats and standards
- Producing high quality images on any printer and finding affordable solutions

**About the Speaker**

**John Mackenzie's** research over the past 25 years has focused on instrument design and development with an emphasis on computer control. He developed the first complete computer control system for the transmission electron microscope. Mackenzie teaches digital imaging to graduate students in engineering, computer science and biology, and a workshop for the Microscopy Society of America. He is also a tour speaker for the Microbeam Analysis Society. Mackenzie received his Ph.D. in cell and developmental biology from Harvard University.

**See page 37 to register for this course.**



John Mackenzie

**Hume-Rothery Award**  
**Lecture**

**"Entropies of Formation and**  
**Mixing in Alloys"**

**Monday, March 13**  
**Henry B. Gonzalez Convention Center**

**by W. Alan Oates,**  
*University of Salford, UK*

**About the Topic**

Attendees learn about:

- Examples in which entropy plays a major role in determining the relative stability of phases in a system at high temperatures
- Methods used for estimating the magnitude of the contributions to formation/mixing entropies
- Models of value in the calculation of formation/mixing entropies for real multi-component alloys and of value in the calculation of phase diagrams for multi-component, multi-phase systems
- The value of the cluster/site approximation for describing the configurational contributions in multi-component, multi-phase systems, and recent developments in its application
- Methods suitable for the estimation of the magnitude of other contributions to formation/mixing entropies

**About the Speaker**

**W. Alan Oates** is the Honorary Visiting Professor at the Institute for Materials at the University of Salford in the United Kingdom. A Fellow at the Institute of Metals, Mining and Materials in London since 1978, he earned his doctorate from The University of Newcastle in Australia. Oates' interests recently are in developing a higher order approximation which is suitable for multi-component alloys and in the thermodynamic modeling of intermetallic compounds.



W. Alan Oates

**Extraction & Processing Division****Luncheon Lecture****“China’s Growing Importance in the Metals Field With an Emphasis on Alloying Additions for the Aluminum Industry”**

*Tuesday, March 14, Noon to 1:45 p.m.,  
Henry B. Gonzalez Convention Center*



Albert Hayoun

by **Albert Hayoun**,  
*President of Standard Resources Corporation*

**About the Topic**

This presentation relates the history leading to China's ascendance to the important position it now holds in the metals market and traces its recent history as a supplier and consumer of alloying additions, such as silicon metal and magnesium metal, in the aluminum industry.

**About the Speaker**

**Albert Hayoun** is president of Standard Resources Corporation, a marketing firm specializing in metals, minerals and alloys. He assisted in establishing the company in 1994 and has helped develop relations with a number of mining and metallurgical companies in China. Hayoun has also established agencies, companies and subsidiaries in several countries including China, Mexico and Venezuela. His work over the past 33 years has involved importing and exporting castings, forgings, pig iron, ferro alloys, metals, minerals and alloys. He began his career in the metallurgical field in 1973 after receiving a bachelor's degree from Brooklyn College.

*Luncheon tickets may be purchased on the registration form on page 37.*

**Institute of Metals/Mehl Lecture****“The Promise and Perils of Extreme Grain Refinement to Produce Superior Structural Materials”**

*Monday, March 13, 12:30 to 1:30 p.m., Henry B. Gonzalez Convention Center*

by **Julia R. Weertman**, *Department of Materials Science and Engineering, Northwestern University*

**About the Topic**

The ability to produce metals with very small grain sizes has led to materials with both the positive aspect of high strength and a number of negative attributes, especially brittle behavior. Attendees of this lecture are updated on the recent developments in the study of the mechanical properties of nanocrystalline metals and alloys, including attempts to make them into useful materials. Julia Weertman's research is sponsored by the Department of Energy Grant DE-FG02-02ER.

**About the Speaker**

**Julia R. Weertman** is the Walter P. Murphy Professor Emerita in Service at Northwestern University. At Northwestern for nearly 20 years, she holds three patents and has authored more than 150 technical publications. Weertman has received a dozen professional honors, and is a member of the NRC National Materials Advisory Board.



Julia R. Weertman

**Distinguished Lecture****“Extractive Metallurgy Principles Applied to the Synthesis of Value-Added Materials, Waste Minimization and Recycling”**

*Tuesday, March 14, 1:45 to 2:30 p.m.,  
Henry B. Gonzalez Convention Center*



Patrick R. Taylor

by **Patrick R. Taylor**, *Colorado School of Mines*

**About the Topic**

Attendees benefit from Patrick Taylor's overview of extractive metallurgy techniques and principles, which are essential tools when addressing technology for the synthesis of value-added materials, waste minimization and recycling. Various laboratory scale experiments are described, illustrating applications of pyrometallurgy, hydrometallurgy and electrometallurgy to these resource recovery opportunities.

- Thermal plasma synthesis of ultra-fine ceramic powders from minerals
- Reactive thermal plasma spraying of specialty coatings
- Closed-top cyclone treatment of radioactive wastes
- High-temperature oxide electro-reduction and metal recovery from residues through leaching

**About the Speaker**

**Patrick R. Taylor** is the George S. Ansell Chair Distinguished Professor of Chemical Metallurgy, and director of the Kroll Institute for Extractive Metallurgy, at the Colorado School of Mines. His research expertise includes mineral processing, extractive metallurgy, chemical processing of materials, thermal plasma processing, recycle and waste minimization. He holds seven patents and has published more than 135 papers. Taylor is a registered Professional Engineer with a doctorate in metallurgical engineering. He has been an active member of TMS for more than 30 years.



*Honorary dinners are held on Monday, March 13.*

Dinner tickets may be purchased on the registration form on page 37.

**Professor John Hunt Honorary Dinner**

**In conjunction with the symposium “Solidification Modeling and Microstructure Formation: A Symposium in Honor of Professor John Hunt”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Materials Processing and Manufacturing Division, TMS Solidification Committee*

**Professor Mysore Dayananda Honorary Dinner**

**In conjunction with the symposium “Multi-Component/Multi-Phase Diffusion Symposium in Honor of Mysore A. Dayananda”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), ASM Materials Science Critical Technology Sector, ASM-MSCTS Atomic Transport Committee*

**Professor Monroe Wechsler Honorary Dinner**

**In conjunction with the symposium “Wechsler Symposium on Radiation Effects, Deformation and Phase Transformations in Metals and Ceramics”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Materials Processing and Manufacturing Division, TMS Structural Materials Division, ASM International, ASM Materials Science Critical Technology Sector, TMS/ASM Joint Mechanical Behavior of Materials Committee, TMS/ASM Joint Nuclear Materials Committee, TMS/ASM Joint Phase Transformations Committee*

**Professor David Brandon Honorary Dinner**

**In conjunction with the symposium “The Brandon Symposium: Advanced Materials and Characterization”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Extraction & Processing Division, TMS Materials Characterization Committee, Indian Institute of Metals*

**Professor Pradeep Rohatgi Honorary Dinner**

**In conjunction with the symposium “The Rohatgi Honorary Symposium on Solidification Processing of Metal Matrix Composites”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Materials Processing and Manufacturing Division, TMS Structural Materials Division, TMS Composite Materials Committee, TMS Solidification Committee*

**Professor William Gerberich Honorary Dinner**

**In conjunction with the symposium “Deformation and Fracture from Nano to Macro: A Symposium Honoring W.W. Gerberich’s 70th Birthday”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Materials Processing and Manufacturing Division, TMS Structural Materials Division, TMS Nanomechanical Materials Behavior Committee, TMS/ASM Joint Mechanical Behavior of Materials Committee*

**Professor Arthur McEvily Honorary Dinner**

**In conjunction with the symposium “Fatigue and Fracture of Traditional and Advanced Materials: A Symposium in Honor of Art McEvily’s 80th Birthday”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Structural Materials Division, TMS/ASM Joint Mechanical Behavior of Materials Committee*

**Professor Amiya Mukherjee Honorary Dinner**

**In conjunction with the symposium “Processing and Mechanical Response of Engineering Materials”**

*Sponsored by The Minerals, Metals and Materials Society (TMS), TMS Structural Materials Division, TMS Materials Processing and Manufacturing Division, TMS Shaping and Forming Committee, TMS/ASM Mechanical Behavior of Materials Committee*

**TOPIC III: EMERGING MATERIALS****Biological Materials Science***...materials behavior and processing at the biological interface*

Sessions:

- Biological materials
- Biological materials science
- Implant biomaterials
- Computational biomaterials/the biomaterials-tissue interface
- Bio-inspired materials
- Functional biomaterials and devices

**Bulk Metallic Glasses***...processing and properties of these emerging materials systems*

Sessions:

- Mechanical behavior
- Atomic study and processing
- Processing and characterization
- Physical properties

