2000 TMS 129th ANNUAL MEETING & EXHIBITION

MARCH 12–16, 2000

OPRYLAND HOTEL

NASHVILLE, TENNESSEE
U.S.A.

TMS
Minerals • Metals • Materials

AIME

Combining the 129th Annual Meetings of The Minerals, Metals & Materials Society and the American Institute of Mining, Metallurgical and Petroleum Engineers, Inc. and celebrating their longstanding commitment to the advancement of materials science and engineering.

HOUSING AND REGISTRATION FORMS INSIDE

Advance Registration Deadline:
February 18, 2000

For 129 years...

Mark your calendar now for the 129th TMS Annual Meeting & Exhibition, March 12–16, 2000

TMS and AIME have helped to accelerate the progress of the materials sciences by being a catalyst for shared knowledge throughout the field. Each year, the TMS Annual Meeting & Exhibition has brought together the brightest and most influential leaders of industrial, academic, and government research in an effort to promote professionalism learn from each other's experience and stored knowledge.

In this age of information overload, being able to differentiate between knowledge and information is vital, as our conference keynote speaker, Daniel Burrus (see page 15), will explain. By attending the 2000 TMS Annual Meeting & Exhibition you will be able to tap into a knowledge base of more than 4,000 of the world's top engineers and researchers. Whether you find your answers in the more than 200 technical sessions and 1,000 individual formal presentations, or you solve your problem while networking in the hallways or during one of the many social events, the TMS Annual Meeting & Exhibition gives you access to a wealth of knowledge and combined experience.

Opportunities to add to your personal knowledge base will abound during the conference with a schedule of activities that also includes special plenary lectures, tutorials, short courses, and plant tours. In addition, TMS 2000 is a hands-on exposition by the world's top organizations. Its 300,000 square feet of exhibits allows you to compare side-by-side the products and services your organization is looking for.

Information is everywhere, but opportunities to gain useful knowledge are rare. If you value knowledge and the advantage it can give you and your organization, you can't afford to miss the 2000 TMS Annual Meeting & Exhibition.

LOOK FOR THESE TMS 2000 ANNUAL MEETING & EXHIBITION HIGHLIGHTS . . .

A comprehensive menu of technical symposia that addresses every major issue in materials and processes. (See the Symposia Highlights from pages 8–19.)

Special tutorial lectures during the lunch hour make even lunch a learning experience. (Tutorial Luncheon Lecture information is available on page 23.)

Pay tribute to your profession and colleagues at the 129th TMS/AIME Banquet and Awards Presentation. (Banquet information is available on page 14.)

If you want to know what technological trends will be important in the next millennium, as well as why knowledge is the key to opportunity in the coming new era, you don't want to miss the special keynote presentation by Daniel Burrus. (See page 15.)

Local plant tours are available as an interesting conclusion to your conference experience. (Plant tours are on page 29.)

Choose from a menu of learning-intensive short courses programmed in conjunction with the conference to maximize your week-long learning experience. (Short Course Information is available on pages 24–28 .)

Optional tours are available for your accompanying guests, or if you just need a break. (See the Optional Tour information on pages 30, 31.)

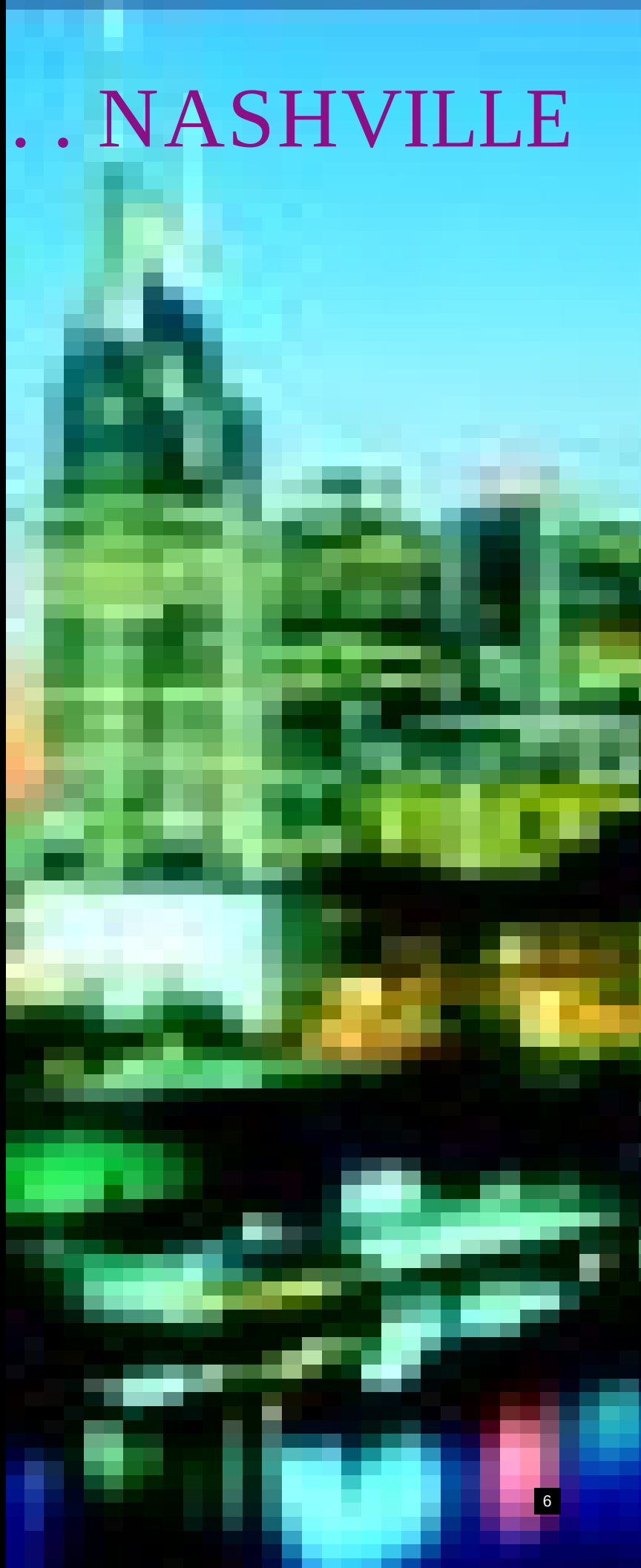
TMS 2000—the TMS Annual Meeting Exhibition has everything you've been looking for. (See pages 32–35.)