**2006 Nanomaterials: Materials and Processing for Functional Applications***...Nanomaterials for functional applications*

Sessions:

- Functional applications of nanoscale materials
- Nanostructure manufacturing, characterization and functionalization
- Nanoscale electronics
- Nanoscale magnetism
- Nanomaterial formation and manufacture
- Carbon nanostructures

**Ultrafine Grained Materials - 4th International Symposium***...special characteristics of materials with very small grain size*

Sessions:

- Reinforcement types and effects
- Deformation and fractures
- Surface properties

*See related Institute of Metals/Mehl lecture, page 20.***Surfaces and Interfaces in Nanostructured Materials II***...unique aspects of surfaces and interfaces at the nanoscale*

Sessions:

- Nanostructured metals and oxides
- Liquid phase and biological interactions
- Nanoscale powders, tubes and composites
- Coatings, films, multi-layers and arrays

**Polymer Nanocomposites***...processing and properties of these nonmetallic advanced materials*

Sessions:

- Reinforcement types and effects
- Deformation and fractures
- Surface properties

## **TOPIC III: EMERGING MATERIALS**

### **7th Global Innovations Symposium: Trends in Materials R&D for Sensor Manufacturing Technologies**

Sessions:

- Nanostructured materials
- Characterization and fabrication
- End use and processing applications

### **Space Reactor Fuels and Materials**

*...materials and performance issues in the specific application*

Sessions:

- Refractory alloy properties and welding
- Environmental effects and fuels

### **Advanced Materials for Energy Conversion III: A Symposium in Honor of Gary Sandrock, Louis Schlapback and Seijirau Suda**

*...the broad range of materials options for energy systems*

Sessions:

- FreedomCAR and fuel partnership
- Complex hydrides
- Metal hydrides
- Carbon, borohydrides and other materials
- Magnets, superconductors, thermoelectrics and energy materials
- Metal, alloys and energy materials

### **Lead-Free Solder Implementation: Reliability, Alloy Development and New Technology**

*...microstructural and materials properties aspects as they influence performance*

Sessions:

- Mechanical behavior: creep, thermal fatigue, shock and reliability
- Interfacial reactions and role of intermetallics
- Microstructure evolution
- Electromigration and reliability

*See related workshop on lead-free technology, below.*

### **Materials in Clean Power Systems: Applications, Corrosion and Protection**

*...production and use of hydrogen and other clean power systems*

Sessions:

- Hydrogen transport and separation
- Hydrogen separation, delivery and materials issues in clean power plants
- Corrosion in clean coal power plants and fuel cells
- Interconnection and sealing in fuel cells

### **Lead-Free Technology Workshop**

*Sunday, March 12*

This one-day workshop includes an up-to-date review of Pb-free solder technology, organized into two sections:

**Section I** covers Pb-free implementation issues and solutions. The invited speakers focus on experiences, learning and knowledge of second level interconnects, including BGA implementation, Pb-free surface finish (i.e., Sn whisker issues), SMT solder joints and long-term reliability assessment.

**Section II** presents new Pb-free technologies including Pb-free flip chip technologies, and new and emerging Pb-free technologies for future packaging needs.

# TMS2006 Annual Meeting & Exhibition

## One-Day Course "Thinking Differently in Teams"

Sunday, March 12, 8:30 a.m. to 5 p.m.

**Cost - Advance Registration**  
\$475 Members; \$560 Nonmembers

### Speaker

**Tony Eltringham**, Consultant, BHP Billiton

### Who Should Attend?

People responsible for leading teams, including department heads, project managers, strategic planners, scientists and engineers

### Learn about:

- Approaches to thinking differently based on the work of Edard de Bono (Lateral Thinking and Six Thinking Hats), Eli Goldratt ("The Goal" and Theory of Constraints), Richard Feynman and others
- The influence of statistical and probability anomalies on decision-making
- Examples of how past experience and personal opinions can overwhelm facts
- Practical application of processes and thinking approaches in team environments

### About the Speaker

**Tony Eltringham** has over 37 years experience in the mining industry, primarily with copper. Currently, he consults for BHP Billiton, the world's largest minerals company. Eltringham has an operations background as well as experience with research and development leadership and performance improvement with ToC and Six Sigma. Enhancing the environment for teams to produce superior results from thinking differently is a challenge in the Americas, Australia and Africa for Eltringham, with a physics background.

See page 37 to register for this course.



Tony Eltringham

## NEW!

## Women in Science Breakfast Presentation

Monday, March 13, 7 a.m.

With **Naomi J. Halas**, Rice University •  
Hosted by TMS President **Tresa Pollock**



Naomi J. Halas

### About the Presentation

The number of women choosing a career in science and engineering has been increasing over the past 40 years, but serious obstacles still remain. Naomi Halas is an example of someone who successfully overcame those obstacles. She is a speaker in-demand and a celebrated scientist. As someone who knows firsthand the unique challenges faced by women in the science and engineering fields, Halas will offer her experiences to help women professionals and students striving to succeed.

### About the Speaker

**Naomi J. Halas** is the Stanley C. Moore professor of electrical and computer engineering, and professor of chemistry, at Rice University. She is best known for her invention of nanoshells, a new type of nanoparticle with tunable optical properties especially suited for biotechnology applications. Halas is also founder and director of Rice University's Laboratory for Nanophotonics, a multidisciplinary research network whose mission is the design, invention and application of nanoscale optical components. She has nine issued patents, authored more than 100 peer-reviewed publications, presented at 170 invited talks, and won several awards. Halas earned her doctorate in physics at Bryn Mawr College in 1986.

*There is no cost for the continental breakfast presentation; however, space is limited. Sign up to attend on page 37.*

**Don't miss the TMS-AIME Dinner and  
Awards Presentation on Tuesday,  
March 14. Details on page 26.**



**Young Leaders Tutorial Luncheon\*  
Lecture**

**“Negotiating Life in Academia –  
a Young Faculty Member’s Perspective”**

**Monday, March 13, Noon to 1:30 p.m.**

by **Nik Chawla**, Associate Professor of Chemical and  
Materials Engineering, Arizona State University

**About the Topic**

Life in academia can be an enjoyable rollercoaster ride, filled with exhilarating experiences. This talk focuses on some of the important issues facing young faculty members, and post-doctorate and graduate students seeking faculty positions.

**Learn how to:**

- Assemble an effective application package
- Build a diverse and satisfying research portfolio
- Develop effective teaching skills
- Balance teaching, research, and service activities

Plus, get tips for navigating life in academia based on successes, challenges, and lessons learned firsthand by the presenter.

**About the Speaker**

**Nik Chawla** is associate professor in the department of Chemical and Materials Engineering at Arizona State University. He serves as director of ASU’s interdisciplinary Mechanical Behavior of Materials Facility. Chawla received his doctorate from the University of Michigan in 1997. His research interests encompass the mechanical behavior of advanced materials at bulk and small length scales, including Pb-free solders, metal matrix composites, ceramic fibers, multilayered materials at nanoscale, biocompatible coatings, powder metallurgy alloys, and 3-D microstructure-based finite element modeling. He has authored or co-authored close to 90 publications in these areas, and is the author of *Metal Matrix Composites*. The recipient of the 2004 Bradley Stoughton Award for Young Teachers, Chawla is chair of the TMS Composite Materials Committee and serves on the Editorial Board of Review for *Materials and Metallurgical Transactions*.

**\*An optional box lunch may be purchased on the registration form on page 37.**

**NEW!**

**Materials Library  
Lecture & Exhibit**

**Tuesday, March 14, 12:30 to 2 p.m.,  
Exhibit Hall**



by **Mark A. Miodownik**,  
King’s College London

**“We are becoming more and more theoretical; we are losing touch with the more sensual side of what we do,” so says Mark Miodownik, the curator of the Materials Library at King’s College London, but the university lecturer is trying to change that.**

**Join us as we bring materials science to life through Dr. Miodownik’s materials library exhibit and his presentation about the development and uses of materials libraries. More than 300 new materials, including aerogel, magnetic liquid and artificial skin, will be within reach at this interactive, tactile, aesthetic display!**

**About the Speaker**

**Mark A. Miodownik** is a materials scientist and NESTA Fellow at King’s College London, as well as the curator of the Materials Library there. He works in the materials group of the engineering division in the school of Physical Sciences and Engineering. In 2005 Miodownik organized and chaired a seminar series at the Tate Modern Museum in London on the influence of new materials on the arts. He is engaged in several collaborative art/science projects including a NESTA project to build a new materials library for artists and designers, and organizes “EngineeringArt,” a network dedicated to the art and science of materials. Miodownik has published more than 40 research papers on materials science and writes a regular column on the aesthetics of materials for the journal *Materials Today*. He earned his doctorate in turbine jet engine alloys from Oxford University in 1996.

**Find out what other exhibits and  
programs will be on the show floor.  
Turn to page 27!**

# TMS2006 Annual Meeting & Exhibition

## 135th TMS-AIME Dinner and Awards Presentation

### With Installation of 2006 TMS President

**Tuesday, March 14, San Antonio Marriott Rivercenter Hotel • 6 p.m. Cash Bar; 7 p.m. Dinner**

This annual, time-honored event includes recognition of the 2006 society and technical division award recipients followed by an address from 2005 TMS President Tresa M. Pollock. She also introduces the new president, Brajendra Mishra.

**Brajendra Mishra** is professor and associate director at the Colorado School of Mines Kroll Institute for Extractive Metallurgy. A TMS member for 18 years, Mishra is an accomplished educator and researcher in the areas of extraction and processing of materials, thin films processing, and corrosion engineering. Mishra received his doctorate from the University of Minnesota, Minneapolis in 1986.

He has held leadership positions on TMS committees in both the Light Metals Division and the Extraction & Processing Division (EPD). In addition, he has served as treasurer and chair of EPD and as a member of the Publications Coordinating Committee. Mishra played a key role in enhancing the TMS international membership through dialogues with the executives of the Indian Institute of Metals. He joined TMS as a student in 1982 and has remained an active member for 24 years.

**Tickets may be purchased on the registration form on page 37.**



**Brajendra Mishra**  
2006 TMS President



**Tresa M. Pollock**  
2005 TMS President

## Congratulations to the 2006 TMS Award Winners!

### TMS FELLOW CLASS OF 2006

**Diran Apelian**, *Worcester Polytechnic Institute*  
**Clyde L. Briant**, *Brown University*  
**Doris Kuhlmann-Wilsdorf**, *Kuhlmann-Wilsdorf Motors*

### APPLICATION TO PRACTICE

**Vinod Kumar Sikka**, *Oak Ridge National Laboratory*

### JOHN BARDEEN AWARD

**Isamu Akasaki**, *Meijo University*

### BRUCE CHALMERS AWARD

**Diran Apelian**, *Worcester Polytechnic Institute*

### EDUCATOR AWARD

**John P. Hager**, *Colorado School of Mines*

### ROBERT LANSING HARDY AWARD

**Mark C. Hersam**, *Northwestern University*

### WILLIAM HUME-ROTHERY AWARD

**William Alan Oates**, *University of Salford*

### INSTITUTE OF METALS/

### ROBERT FRANKLIN MEHL AWARD

**Julia R. Weertman**, *Northwestern University*

### LEADERSHIP AWARD

**Toni Grobstein Marechaux**,  
*Board on Manufacturing & Engineering Design*

### CHAMPION H. MATHEWSON AWARD

**K.S. Ravi Chandran**, *University of Utah*

### TMS FOUNDATION SHRI RAM ARORA AWARD

**Krishau Biswas**, *Indian Institute of Science*

### TECHNICAL DIVISION AWARD WINNERS

#### EXTRACTION & PROCESSING DISTINGUISHED LECTURER

**Patrick R. Taylor**, *Colorado School of Mines*

#### EXTRACTION & PROCESSING SCIENCE AWARD

**Gamini Senanayake**, *Murdoch University*

#### EXTRACTION & PROCESSING TECHNOLOGY AWARD

**Michelle G. Lee**, *MSE Technology Applications Inc.*

**Jay McCloskey**, *MSE Technology Applications Inc.*

**Jennifer Saran**, *Kennecott Copper*

**Larry G. Twidwell**, *University of Montana*

#### LIGHT METALS DISTINGUISHED SERVICE AWARD

**John Hryn**, *Argonne National Laboratory*

**Howard J. Kaplan**, *US Magnesium*

#### LIGHT METALS TECHNOLOGY AWARD

**Jan Van Linden**, *Recycling Technology Services*

#### LIGHT METALS AWARD

**Gary P. Tarcy**, *Alcoa Inc.*

**Knut Torklep**, *Elkem Aluminium*

#### STRUCTURAL MATERIALS DISTINGUISHED SERVICE AWARD

**Russell H. Jones**, *Pacific Northwest National Laboratory*

#### STRUCTURAL MATERIALS DISTINGUISHED SCIENTIST/ ENGINEER AWARD

**Edgar A. Starke, Jr.**, *University of Virginia*

### AIME AWARD

#### AIME HONORARY MEMBER

**Merton C. Flemings**, *Massachusetts Institute of Technology*

# TMS2006 Exhibition

■ *Linking science and technology for global solutions*

Find the Latest Metals and Materials Innovations for Practical Solutions to Today's Production, Processing and Research Challenges.

**More Than 120 Exhibitors on the Show Floor to Provide You With Options!**

## **Cast Shop Technology:**

- Combustion and Furnace Technology
- Grain Refiners/Hardeners
- Molten Metal Filtration and Pumps
- Refractory and Insulating Products

## **Emerging Materials:**

- Biomaterials
- Fuel Cells
- Nanomaterials

## **Environmental Management:**

- Air Pollution Control Equipment
- Recycling/Scrap Processing

## **Industrial Process Control and Automation, Sensors**

## **Materials Characterization Equipment:**

- Analysis
- Instrumentation
- Measurement
- Microscopy
- X-ray Fluorescence

## **Materials for R&D:**

- Alloys, Rare Earths and Precious Metals
- Minerals
- Chemicals

## **Primary Production Equipment and Services:**

- Carbon Technology and Supplies
- Combustion and Furnace Technology
- HF Measurement Systems – Pot Rooms/Stacks
- Industrial Gases

## **Professional Services:**

- Consulting
- Contracting
- Engineering
- Research and Development

## **Publishers**

## **Software:**

- Design
- Modeling
- Process Simulation
- Thermodynamics and Phase Diagram

## **Surface Processes:**

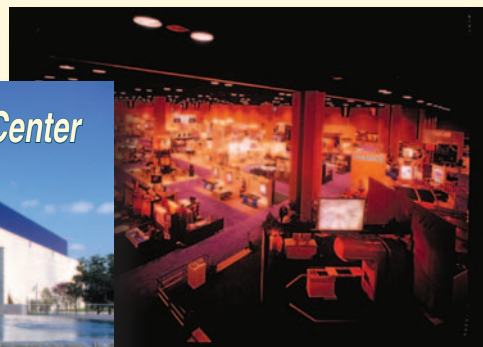
- Coatings
- Thin Films
- Surface Modification

## **Technology Resources:**

- Collaborative Programs and Centers
- National Laboratories
- Nongovernmental Organizations



*Henry B. Gonzalez Convention Center*





# TMS2006 Annual Meeting & Exhibition

## Show Dates and Hours

Monday, March 13 ..... noon to 6 p.m.  
 Tuesday, March 14 ..... 9:30 a.m. to 5:30 p.m.  
 Wednesday, March 15 ..... 9:30 a.m. to 3 p.m.

To visit the exhibition only, complete and return the enclosed registration form or contact TMS for an Expo Pass.

## Special Events at the 2006 Exhibition

### Hosted Grand Opening Reception

Monday, March 13 ..... 5 to 6:30 p.m.

### Wednesday Snack

Wednesday, March 15 ..... 12:15 to 2 p.m.

### For information about exhibiting,

contact **Cindy Wilson**, TMS exhibits coordinator,

at telephone (724) 776-9000, ext. 231; fax (724) 776-3770; or e-mail [wilson@tms.org](mailto:wilson@tms.org).

## NEW This Year!

### Furnace Systems Technology Workshop

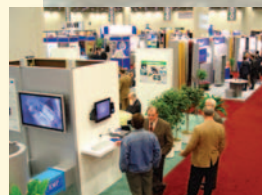
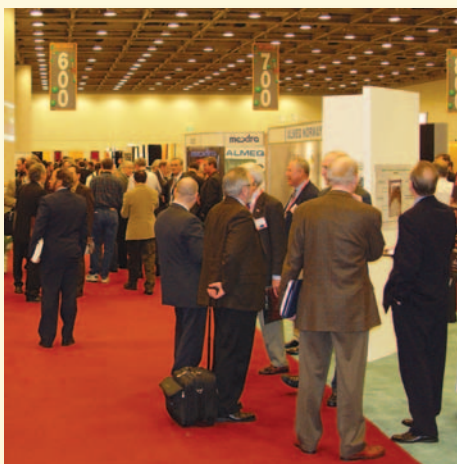
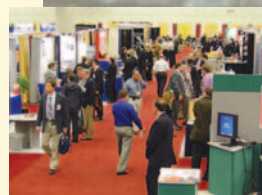
Monday, March 13 through Wednesday, March 15

Register to attend this workshop designed for cast house managers, melt shop operators and engineers, and furnace operations personnel responsible for operating, specifying and purchasing melting and process heating equipment.