Don't miss the special plenary session presented by key experts in the field of aluminum production technology and sponsored by the Aluminum Committee of the TMS Light Metals Division. (See pages 16–18.)

Online registration is available via the 2000 TMS Annual Meeting & Exhibition Home Page on the World Wide Web at http://www.tms.org/Meetings/Annual-00/AnnMtg00Home.html

Contents

OPRYLAND. . . NASHVILLE



The Opryland Hotel is a unique and amazing site to hold a conference. Although it may be best known for its tradition of Southern hospitality, it is a completely self-contained resort beckoning you with awe-inspiring scenery, soothing ambience, comfortable surroundings, and impeccable service.

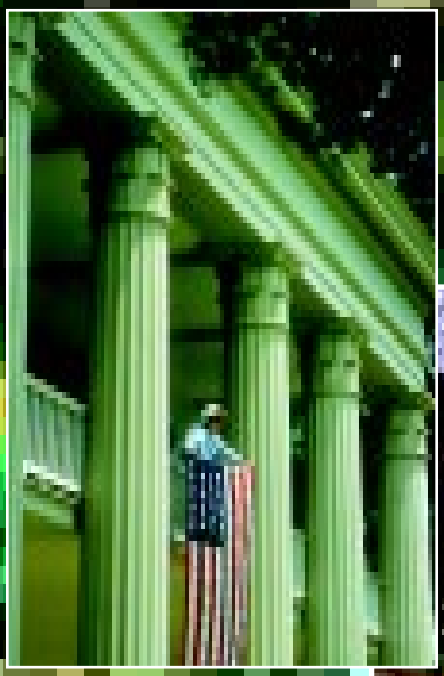
Nine acres of beautiful gardens and elaborate waterfalls are the highlights of the hotels' three indoor gardens—the Delta, the Cascades, and the Conservatory. The Hotel also features a winding river with Mississippi-style flatboats, a variety of restaurants and lounges, 30 unique shops, three swimming pools, 2,883 guest rooms, a multitude of meeting rooms, and a world-class exhibit hall—all under one roof. Complementing the Opryland Hotel are other components of Opryland USA, including the Grand Ole Opry; the General Jackson showboat which cruises the Cumberland River; the Wildhorse Saloon; and the Ryman Auditorium, Nashville's premier performance hall and museum.

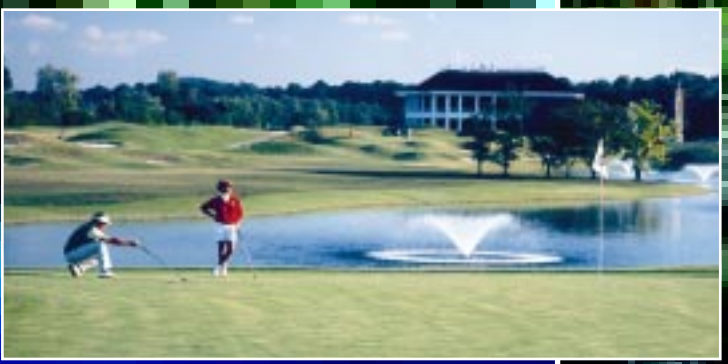
Even though you would never have to leave Opryland, the Nashville area has much that you will want to experience. Opryland is located in Nashville's "Music Valley". This lively area offers more than 100 shops, restaurants, hotels, and one-of-a-kind attractions and entertainment opportunities—convenient and close by.

Downtown Nashville has evolved into a vibrant combination of traditional charm and ultra-modern facilities. Historic buildings along Second Avenue now house an eclectic mix of shops, restaurants, and high-energy nightclubs.