Topics include:

- Combustion Process
- Melters and Holders
- Process Furnaces
- Additional Furnace Considerations

See page 10 for complete workshop details.

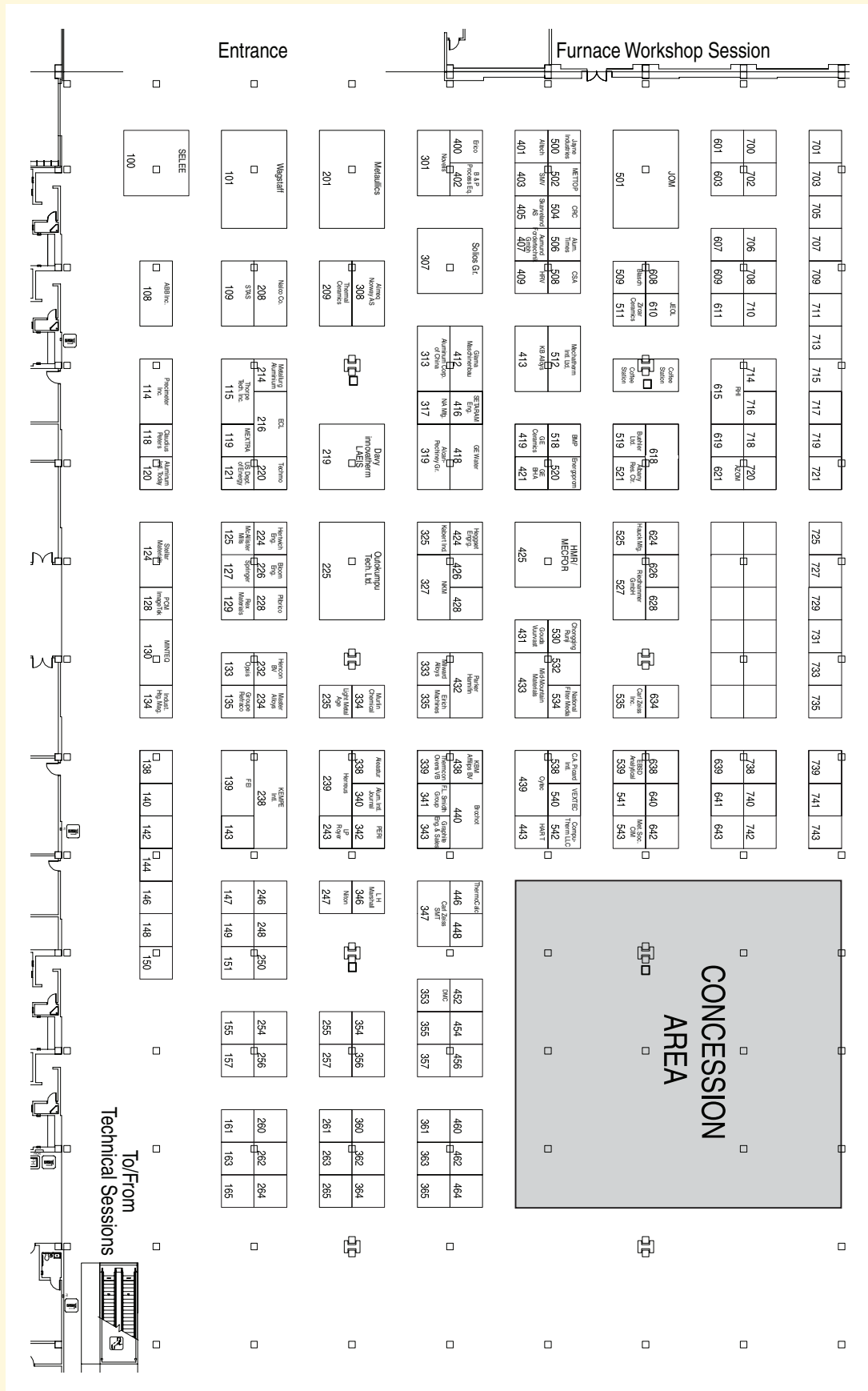




As of 10/17/05

<b>Exhibiting Company</b>	<b>Booth #</b>
ABB Inc.	108
Albany Research Center	521
Alcan Group	319
Aleasur	338
Almeq Norway AS	308
ALTECH SMV Ltd.	401
Aluminium International Journal	340
Aluminium International Today	120
Aluminium Times	506
Aluminium Corporation of China	313
APT Aluminium Process & Product Technology	428
AUMUND Fordertechnik GmbH	407
AZoM Network Group	621
B&P Process Equipment Systems LLC	402
Blasch Precision Ceramics Inc.	509
Bloom Engineering Co. Inc.	226
BMP Bi-Metal Products	518
Brochot SA	440
Buehler	519
Cambridge Scientific Abstracts	508
Carl Aug Picard GmbH & Co. KG	538
Carl Zeiss MicroImaging Inc.	535
Carl Zeiss SMT Inc.	347
Chongqing Runji Alloy Co. Ltd.	530
Claudius Peters	118
CompuTherm LLC	542
Taylor & Francis Group/CRC Press	504
Cytec Industries Inc.	439
Davy Process Technology (Switzerland) AG	219
DMC Clad Metal Division	353
EBSD Analytical Inc.	539
ECL	216
Eirich Machines Inc.	335
ENERGOPROM	520
ERICO Inc.	400
FEI Company	139
FLSmith Group	341
GE Advanced Materials, Quartz	419
GE/GE Energy	421
GE Water & Process Technologies	418
GLAMA Maschinenbau GmbH	412
Gouda Vuurvast N.V.	431
Graphite Engineering & Sales	343
Groupe Refraco	135
Hamilton Research & Technology Pvt. Ltd.	443
Hauck Manufacturing Co.	525
Heggset Engineering	424
Hencon BV	232
Hereaus Electro-Nite Co.	239
Hertwich Engineering	224
HMR Group AS	425
HRV Engineering Group	409
Industrial Heating Magazine	134
innovatherm GmbH+Co. KG	219
Jayne Industries	500
JEOL USA Inc.	610

JOM	501
Kabert Industries Inc.	325
KB Alloys Inc.	413
KBM AFFILIPS B.V.	438
KEMPE International	238
Laeis GmbH	219
L.H. Marshall Co.	346
Light Metal Age	235
L.P. Royer Inc.	243
Maerz-Gautschi Industrieofenanlagen GmbH	502
Master Alloys Co.	234
McAllister Mills/TRITEX LLC	125
MECFOR Inc.	425
Mechatherm International Ltd.	512
Metallurg Aluminium	214
Metallurgical Society of CIM	543
METTOP GmbH	448
MEXTRA Eng. Extrativa de Metals	119
Mid-Mountain Materials Inc.	433
Milward Alloys Inc.	333
MINTEQ International Inc.	130
Murlin Chemical Inc.	334
Nalco Company	208
National Filter Media	534
NKM Noell Special Cranes GmbH	327
North American Manufacturing Co. Ltd.	317
Novelis	301
Opsis AB	133
Outokumpu Technology Ltd.	225
Parker Hannifin	432
PCM/Image-Tek	128
PERI/PHYSICA	342
Plibrico	228
Precimeter Control AB	114
Pyrotek Inc.	201
Rex Materials Inc.	129
RHI AG	615
Riedhammer GmbH	527
SELEE Corporation	100
SenTech Precimeter Inc.	114
SETARAM Engineering	416
Skarveland AS	405
SMV AS	403
Solios Group	307
Springer	127
STAS	109
Stellar Materials Inc.	124
Techmo Car s.p.a.	220
Thermal Ceramics	209
Thermcon Ovens B.V.	339
Thermo-Calc Software	446
Thermo Electron Corporation/Niton	247
Thorpe Technologies Inc.	115
U.S. Dept. of Energy/ Office of Energy Efficiency and Renewable Energy	121
VEXTEC Corporation	540
Wagstaff Inc.	101
ZIRCAR Ceramics Inc.	511



## **Student Events**

***TMS 2006 is the place for students serious about their career and camaraderie! You'll gain technical knowledge, explore career possibilities, and network with fellow students and professionals in the field.***

***Sunday, March 12, San Antonio Rivercenter Marriott***

### **Student Orientation - 2 to 3 p.m.**

Make sure you're in the right place at the right time—attend student orientation and get your questions answered about TMS and the different activities taking place during the week. It's your first chance to meet other students with similar interests.