Although Nashville is best known as the home of country music, it is also a thriving center for industry. Major automobile technology centers and manufacturing plants can be found near by and Nashville is centrally located within a day's driving distance of a large portion of the country's major aluminum, steel, and material manufacturing centers.

If you have never been to Nashville and Opryland, don't miss this chance. It's the perfect setting for a pleasurable learning experience.





SYMPOSIA HIGHLIGHTS

Over 175 technical session are being programmed by the TMS...

***EMPMD** - Electronic, Magnetic & Photonic Materials Division*

***EPD** - Extraction & Processing Division*

***LMD** - Light Metals Division*

***MPMD** - Materials Processing & Manufacturing Division*

***SMD** - Structural Materials Division*

***MSCTS** - and the Materials Science Critical Technologies Sector of ASM International*

In addition, special topical symposia have been programmed by the Professional Registration Committee, Young Leaders Committee, Public & Governmental Affairs Committee and the Education Committee. Brief descriptions of the scheduled symposia follow. The entire program, including abstracts and the technical session grid, listing day, date and room location will appear in the November 1999 issue of JOM.

The entire program, including abstracts, will also be available beginning in November on the 2000 TMS Annual Meeting & Exhibition World Wide Web site at http://www.tms.org/Meetings/Annual-00/AnnMtg00Home.html.

Attention Organizers, Editors and Technical Committee Chairs

At a special workshop on Tuesday, March 14, 12:30PM, TMS will demonstrate its Conference Management System (CMS) and review the editors' responsibilities. This presentation will familiarize organizers with the direct electronic submission of abstracts and the organization of symposia via the TMS World Wide Web site. All organizers of present and future symposia, as well as technical committee members are strongly encouraged to attend. Contact Peggy Weiss, TMS Manager of Programming Services for additional information at 724-776-9000, ext. 227 or Email weissp@tms.org.

12th International Symposium on Experimental Methods for Microgravity Materials Science

Sponsored by EMPMD/SMD Alloys Phases Committee, MSCTS Thermodynamics & Phase Equilibria Committee, and NASA Microgravity Sciences

MSCTS Thermodynamics & Phase Equilibria Committee This symposium will focus on the opportunities that a reduced gravity environment can offer in unique processing both in-space and with on-earth experiments. Topics include: solidification; containerless processing; thermophysical property measurements; experimental techniques and apparatus; protein crystal growth; modeling, theoretical calculations and proposed systems; launch and experimental facilities and opportunities; crystal growth; phase relations; fluid sciences; supercooled material; plantary sciences; mission results and gravitational effects.

General INFORMATION

Location

The 2000 TMS Annual Meeting & Exhibition will take place in Nashville, Tennessee. The Opryland Hotel and Convention Center will be the headquarters hotel for the event. All conference events, including registration, technical sessions, and the exhibition will take place at the Opryland Hotel and Convention Center.

Advance Registration

Take advantage of the discounted advance registration fees. Complete the Advance Registration form in the center, fold-out section of this brochure and return it to The Minerals, Metals & Materials Society no later than February 18, 2000. Advance registration is encouraged. For your convenience, you may charge your registration fees on MasterCard, VISA, American Express, or Diner's Club credit cards. Full payment of registration fees and social function tickets must accompany the completed Advance Registration form. Complete the registration form in this brochure and mail it in today.

Advance Registration Deadline: February 18, 2000

Register Via TMS OnLine

You may register any time day or night via the 2000 TMS Annual Meeting & Exhibition Home Page on the World Wide Web at http://www.tms.org/Meetings/Annual-00/AnnMtg00Home.html. TMS OnLine also provides detailed information on this and all TMS sponsored conferences.

Advance Registrant Packet Pick Up

Advance registrants should pick up their registration packets at the Ryman Hall in the Opryland Hotel & Convention Center during the registration hours. Full payment of registration fees and social function tickets must accompany the completed Advance Registration form. For questions on advance registration, please contact:

TMS Meetings Services
184 Thorn Hill Road
Warrendale, PA 15086
Telephone: (724) 776-9000, ext. 243
Fax: (724) 776-3770
E-mail: mtgserv@tms.org

At Meeting Registration

Registration will be held in the Ryman Hall in the Opryland Hotel & Convention Center during the following hours:

Sunday, March 12 ..... 11:00 a.m. – 6:00 p.m.

Monday, March 13 ..... 7:00 a.m. – 5:00 p.m.

Tuesday, March 14 ..... 7:00 a.m. – 5:00 p.m.

Wednesday, March 15 ..... 7:00 a.m. – 5:00 p.m.

Thursday, March 16 ..... 7:00 a.m. – 10:00 a.m.

Registration Policy

All attendees and authors must register for the meeting. Non-member authors may register at the special non-member author rate. Badges are required for admission to all technical sessions, the exhibition, and social functions.

Refund Policy

Written requests must be sent to TMS Meeting Services, 184 Thorn Hill Road, Warrendale, PA 15086. No refunds will be issued after February 18, 2000. A $50 processing fee will be charged on all cancellations.

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 compliance with this Act, we ask that those requiring specific equipment or services as an attendee of the TMS Annual Meeting contact the TMS Meeting Services Department and advise of any specific requirements in advance.

Technical Sessions

Technical sessions will begin on Monday, March 13, 2000, and end on Thursday, March 16, 2000. Technical sessions will be held at the Opryland Hotel and Convention Center. Abstracts will be printed in the November 1999 issue of JOM and will also be available via TMS OnLine on the World Wide Web at http://www.tms.org/Meetings/Annual-00/AnnMtg00Home.html.

Poster Session

A technical, noncommercial poster session will be held in conjunction with the 2000 Annual Meeting. Presentations will be displayed on 4x8-foot poster boards; no formal presentation is required. Individuals should refrain from the use of brand names and specific product endorsements. The Poster Session will begin on Monday, March 13 and remain in place through Wednesday, March 15. Abstracts of 150 word or less must be submitted to the Conference Management System (CMS) at http://www.tms.org/cms by February 4. If you do not have access to the World Wide Web, abstracts may be mailed to Peggy Weiss, TMS, 184 Thorn Hill Road, Warrendale, PA 15086, Fax 724-776-3770, Email weissp@tms.org.

Audio/Video Recording Policy

The Minerals, Metals & Materials Society (TMS) reserves the right to any audio and video reproduction of all presentations at every TMS-sponsored meeting. Recording of sessions (audio, video, still-photography, etc.) intended for personal use, distribution, publication, or copyright without the express written consent of TMS and the individual authors is strictly prohibited. Contact the TMS Technical Programming Department to obtain a copy of the waiver release form.

Employment Referral Board

An employment referral board will be located at the TMS Member Services Desk. Attendees may leave their resumes and employers may post job openings. Also look for the tabletop display promoting the TMS Resume Link service. Information and resume forms are available at the display.

Guest Hospitality

A special guest hospitality area will be hosted each day of the meeting from 7:00 a.m. – 10:00 a.m. in the Opryland Hotel and Convention Center. TMS will sponsor a continental breakfast for the convenience of spouses and accompanying persons of meeting attendees. The Guest Hospitality Room will be a good place to meet, socialize, and gather for tour departures.

To "register" an accompanying person, please provide your guest's name on your meeting registration form. They will receive a complimentary badge identifying them as a Conference Guest, which will allow admission to the TMS Exhibition and Reception, and the Guest Hospitality Room.

Note: The Conference Guest badge is intended for spouses and accompanying persons of registered attendees and for identification only. It does not permit access to technical presentations.

Housing Accommodations

The TMS headquarters hotel will be the Opryland Hotel. To make a reservation at the headquarters hotel, please complete the housing form in the enclosed Registration Packet. Fax or mail your housing form directly to the Opryland Hotel.

Do not fax and mail your housing form, as this may result in a duplicate reservation.

Overflow hotel rooms have been reserved at special convention rates at surrounding properties. There are no housing forms for the overflow hotels. Please call these properties directly to make your housing reservations and request the TMS room block:

Inn at Opryland	**AmeriSuites**	**Shoney's Inn**
(615) 889-0800	(615) 872-0422	(615) 885-4030

All reservations are processed on a first-come, first-served basis.

A confirmation from the hotel of your choice will be mailed directly to you within approximately 2-3 weeks.

Cancellations/changes must be made directly with the hotels. **Do not send to the TMS Office.**

SYMPOSIA HIGHLIGHTS

Advanced Technologies for Superalloy Affordability

Sponsored by SMD High Temperature Alloys Committee

To meet the performance goals of aerospace and industrial applications, advanced superalloys of different processing routes are required. Research efforts on new technologies are in progress to reduce component acquisition costs as well as system life cycle costs. This symposium will address recent R&D experiences, both industrial and academic, on those technologies for superalloy affordability. Topics include: processing Improvement-method to increase the productivity and to reach better quality of superalloys; new process/new alloys-innovation of better manufacturing idea or enhanced alloy chemistry for particular superalloy components; process modeling-computational modeling that reduces trial-and-error steps; and simulation of microstructure/properties-numerical or physical simulation providing prediction of alloy microstructure/defect, phase relationship, and expected properties after specific processing operation.

Alumina and Bauxite

Sponsored by LMD Aluminum Committee

Discussion will focus on all aspects of the alumina and bauxite industry including and process design, alumina quality improvements and challenges, as well as current and new uses of both alumina and alumina trihydrate.

Aluminum Reduction Technology

Sponsored by LMD Aluminum Committee

Several sessions will address all aspects of aluminum reduction, technical innovations, novel concepts, cell design, performance improvements and operating advances. Papers on smelting, energy and environment will also be presented. Also, there will be a session to cover anode performance in cells and modeling for cell design.

Automotive Alloys 2000

Sponsored by LMD Aluminum Committee

The science and technology of aluminum and magnesium alloys as it relates to the automotive market will be the main thrust of this symposium. Topics will include the physical and process metallurgy for aluminum and magnesium castings, extrusions, composites and sheet; alloys processing structure and properties characterization, commercial and pilot applications in automotive market technology and performance.