### **Career Tips - 3:30 to 4 p.m.**

Find out what human resources representatives are looking for when reviewing resumes and interviewing candidates. This session gives you the tips you need to get your resume noticed, get your foot in the door and land that perfect job.

### **Career Forum - 5 to 6:30 p.m.**

Determining an appropriate career path is an important decision for any student. This career forum addresses the many pertinent issues that students in the minerals, metals, and materials field face today. Key industry figures provide personal insight into preparation strategies and tips for developing and fostering a rewarding career. Come prepared with questions.

### **TMS Networking Mixer - 8 to 10:30 p.m.**

Open the door to endless career possibilities at this networking mixer sponsored by the TMS Student Affairs Committee. Make connections with faculty, government, and industry officials in this relaxing, casual and fun atmosphere as they share experiences of professional growth. Beer,\* soft drinks, snacks and music are provided.

\*In accordance with Texas state law, alcoholic beverages are served only to attendees who are 21 years of age or older; proper photo I.D. with birth date must be presented upon entry.

***Monday, March 13 through Thursday, March 16***

### **Technical Sessions, Lectures, Exhibit**

Material Advantage students may attend at no charge. Registration for students who are not members is \$25, which will be applied toward student membership for 2006.



## TMS2006 Annual Meeting &amp; Exhibition

**Material Advantage Students Eligible for Division Travel Scholarships**

A limited number of \$500 travel scholarships are available through three TMS technical divisions: Electronic, Magnetic & Photonic Materials; Structural Materials; and Materials Processing & Manufacturing. To apply, visit [www.tms.org/Students/AwardsPrograms/OtherContests.html](http://www.tms.org/Students/AwardsPrograms/OtherContests.html). Deadline to apply is November 15, 2005. Students receiving travel scholarships are responsible for making their travel and hotel arrangements as well as for registering for the meeting.

**Travel Reimbursement for Material Advantage Chapters**

Active Material Advantage chapters are eligible to receive \$500 per calendar year in travel reimbursement related to attendance at either the TMS Annual Meeting or the Materials Science and Technology Conference. The Chapter Travel Reimbursement Program form is available at [www.tms.org/students/studentchapters.html](http://www.tms.org/students/studentchapters.html) and must be submitted with original receipts by March 31, 2006. Mail to: Chris McKelvey, Member Services & Student Affairs Coordinator, TMS, 184 Thorn Hill Road, Warrendale, PA 15086.

**Increase Your Chances to Win a Door Prize!**

Use your creativity as a student chapter member and donate a promotional item displaying your school logo. TMS is also donating items, so the more prizes donated, the better your chance to win! Send an e-mail to Chris McKelvey at [cmckelvey@tms.org](mailto:cmckelvey@tms.org) indicating what item you can donate.

**NEW This Year!****Student Poster Session—  
\$7,500 in Prize Money to be Awarded****Sponsored by TMS Technical Divisions**

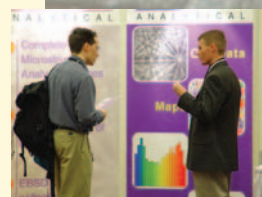
Participate in this poster session and have the opportunity to win a \$500 award from one of TMS' technical divisions for the best undergraduate and the best graduate student posters. A top prize of \$2,500 will be awarded by TMS for the "Best of Show" poster.

**Participants must satisfy the following requirements:**

- Poster presentation must be related to an area of interest of one of the five TMS technical divisions - Electronic, Magnetic & Photonic Materials; Extraction & Processing; Light Metals; Materials Processing & Manufacturing; Structural Materials.
- Authors must be full-time students pursuing undergraduate or graduate degrees.
- Authors must register to attend TMS 2006 Annual Meeting & Exhibition and be present to display and remove the posters.
- Authors must be present during a scheduled "Exhibit Showing" to answer questions and discuss their work.
- Each author is limited to a 4' x 4' space. Posters exceeding this space will not be presented or eligible for contest. (Authors are assigned display numbers prior to the conference to designate where presentations should be posted.)
- Visual aids that clarify the results of the individual's work are encouraged, however, paper text is not to be posted. Graphics should be simple, colorful, well-labeled and clear. Titles should be written in letters two-to-five-centimeters high, and all materials should be readable from a distance of two meters.

To participate, complete the submittal form found online at [www.tms.org/Students/studentpostersession-form.pdf](http://www.tms.org/Students/studentpostersession-form.pdf) by December 31, 2005.

**Don't miss the poster contest "showing" during the exhibition grand opening reception on Monday, March 13, 5 to 6:30 p.m**





## **NEW This Year!**

### **“Manufacturing Materials”**

#### ***New Design Competition for Material Advantage Student Chapters***

Enter this new design competition being offered to Material Advantage student chapters through the TMS Materials Processing & Manufacturing Division (MPMD). The goal of the new contest is for students to design and manufacture a product that can be used for chapter fundraising activities. The product can be marketed to students, faculty, alumni or the general population.

Chapters participating in the competition are invited to display and sell their finished products in the exhibit hall at the TMS Annual Meeting & Exhibition. Each chapter is provided with an eight-foot table and may include a mounted poster (no more than 36 x 24 inches) as part of the table-top display to describe the product and production process.

#### ***To Participate***

In addition to an application, chapters are required to submit a report, no more than eight pages in length, detailing:

- design and fabrication of the product prototype
- materials and processing used to manufacture the product
- economics of the product in terms of costs and potential revenue
- chapter participation efforts (number of members and time committed)

#### ***Deadline***

Applications and project reports must be received by TMS before December 15.

#### ***Rewards***

A cash award of \$500 is provided to the winning chapter in each of the following categories:

- Best Use of Materials
- Best Financial Plan
- Best Club Involvement
- Best Engineering Design
- Best Report

***The online application can be found at  
[www.tms.org/Students/AwardsPrograms/OtherContests.html](http://www.tms.org/Students/AwardsPrograms/OtherContests.html)***

#### ***Questions?***

Contact Chris McKelvey, TMS Member Services & Student Affairs Coordinator  
(724) 776-9000, ext. 259, or e-mail [cmckelvey@tms.org](mailto:cmckelvey@tms.org).

#### ***Do you think your chapter is the best?***

***Prove it by entering the Manufacturing Materials Design Competition!***



# TMS2006 Annual Meeting & Exhibition

## Registration Information

### Location

All events at TMS 2006, including registration, technical sessions, and the exhibition take place at the Henry B. Gonzalez Convention Center.

### Who Must Register

All attendees and authors must register for the meeting. Badges are required for admission to all technical sessions, the exhibition, and social functions.

**Register Before Monday, February 13, 2006, and Pay a Discounted Rate!**

### Two Convenient Ways to Register:

1. Register online on our secure site at [www.tms.org/AnnualMeeting.html](http://www.tms.org/AnnualMeeting.html).
2. Or complete the registration form on page 37 and mail or fax to TMS.

Full payment of fees for registration and social function tickets, by check or credit card, must accompany the completed registration form.

Advance registrants may obtain their conference packets at the At-Meeting Registration location during registration hours.

### At-Meeting Registration, Exhibit Hall C, Henry B. Gonzalez Convention Center:

Sunday, March 12 .....	11 a.m. to 6 p.m.
Monday, March 13 .....	7 a.m. to 6 p.m.
Tuesday, March 14 .....	7 a.m. to 5 p.m.
Wednesday, March 15 .....	7 a.m. to 5 p.m.
Thursday, March 16 .....	7 a.m. to 10 a.m.



### Americans With Disabilities Act

TMS strongly supports the federal Americans with Disabilities Act (ADA) which prohibits discrimination against, and promotes public accessibility for, those with disabilities. In support of, and in compliance with, ADA, we ask those requiring specific equipment or services to contact TMS Meeting Services in advance.

### Registration Questions?

Contact TMS Meeting Services:  
Telephone (724) 776-9000, ext. 243;  
Fax (724) 776-3770; E-mail [mtgserv@tms.org](mailto:mtgserv@tms.org)

### An Added Benefit for Nonmembers

Receive a one-year, complimentary associate membership to TMS for 2006 when you register for the annual meeting as a nonmember!

As an associate member, you will have access to the technical information and professional network you need to advance your work:

- Free print and electronic subscription to *JOM*, a monthly technical journal covering varied subjects important to the materials science and engineering world
- Discounts on additional TMS publications, including archival technical journals and proceedings
- Reduced registration fees for TMS meetings
- Access to the online TMS membership directory, and more!

Your membership card and new member packet will be on their way to your mailbox following the annual meeting, but you may begin taking advantage of your membership once your annual meeting registration fee is received and processed. For additional information about activating your membership, contact TMS Member Services at (800) 759-4TMS or (724) 776-9000, ext. 241.