Carbon Technology

Sponsored by LMD Aluminum Committee

Several sessions will cover anode (both prebaked and soderberg) and cathode operations as they relate to the aluminum industry. This includes raw materials, paste and green anode manufacture, anode baking, anode rodding, as well as all cathode operations. Also there will be a joint session with Reduction Technology on anode performance in cells. All aspects as they relate to properties, analytical procedures, and operations will be included.

Attention all non-member registrants . . .

Welcome!

All attendees of the 129th TMS Annual Meeting who register at the non-member fee, will automatically receive a one-year, complimentary, introductory associate membership for 2000.

Associate members receive all of the same benefits as members, including a subscription to *JOM,* discounts on TMS publications and meeting fees, inclusion in, and access to, the TMS Membership Directory on TMS OnLine, plus an array of other personalized membership benefits and services.

Your membership card and new member packet, along with a postal card asking for additional vital information for our records, such as birthdate, education, and work experience, will be sent to you immediately after the meeting.

Your associate membership will be activated upon completion of your registration form and payment of the non-member registration fee. If you have any questions, please contact the TMS Member Services Department at 724/776-9000 Ext. 215.

Advance Registrants: Your year 2000 TMS membership will be processed immediately. At the meeting, stop by the TMS Membership Desk to receive your free gift and enter our grand prize drawing!

On-site Registrants: Proceed directly to the N*on-Member Only Registration Area,* where your form will be processed quickly. Receive your new member sticker on the spot; then stop by the TMS Membership Desk to receive your free gift and enter our grand prize drawing.

SYMPOSIA HIGHLIGHTS

Cast Shop Technology

Sponsored by LMD Aluminum Committee

The pre-eminent forum on molten metal processing, casting and solidification of aluminum will be held in Nashville, Tennessee. Broad-based scientific and engineering papers are requested in the areas of recycling, melting and melt preparation, alloying and grain refinement, metal treatment, ingot casting, continuous strip and slab casting, process modeling, and safe melt-handling practices.

Cyclic Deformation and Fatigue of Materials; A Symposium in Honor of Professor Campbell Laird

Sponsored by SMD/MSCTS Mechanical Behavior of Materials Committee

This symposium will be held to honor Professor C. Laird of the University of Pennsylvania for his tremendous contribution to the study and understanding of cyclic deformation and fatigue of materials in the past 40 years. This symposium will bring together an international assembly of researchers to present and discuss the mechanisms, the new issues and the trend in the field of cyclic deformation and fatigue. The areas to be discussed include cyclic deformation, fatigue, fracture, and failure analysis of model materials and structural materials, as well as advanced materials and systems. In addition to the presentations on the fundamental mechanisms, papers on structural components as well as design-related issues in the area of cyclic deformation and fatigue will also be covered. A special honorary dinner is also planned. See page 21 for details.

Deformation and Stress During Solidification

Sponsored by MPMD Solidification Committee, Shaping & Forming Committee, EPD/MPMD Processing Modeling Analysis & Control Committee

This symposium will explore recent developments in the modeling and measurement of the mechanical behavior of metals and other materials while they are solidifying and some portion of the material is in the semi-solid or mushy state. Many manufacturing technologies subject solidifying materials to thermal and mechanical stresses, which alter the shape and microstructure of the part, and may lead to defects such as cracks and segregation. Processes include casting, welding, and semi-solid forming. Research on theoretical and computational models, as well as on laboratory and plant measurements will be discussed.

Travel and Destination INFORMATION

Airlines

Nashville International Airport is served by all major U.S. airlines.

Highway Access

Nashville is accessible via I-40, I-65, and I-24, as well as the scenic Natchez Trace Parkway.

U.S. AIRWAYS

. . . Official Carrier for the 2000 TMS Annual Meeting & Exhibition

Special Airfare

U·S AIRWAYS

US Airways has been designated as the official carrier for the attendees of The Minerals, Metals & Materials Society 2000 Annual Meeting, March 12-16, 2000 in Nashville, Tennessee and agrees to offer exclusive low fares for the attendees.

This special fare will offer a 5% discount off First or Envoy Class and any published US Airways promotional round trip fare. A 10% discount off unrestricted coach fares will apply with seven-day advance reservation and ticketing required. Plan ahead and receive an additional discount by ticketing 60 days or more prior to departure. These discounts are valid provided all rules and restrictions are met and are applicable for travel from all points on US Airways route system.

The above discounts are not combinable with other discounts or promotions, and are valid March 9–March 19, 2000. Additional restrictions may apply on international travel.

To obtain these discounts, you or your professional travel consultant must call US Airways' Meeting and Convention Reservation Office at 800-334-8644; 8:00 AM – 9:30 PM, Eastern Time. Select option "1" when making the call.

REFER TO GOLD FILE NO. 22631205

Visitors to Opryland Hotel may explore an exquisite botanical environment from a nostalgic flatboat while meandering along the Delta Garden's quarter-mile-long Delta river.

Hertz® Rent-a-car System . . .

Has been selected as the official car rental company for the 2000 TMS Annual Meeting, March 12-16, 2000, in Nashville, Tennessee.

Meeting rates listed below, with free unlimited mileage, are guaranteed one week before, through one week after, the actual meeting dates and are subject to car availability. Rates are available from all Southern Tennessee locations.

Advance reservations may be made by calling the Hertz Reservations number (US 1-800-654-2240; Canada: 1-800-263-0600; International: contact your nearest Hertz reservation center) and identify yourself as an attendee of the TMS Annual Meeting and reference the CV number which follows:

You must give the reservations agent the Hertz CV #010P001

TERMS AND CONDITIONS:

- UNLIMITED MILEAGE ALLOWANCE ON ABOVE RATES.
- One-way service fee will apply when cars are not returned to renting location.
- Additional daily charges for optional coverages (Loss Damage Waiver, Effect Protection, refueling and state tax) are not included in the above rates.
- Drivers must meet standard hertz age, driver and credit requirements.
- Hertz is a frequent flyer partner with US Airways, Delta, Northwest, United and American Airlines. Frequent flyer information may be requested at time of car booking.

Rates			
CAR CLASS	DAILY PER DAY	WEEKEND PER DAY	WEEKLY 5–7 DAY
A **Economy 2DR**	$34.99	$21.99	$129.99
B **Compact 4DR**	$37.99	$23.99	$144.99
C **Midsize 2/4DR**	$40.99	$25.99	$154.99
D **Sporty 2DR**	$43.99	$30.99	$174.99
F **Fullsize 4DR**	$47.99	$32.99	$189.99
I **Luxury**	$65.99	$62.99	$294.99
L **4Wheel Drive**	$65.99	$62.99	$274.99
R **Minivan**	$65.99	$62.99	$274.99

SYMPOSIA HIGHLIGHTS

Dislocations and Microscale Plasticity Modeling

Sponsored by MPMD/MSCTS Computational Materials Science & Engineering Committee, SMD/MSCTS Mechanical Behavior of Materials Committee

Plastic flow arises from dislocation creation, motion, and annihilation. While continuum models for flow are well developed, new techniques in microscale modeling of dislocations allow a more detailed and physically based understanding of the phenomena that mediate plasticity. This symposium will address recent developments in the area of modeling the plastic deformation of various materials on the basis of dislocation structure, patterns, interactions, and motion. Atomistic and mesoscale approaches to these problems will be featured, with a special focus on techniques which bridge the length scales necessary to achieve realistic plasticity modeling. Issues of dislocation patterning during recovery and recrystallization, and models for hardening phenomena, including the interaction of dislocations with grain boundaries, dislocations, and other defects, will be included.

Fundamentals of Lead and Zinc Extraction and Recycling

Sponsored by EPD Lead, Zinc, Tin Committee

Aspects of the physical chemistry of primary and secondary processing of lead and zinc, including pyro-, hydro-, and electro-metallurgy will be covered.

GENERAL ABSTRACTS

Sponsored by TMS These sessions provide a forum for a variety of papers discussing minerals, metals, intermetallics, ceramics polymers, electronic materials, composites, coatings and thin films, deformation, physical properties, environmental effects, extraction and processing, fatigue, fracture, phase transformations and structural evolution, modeling, powder technology, solidification, structure, and wear phenomena. Presentations will cover original research and development in the field.

General Non-Ferrous Pyrometallurgy

Sponsored by EPD Pyrometallurgy Committee

Discussion will include the industrial practice and/or engineering science of pyrometallurgical processes in both primary and secondary non-ferrous metals industries. Topics include: descriptions of operating plants, improved operating practices, physcial and chemical property measurements and predictions for slags, mattes, speisses, and metals, physical, computational, or thermochemical modeling results, refractories science and practice, improvements in ancilliary facilities such as handling of smelter offgases, and production of useful materials from byproducts such as slags.

SYMPOSIA HIGHLIGHTS

General Recycling of Materials

Sponsored by EPD/LMD Recycling Committee

Coverage will include innovative research work, advances in ongoing research, and general industrial practices from recycling of materials. Work in other fields, including optimization of physical, aqueous, and thermal processing of scraps and waste; environmental and economic impacts; material selection and design based on recyclability; life-cycle analysis of materials; properties; and applications of recovered materials will be discussed.

High-Temperature Superconductors

Sponsored by EMPMD/SMD Superconducting Materials Committee

Those actively engaged in research on synthesis, fabrication, and applications of high-temperature superconductors will present their recent results and discuss the future prospects and directions for research and development. Topics include but are not limited to: synthesis & phase relations; coated conductors (second generation conductors); substrate & buffer layer(s) development; flux pinning; microstructure-property relationships; fabrication of wires & bulk conductors; novel characterization techniques; and electronic and electric power applications.

High Resolution Electron Microscopy in Materials Science

Sponsored by SMD Physical Metallurgy Committee

The use of high resolution electron microscopy as a tool for the study of advanced engineering materials will be discussed. Topics will include application of HREM to the study defects, interfaces, and phase structures in metals, ceramics, polymers and composites.