# TMS

**Your Professional Partner for  
Career Advancement**

## **Transportation and Hotel**

Airfare discounts and hotel rates have been negotiated for TMS 2006 attendees by Travel Planners. You can book online in real time, 24/7, at [www.tms.org/AnnualMeeting.html](http://www.tms.org/AnnualMeeting.html) by following the link for Housing Reservations.

You benefit from:

- The lowest rates at official show hotels (If you find a lower rate, let Travel Planners know!)
- No prepayment for hotel reservations
- Immediate confirmations
- No fees or penalties to update or cancel hotel reservations online
- Descriptions, photos and maps to help you choose the perfect hotel
- Lowest Web-based fares on preferred airlines
- Up to 20% in additional airfare discounts

### **Reserve Your Hotel Before February 13, 2006, to Receive the Conference Rate!**

The TMS headquarters hotel is the Marriott Rivercenter Hotel, however special conference rates have been contracted at all the hotels listed on the housing form in this brochure. To receive the special rate, you must use the enclosed form to make hotel reservations or log onto [www.tms.org/AnnualMeeting.html](http://www.tms.org/AnnualMeeting.html) and follow the link to Travel Planners Inc. Hotel reservations are processed on a first-come, first-served basis.

***TMS has contracted a block of rooms at the hotels listed on the housing form and, therefore, has assumed a financial liability for any and all rooms in the block that are not reserved. You are strongly encouraged to reserve your room(s) at the hotels listed, before the deadline, to limit financial liability and make the 135th TMS Annual Meeting & Exhibition a successful event for all.***

### **About the Marriott Rivercenter Hotel**

Approximately eight miles (15 minutes) from the San Antonio International Airport, the Marriott Rivercenter Hotel is located near the Henry B. Gonzalez Convention Center and is within walking distance of shopping and attractions, such as The Alamo and The River Walk. All rooms feature individual climate control, STSN high-speed Internet access, voicemail, desk with lamp, iron and ironing board, coffee maker, hair dryer and a television with in-room pay movies. No shuttle service is provided.

### **Guest Hospitality at the Marriott**

A special guest hospitality area will be hosted each day from 7 to 9:30 a.m. at the San Antonio Marriott Rivercenter Hotel. TMS will sponsor a continental breakfast for the convenience of spouses and others accompanying meeting attendees. The Guest Hospitality Room is an ideal place to meet, socialize, and gather before tour departures.

To register an accompanying person, provide your guest's name on the meeting registration form. A complimentary "Conference Guest" badge will be issued to permit admission to the TMS exhibition, reception, and Guest Hospitality Room.

The conference guest badge is intended for spouses and accompanying persons of registered attendees and for identification purposes only. It does not permit access to technical presentations.



**NEW!****Collected Proceedings CD-ROMs for 2006**

To provide added value for attendees, CD-ROMs containing multiple symposia on a topical area will be available on-site at TMS 2006 Annual Meeting and Exhibition in San Antonio. At no extra charge, attendees registered as members, nonmembers, and nonmember authors may choose a CD-ROM from one of the three areas:

- Light Metals
- Structure, Extraction, Processing and Properties
- Emerging Materials

***The CD-ROMs will include:***

- Multiple symposia proceedings in the topical area
- Keynote presentations
- Links to additional resource information
- Featured presentations
- Table of contents

Each symposium will be presented as an individual publication on the CD-ROM, with its own table of contents, standard publication reference numbers, and copyright information.

All three CD-ROMs will also be available for purchase but only on-site during the annual meeting. The cost per CD-ROM will be \$150 with a student price of \$75.

***See the registration form on the next page to make your selections.***

***Printed Proceedings***

For those interested in purchasing printed copies of individual symposia, arrangements can be made before, during, and after the annual meeting. To order in advance or after the meeting, contact Stephen Kendall, TMS publication manager: telephone (724) 776-9000, ext 219, or (800) 759-4TMS; e-mail skendall@tms.org. Arrangements may also be made at the meeting by visiting the TMS Publications Sales area.

***Make your collection of proceedings complete with the 2005 TMS Annual Meeting Featured Presentations***

**Now available as a collection in portable document format (PDF), seven papers are featured:**

- Alumina and Bauxite: Industry Trends and Developments
- Arsenic Metallurgy
- Magnesium, Primary Production and Environmental
- Post-Consumer Recycling
- Characterization of Minerals, Metals & Materials
- Multicomponent Multiphase Diffusion
- Applications and Fundamentals of High Aspect Ratio Nanomaterials

***Price \$105***

**TMS members and students save more than 25%.**

**Also available as individual papers for \$15 each.**

**Order through the TMS Document Center at <http://doc.tms.org>**



## ADVANCE REGISTRATION FORM

Advance Registration Deadline: February 13, 2006

Payment must accompany form.

Forms received past this date will be processed at the on-site fee.

WEB

[www.tms.org/AnnualMeeting.html](http://www.tms.org/AnnualMeeting.html)

Web registration requires credit card payment.

FAX

USA: (724) 776-3770

Fax registration requires credit card payment.

MAIL

Return with TMS Meeting Services  
payment to: 184 Thorn Hill Road  
Warrendale, PA 150861. Member of: ☐ TMS ☐ AIST ☐ SME ☐ SPE Member Number: \_\_\_\_\_☐ Dr. ☐ Prof.☐ Mr. ☐ Mrs. ☐ Ms. \_\_\_\_\_

Last Name

First Name

Middle Initial

Informal First Name to Appear on Badge: \_\_\_\_\_ Date of Birth: \_\_\_\_\_  
mm / dd / yyyy

Employer/Affiliation: \_\_\_\_\_ Title: \_\_\_\_\_

Address: ☐ Business ☐ Home \_\_\_\_\_

City: \_\_\_\_\_ State/Province: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_ Country: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

Guest/Spouse Name: \_\_\_\_\_ *Guests do not receive admission to technical sessions.*

## 2. Registration Fees:

Advance Fees  
Until 2/13/06On-Site Fees  
After 2/13/06

<input type="checkbox"/> Member.....	\$545	M.....	\$645	ML
<input type="checkbox"/> Nonmember Author * .....	\$635	NMA.....	\$735	NMAL
<input type="checkbox"/> Nonmember * .....	\$695	NM.....	\$795	NML
<input type="checkbox"/> Student Member ## .....	\$0	STU.....	\$25	STUL
<input type="checkbox"/> Student Nonmember ## * .....	\$25	STUN.....	\$50	STUNL
<input type="checkbox"/> TMS Senior Member.....	\$385	RM.....	\$435	RML
<input type="checkbox"/> Exhibit Booth Personnel.....	\$0	E.....	\$0	EL
<input type="checkbox"/> Exhibit Only.....	\$50	EO.....	\$50	EOL

Registration TOTAL \$ \_\_\_\_\_

Each member, nonmember author and nonmember registrant will receive a collected proceedings CD-ROM of his/her choosing as part of the registration fee. Please make your selection below, in section 3-Publications.

\* Includes TMS membership for 2006

## Students must attach a copy of school student identification card.

## 3. Publications/Collected Proceedings:

Each member, nonmember author and nonmember registrant will receive a collected proceedings CD-ROM of his/her choosing as part of the registration fee. Indicate below the CD-ROM you prefer; you may also purchase additional CD-ROMs below. **Note:** the collected proceedings CD-ROMs will not be available after the meeting. CD-ROMs must be picked up at the meeting; none will be shipped.

As part of my registration, I choose the CD marked below:

- ☐ Light Metals 06-6059-CD-C  
☐ Structure, Extraction, Processing and Properties 06-6066-CD-C  
☐ Emerging Materials 06-6073-CD-C

I also wish to purchase:

	Attendee	Student	Quantity
<input type="checkbox"/> Light Metals 06-6059-CD-P	\$150	\$75	_____
<input type="checkbox"/> Structure, Extraction, Processing and Properties 06-6066-CD-P	\$150	\$75	_____
<input type="checkbox"/> Emerging Materials 06-6073-CD-P	\$150	\$75	_____

Publications TOTAL \$ \_\_\_\_\_

Visit the Publications Sales area at the meeting to purchase CD-ROMs or print volumes of selected symposia proceedings. After the meeting, proceedings volumes may be purchased online at the TMS Document Center, <http://doc.tms.org>.

## 4. Continuing Education Short Courses:

Courses are to be held on March 11 or 12.