Student INFORMATION

The 2000 TMS Annual Meeting offers students, interested in materials science and engineering, a myriad of opportunities to gather technical information, explore career possibilities, and network with students and professionals in the field.

Non-Member Students Receive a Free Year of TMS Membership!

Student members of TMS may attend the technical sessions, exhibits and lectures held Monday through Thursday on a complimentary basis. Registration for students who are not members is $25.00, which will be applied toward a TMS Student Membership in 2000.

2nd Annual TMS Student Poster Session

This students-only Poster Session will be held in conjunction with the 2000 TMS Annual Meeting. Presentation will be displayed on 4' x 4' poster boards; no formal presentation is required. The Poster Session will begin Monday, March 13 and remain in place through Wednesday, March 15. Annual Meeting attendees will have the opportunity to vote for the "Best Poster," with the winning poster receiving $500.

To enter, contact the TMS Member Services Department for a Submittal Form or visit the student pages of TMS OnLine. All forms must be received at TMS by January 15, 2000.

Student Session Monitors

Students will have the opportunity to partially defray their conference expenses by serving as session monitors. Monitors are responsible for assisting the session chair, recording session attendance and assisting with audio/visual equipment. All monitors must report to the Authors' Coffee each morning that they are scheduled to monitor sessions. Monitors' positions are limited and will be assigned on a first-come basis. To obtain work forms and schedule, contact Peggy Weiss, Phone 724-776-9000, ext. 227, Fax 724-776-3770, Email weissp@tms.org.

The deadline to submit completed work forms is February 11, 2000.

Student Travel Assistance

TMS Technical Division Student Travel Scholarships

This program sponsored by the TMS technical divisions can help pay your travel expense.

Students receiving travel scholarships are responsible for making their own travel and hotel arrangements and registering for the meeting. To apply for travel assistance, send a letter of application and state why you wish to attend the 129th TMS Annual Meeting & Exhibition in Nashville, Tennessee. Name the TMS division in whose technical programming you are most interested and include complete information on how you can be contacted. You must be a TMS student member to qualify. If we cannot contact you, your award will be forfeited. Your letter will be reviewed by a subcommittee of the appropriate sponsoring division, and this group will select the applicants to receive the travel scholarships. Those receiving travel scholarships will be contacted by TMS shortly after a decision is made.

Send letters of application by December 1, 1999 to:

TMS Student Travel Scholarships
184 Thorn Hill Drive
Warrendale, PA 15086 USA
Fax: (724) 776-3770
E-mail: melder@tms.org

TMS Student Chapters – Don't forget to select a representative and submit the TMS Travel Reimbursement Program form, granting each chapter up to $500 per year to send student(s) to TMS conferences!

STUDENT/ FACULTY MIXER

Sunday, March 12, 2000
7:30 p.m.–9:30 p.m.

Opryland Hotel & Convention Center

Sponsored by the TMS Student Affairs Committee

* *Note: In accordance with the Tennessee State Law, alcoholic beverages will be served only to attendees who are 21 years of age or older; proper photo identification with birth date must be presented upon entry.*

The traditional TMS Student/Faculty Mixer is scheduled for Sunday evening, March 12, from 7:30 p.m. to 9:30 p.m. Beer*, soft drinks and snacks will be provided. This event is intended to welcome students to the TMS Annual Meeting, and all students and university faculty are invited to attend!

Display school pride! Everyone—even faculty! —is encouraged to display school pride by wearing school colors to this casual event.

Donate a door prize! Student Chapters are encouraged to use their creativity and donate an item as a door prize! TMS will also be donating items, with a *grand prize surprise*! The more prizes donated, the better your chances to win.

Dance and enjoy! The DJ will spin the tunes, the kegs will be tapped, and snacks will abound. Come see old friends and meet new ones!

Watch your student chapter mail for further details.

Young LEADERS

Attention professional members under age 35!

You are invited to attend the TMS Young Leaders Business Meeting from 3:30 p.m. to 5:30 p.m., on Sunday, March 12, 2000, in the Opryland Hotel. Check the Calendar of Events for room location.

Reception to immediately follow from 5:30 p.m.-6:30 p.m.

Professional Development Sessions

MONDAY, MARCH 13, 2000

Opportunities for Materials & Engineering Research Funding from Government and Industry

Co-sponsored by the TMS Young Leaders Committee and the Public & Governmental Affairs Committee

Organizers:
Canan U. Hardwicke
General Electric CRD, Niskayuma, NY
Sam Davis
TIMET, Henderson, NV

- "An Outline of the Federation of Materials Societies (FMS)"
  Dr. John Mundy
  Consultant
  Washington, DC
- "An Overview of R&D in the Federal Government with Emphasis on DOE's Materials Research Programs"
  Dr. Louis Ianniello
  Consultant
  Washington, DC
- "Materials Opportunities in Energy Efficiency"
  Dr. Toni Marechaux
  US-DOE,
  Washington, DC
- "Opportunities for Materials Technologies in the Advanced Technology Program"
  Clare M. Allocca
  NIST-ATP
  Washington, DC
- "Thoughts on Federal Research Funding in MSE with Specific Examples Related to the National Science Foundation"
  Dr. Bruce MacDonald
  Washington, DC
- "Collaborative Research Opportunities for New Faculty"
  Dr. Reza Abbaschian
  University of Florida
  Gainesville, FL
- "University/Industry Cooperative Applied Research Initiative: How It Works"
  Dr. Manoranjan (Mano) Misra
  University of Nevada
  Reno, NV