Advance Fees  
Through 2/13/06On-Site Fees  
After 2/13/06

Member Nonmember Member Nonmember

<input type="checkbox"/> 1. Aluminum Smelting (Sat/Sun) .....	\$525	\$610	\$575	\$660
<input type="checkbox"/> 2. Heat Treatment for Alloys (Sun).....	\$475	\$560	\$525	\$610
<input type="checkbox"/> 3. Scientific Digital Imaging (Sun) .....	\$475	\$560	\$525	\$610
<input type="checkbox"/> 4. Thinking Differently in Teams (Sun).....	\$475	\$560	\$525	\$610
<input type="checkbox"/> 5. 3-D Materials Science Tutorial (Sun).....	\$100	\$250	\$125	\$275

Short Course TOTAL \$ \_\_\_\_\_

## 5. Social Function Tickets:

Fee

Quantity

Total

David Brandon Honorary Dinner .....	\$65	_____	\$_____ BD
Mysore Dayananda Honorary Dinner.....	\$55	_____	\$_____ DD
William Gerberich Honorary Dinner .....	\$65	_____	\$_____ GD
John Hunt Honorary Dinner .....	\$65	_____	\$_____ JD
Art McEvily Honorary Dinner.....	\$65	_____	\$_____ MD
Amiya Mukherjee Honorary Dinner .....	\$65	_____	\$_____ RD
Pradeep Rohatgi Honorary Dinner.....	\$65	_____	\$_____ WD
Monroe Wechsler Honorary Dinner .....	\$65	_____	\$_____ HD
"Women in Science" Breakfast .....	\$0	_____	\$_____ SB
TMS-AIME Banquet .....	\$65	_____	\$_____ AD
Tables of 8 .....	\$520	_____	\$_____ AD8
Table Sign to Read .....			
Extraction & Processing Division Luncheon.....	\$45	_____	\$_____ EP
Tables of 8 .....	\$360	_____	\$_____ EP8
Table Sign to Read .....			
Light Metals Division Luncheon .....	\$45	_____	\$_____ LM
Tables of 8 .....	\$360	_____	\$_____ LM8
Table Sign to Read .....			

For any special dietary needs, please contact  
Meeting Services at (724) 776-9000, ext. 243.

Social Function TOTAL \$ \_\_\_\_\_

## 6. Furnace Systems Workshop:

Fee

Quantity

Total

Monday 3/13/06-Wednesday 3/15/06 .....	\$100	_____	\$_____
----------------------------------------	-------	-------	---------

## 7. Tutorial Luncheon Tickets:

Fee

Quantity

Total

Monday 3/13/06			
The Young Leaders Tutorial Lecture is free.			
You may purchase the optional box lunch for .....	\$35	_____	\$_____ EM

## 8. 2006 Membership Dues: For current TMS members only

<input type="checkbox"/> Professional Member .....	\$105	FM
<input type="checkbox"/> Recent Graduate (Years 2 & 3).....	\$52.50	JM
<input type="checkbox"/> (ACerS/AIST/ASM/TMS) Material Advantage Student Member .....	\$25	ST

## 9. Payment Enclosed:

☐ Check, Bank Draft, Money Order

Make checks payable to TMS. Payment must be made in U.S. dollars drawn on a U.S. bank.

☐ Credit Card Expiration Date \_\_\_\_\_

Card No. \_\_\_\_\_

☐ Visa ☐ MasterCard ☐ Diners Club ☐ American Express

Cardholder Name \_\_\_\_\_

Signature \_\_\_\_\_

10. TOTAL FEES PAID .....\$ \_\_\_\_\_

**Refund Policy:** Written requests must be mailed to TMS, post-marked no later than February 13, 2006.  
A \$75 processing fee is charged for all cancellations. No refunds will be processed after February 13, 2006.

# San Antonio, Texas





# TMS2006

**135th Annual Meeting & Exhibition**  
**March 12-16, 2006 • San Antonio, Texas, USA**

## HOUSING RESERVATION FORM

Mail or fax this housing form to:  
 Travel Planners, Inc., 381 Park Ave. South, New York, NY 10016  
 FAX: (212) 779-6128 • PHONE: (800) 221-3531  
 In 212, 718, 516, 914, 631 or international, call (212) 532-1660.  
 (CHOOSE ONLY ONE OPTION.)

Making a reservation is easier than ever through Travel Planners' real-time Internet reservation system! Just log on to [www.tms.org/AnnualMeeting.html](http://www.tms.org/AnnualMeeting.html), and follow the link to Travel Planners. View actual availability, learn about hotel features and services, and obtain local city and sightseeing information. Most importantly, receive instant confirmation of your reservation!

**Reservations must be received at Travel Planners by: Monday, February 13, 2006**

Arrival Date \_\_\_\_\_ Departure Date \_\_\_\_\_  
 Last Name \_\_\_\_\_ First Name \_\_\_\_\_ MI \_\_\_\_\_  
 Company \_\_\_\_\_  
 Street \_\_\_\_\_ Address \_\_\_\_\_  
 City \_\_\_\_\_ State/County \_\_\_\_\_ Zip/Postal Code \_\_\_\_\_ Country \_\_\_\_\_  
 Daytime Phone \_\_\_\_\_ Fax \_\_\_\_\_  
 Additional Room Occupants \_\_\_\_\_  
 E-mail \_\_\_\_\_ (Confirmation will be sent via e-mail if address is provided.)  
 Non-Smoking Room Requested \_\_\_\_\_ Special Needs \_\_\_\_\_

### Indicate 1st, 2nd, and 3rd hotel choice:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

### Type of Accommodations: (check one)

- ☐ Single 1 person/1bed ☐ Double 2 people/1bed ☐ Twin 2 people/2 beds  
☐ Triple 3 people/2 beds ☐ Quad 4 people/2 beds

If all three requested hotels are unavailable, please process this reservation according to: (check one) ☐ ROOM RATE ☐ LOCATION

**In order to ensure that rooms are available for attendees, TMS has contracted a block of rooms at the headquarters hotel, Marriott Rivercenter Hotel, along with each of the hotels listed. TMS assumes financial liability for any and all rooms that are not reserved in the blocks. Therefore, attendees are strongly encouraged to reserve rooms at the hotels listed. This will help to limit undue expenses and secure the success of TMS 2006. Thank you.**

**Confirmations:** A confirmation is e-mailed, faxed or mailed from Travel Planners Inc. once the reservation has been secured with a deposit or credit card. The hotels do not send confirmations. If you do not receive a confirmation within seven days, please call Travel Planners Inc.

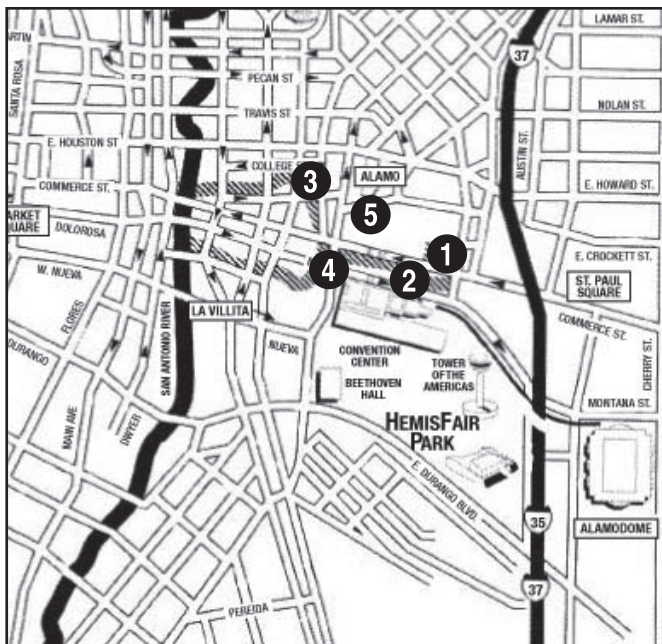
**Changes/Cancellations:** All changes and cancellations in hotel reservations must be made with Travel Planners Inc. until three business days prior to arrival and are subject to the individual hotel's cancellation policies. Cancellations and changes within three days of arrival MUST be made with the hotel directly. Many hotels impose fees for early departure. This rate is set by each hotel and may vary accordingly. Please reconfirm your departure date at the time of check-in.

**Reservations/Deposits:** All reservations are being coordinated by Travel Planners Inc. Arrangements for housing must be made through Travel Planners Inc and NOT with the hotel directly. Reservations via Internet, phone or fax are accepted with a major credit card only. Housing forms and written requests are accepted with a major credit card or deposit of one night's room and tax payable to Travel Planners Inc. Check must be drawn in U.S. funds on a U.S. bank. No wire transfers are accepted. Deposit policies are set by each hotel and are outlined on the hotel confirmation.

**Please read all hotel information prior to completing and submitting this form to Travel Planners Inc. Keep a copy of this form. Use one form per room required. Make additional copies if needed.**

### HEADQUARTERS

- 1 Marriott Rivercenter Hotel**  
\$209 single/double
- 2 Marriott Riverwalk Hotel**  
\$209 single/double
- 3 Hyatt Regency San Antonio**  
\$189 single/double
- 4 Hilton Palacio de Rio**  
\$212 single • \$222 double
- 5 Menger Hotel**  
\$129 single/double



**Deposit Payment:** ☐ Check ☐ American Express ☐ MasterCard ☐ VISA ☐ Discover ☐ Diners

Account Number \_\_\_\_\_ Expiration Date \_\_\_\_\_

Cardholder Name \_\_\_\_\_ Authorized Signature \_\_\_\_\_

## **"Celebrating San Antonio!"**

**Monday, March 13**  
**8:30 a.m. to 12:30 p.m.**  
**\$39 per person**



### **Stop #1 King William Historic District**

The King William Historic District recalls a more gracious era. Prosperous German merchants who made their fortunes in San Antonio in the late 1800s built these grand homes. They are showcased along tree-lined avenues, with ornately carved wood, delicately scrolled ironwork and beautiful landscaping.

Just at the end of King William Street is the Guenther House, built by the German immigrant who operated the first flourmill on the San Antonio River. This house is still part of the Pioneer Flour Mill and run by the Guenther family. A tour of the house reveals wonderful memorabilia from the Pioneer Mill.

A visit to King William is not complete without a tour of the Steves Homestead. Edward Steves built this home in 1876. It is now a museum owned and operated by the San Antonio Conservation Society. The house has been meticulously restored to the period of the early 1900s.

### **Stop #2 San Fernando Cathedral**

At the center of San Antonio, the San Fernando Cathedral was founded in 1731 by a group of 15 families who came from the Canary Islands at the invitation of King Phillip V of Spain. Over 5,000 people participate at weekend Masses, and symphonies, concerts, and television specials are but a few of the special events held in the cathedral regularly. Hundreds of people of all denominations enter the church daily to pray, visit, light a candle, or follow various devotional traditions.

### **Stop #3 El Mercado (Mexican Market)**

The last stop on the tour is the border-style El Mercado, or Mexican Market. Serving as a hub of commerce years ago, Market Square, as it has become known, has retained much of its charm of the past with its quaint shops, which offer local crafts, art, clothing and food.

## **Caverns and Cabernet!**

**Wednesday, March 15**  
**8:30 a.m. to 12:30 p.m.**  
**\$55 per person**

Over 30 million years ago, what is known now as the picturesque Texas Hill Country was a volcanic bed of activity and violent earthquakes. Today, rich farmland lies to the east and rugged ranch land to the west.

One amazing feat of nature is the Natural Bridge Caverns, named for the 60-foot natural limestone arch that spans the entrance. Trails through these caverns cover more than one mile, and the temperature is 70 degrees year round. Tourists are amazed by the natural formations; the constant sound of dripping water is a reminder the cave is still alive and growing. Following the tour, each guest has the opportunity to pan for gold!

Next, it's time to enjoy the fruits of ancient Texas at Dry Comal Creek Vineyards, nestled in a small protected valley. Proprietor Franklin Houser's passion for the grape has resulted in a quality winery. From the picking to the bottling, every step is completed by hand. Tasting four unique wines with Mr. Houser is a special treat as he explains the history and character of each wine.

**To sign up for a tour, complete the form on the next page.**  
**Tours depart from the San Antonio Marriott Rivercenter Hotel, Commerce Street door.**

## **Spanish Mission Trail**

**Tuesday, March 14**  
**8:30 a.m. to 12:30 p.m.**  
**\$39.50 per person**



### **Site #1 The Alamo**

The most well-known, Mission San Antonio de Valero, or the Alamo, was established in 1718 and played a pivotal role in Texas history. The shrine displays exhibits from the battle, and guests can explore the beautifully landscaped grounds.

### **Site #2 Mission San Jose**

The largest and most restored of the Missions is Mission San Jose. Known as the "Queen of the Missions," it was established in 1720 and is the showpiece of the San Antonio Missions National Historical Park. Visitors tour the Indians' quarters, located within the walls, as well as the Spanish soldiers' quarters. San Jose's church is one of the most beautiful in the country with its elaborate carvings on the chapel facade. The famous "Rose Window," intricately carved, is said to be dedicated to its creator's lost love.

### **Site #3 Espada Dam**

The next stop is the Espada Dam, an engineering marvel. Built curving the wrong way, the dam has withstood floods for more than 200 years.

### **Site #4 Mission Concepcion**

Established in 1731, Mission Concepcion, the oldest unrestored Mission church in Texas, marks the final stop on the trail. Construction of the building, graced with twin towers, beautiful cupola and rare frescoes decorating the side rooms, spanned more than 20 years.

As an everlasting memory of the beautiful Missions, every guest receives a complimentary book of the Spanish Mission Trail.



# TMS2006

**135th Annual Meeting & Exhibition**  
**March 12-16, 2006 • San Antonio, Texas, USA**

## OPTIONAL EVENTS RESERVATION FORM

Mail or fax this form with full payment (check or credit card, U.S. funds only) to:  
Circa Texas, Inc., P.O. Box 1361, San Antonio, TX 78295  
FAX: (210) 271-7528 • PHONE: (800) 786-2209 or (210) 224-0926

Name (please print) \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_ Zip \_\_\_\_\_

Country \_\_\_\_\_ E-mail \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_

Payment Enclosed: ☐ Check      Credit Card: ☐ Visa    ☐ MasterCard    ☐ American Express

**International attendees must pay with checks written on accounts maintained in U.S. banks.**

Credit Card Number \_\_\_\_\_ Expiration Date \_\_\_\_\_

Authorized Signature \_\_\_\_\_

TOUR OPTION	TIME	QTY X PRICE = AMOUNT (Prices are per person.)		TOTAL	
<b>Monday, March 13, 2006</b>					
Tour 1: Celebrating San Antonio	8:30 a.m. – 12:30 p.m.		\$39.00		
<b>Tuesday, March 14, 2006</b>					
Tour 2: Spanish Mission Trail	8:30 a.m. – 12:30 p.m.		\$39.50		
<b>Wednesday, March 15, 2006</b>					
Tour 3: Caverns and Cabernet	8: 30 a.m. – 12:30 p.m.		\$55.00		
			<b>TOTAL</b>		

**All tours depart from the Marriott Rivercenter Hotel, Commerce Street door.**

**Preregistration Deadline: Friday, February 24, 2006**

**Cancellations:** Prepaid tour registrations are refundable only if cancelled by the above deadline date. Tour refunds requested prior to the deadline date will be made, less a \$3.00 per ticket handling charge. There will be no refunds or exchanges after the deadline date. Circa Texas reserves the right to cancel any tour if the agreed minimum number of participants preregistered for a tour is not met. Refunds for any tour cancelled by Circa Texas will be mailed to registrants without penalty.



# San Antonio Texas



**For more ideas on enjoying the flavor of San Antonio,  
visit the convention center and visitors bureau online at  
[www.sanantoniocvb.com](http://www.sanantoniocvb.com)**

***Look for these added conveniences at TMS  
2006 Annual Meeting & Exhibition:***

- ***Cyber Center*** - *Stay in touch while out of the office with the capability to check your e-mail and send messages.*
- ***Employment Referral Board*** - *Visit the TMS membership area to post your resume or a job opening and find a potential match at the meeting.*
- ***“Networking” Areas*** - *Take advantage of plenty of comfortable niches to sit and discuss common challenges, projects and ideas with colleagues!*

# TMS

## ***Who We Are***

The Minerals, Metals & Materials Society (TMS) is the professional organization encompassing the entire range of materials in science and engineering, from minerals processing and primary metals production to basic research and the advanced applications of materials. The Society's broad technical focus covers light metals; electronic, magnetic and photonic materials; extraction and processing; structural materials; and materials processing and manufacturing.

## ***Our Members***

Included among TMS professional and student members are metallurgical and materials engineers, scientists, researchers, educators, and administrators who work in industry, government and academia. They hail from more than 70 countries on six continents.

## ***Our Mission***

The mission of TMS is to promote the global science and engineering professions concerned with minerals, metals, and materials. The Society works to accomplish its mission by providing technical learning and networking opportunities through interdisciplinary and specialty meetings; short courses; publications, including five journals and proceedings; and its Web site.

**To learn more, visit [www.tms.org](http://www.tms.org).**

# TMS

[www.tms.org](http://www.tms.org)

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# TMS2006

## 135th Annual Meeting & Exhibition

■ *Linking science and technology for global solutions*

March 12-16, 2006  
Henry B. Gonzalez Convention Center  
San Antonio, Texas, USA

**INSIDE - Your Invitation to  
Learn, Network, and Advance Your Work**