MONDAY, MARCH 13, 2000

Professional Engineering Licensing

Co-sponsored by the TMS Young Leaders Committee and the Professional Registration Committee

Organizer:
Ned Bahtishi
Western Zirconium, Ogden, Utah

- "Metallurgical P.E. – What Do I Do and Why?"
  Charles V. White
  P.E., Kettering University
  Flint, MI
- "Professional Registration: A Higher Standard"
  Christy Allen
  Tennessee Board of Engineering Examiners
  Nashville, TN
- "Professional Registration is a Key Element in Credential Building"
  J. Mike York
  P.E., York Engineering Services, Inc.Corvallis, OR
- "The Practice of Being a Professional Engineer: It's More Than Just a Stamp"
  Larry M. Southwick
  P.E., Consultant
  Cincinnati, OH
- "The P.E. License: It's Value in Industry
  Nicholas J. Gianaris
  P.E., Briton Chassie

SYMPOSIA HIGHLIGHTS

High Temperature Processes for Waste Treatment & Minimization

Sponsored by EPD Waste Treatment & Minimization Committee

This symposium will focus on the science, technology, application and economics of high temperature processes for waste treatment and minimization of solid, liquid and gaseous wastes. Pyrometallurgical methods for value-recovery from wastes and waste handling, stabilization, volume reduction, abatement and recycling are within the scope. Industrial applications of high temperature waste mitigation techniques and their economic analyses, such as plasma processing and incineration will be discussed.

Honorary Symposium for Professor Oleg D. Sherby

Sponsored by SMD Structural Materials Committee

This symposium is held to honor Professor Oleg D. Sherby, whose contributions in understanding the behavior of structural materials have been both numerous and fundamental. In his over thirty years at Standford University, Professor Sherby has also made significant contributions to education, helping to produce a whole generation of materials scientists and engineers. Of the many technical areas in which Professor Sherby has made important contributions, this symposium will concentrate on three key areas; creep deformation of structural materials, superplastic materials, and the processing and properties of ultrahigh-carbon steels.

Hume Rothery Award Symposium; Phase Transformations and Evolution in Materials

Sponsored by EMPMD/SMD Alloy Phases Committee

This symposium, held in honor of the 2000 Hume-Rothery Award recipient, Professor Armen G. Khachaturyan, will emphasize both theoretical and experimental aspects of phase transformations and evolution in solids. It will provide an assessment of our current understanding of phase transformations and mechanical properties of structurally heterogeneous systems, simulations of structural transformations, large scale modeling of microstructure evolution in martensites, the application of the concentration wave method to the prediction of ordering phenomena in substitutional alloys and ceramic materials, and of the phase field method to the study of coherent transformations, all in the spirit of the studies carried out by A. G. Khachaturyan.

International Symposium on Global Innovations in Materials Processing and Manufacturing in Rapid Manufacturing

Sponsored by MPMD

This symposium will review the state of the art in rapid manufacturing, also known as solid freeform fabrication, rapid prototyping and rapid tooling. These processes all involve creation of parts without the use of part-specific tooling. Included are presentations of research, industrial potential, funding opportunities, challenges and industrial applications. Authors will also present a "parts show" within the session room to enhance their presentations.

International Symposium on Iridium

Sponsored by SMD

Refractory Metals Committee The scope of this symposium includes all aspects of the metallurgy, production, and applications for iridium and iridium-containing materials. Particular attention will be given to refining and recycling of iridium, processing of iridium compounds, processing, structure and properties of iridium and its alloys, iridium coating technology, component design and applications of iridium components and coatings, applications of iridium isotopes, iridium as an alloying element in metallic and intermetallic systems, and applications of iridium catalysts. Presentations will include recent research and technology of iridium and reviews that summarize historical developments and established technology will be given.

Kleppa Symposium on High Temperature Thermochemistry of Materials

Sponsored by EPD Process Fundamentals Committee, MSCTS Thermodynamics & Phase Equilibria Committee

This is a special symposium in honor of Professor Ole J. Kleppa's more than 50 years of scientific contributions in thermochemistry. Special emphasis will be on the following topics, which correlate in chronological order with Professor Kleppa's scientific contributions: electrochemistry, low melting materials; molten salts; oxides and sulfides; metal-hydrogen systems; metal-metal systems; metal-nonmetal systems.

AIME & TMS Banquet & AWARDS PRESENTATION

. . . with installation of 2000 TMS president




AIME

Paul G. Campbell — 1999 AIME PRESIDENT

Robert E. Murray — 2000 AIME PRESIDENT

TMS

J. Wayne Jones — 1999 TMS PRESIDENT

Y. Austin Chang — 2000 TMS PRESIDENT

The combined AIME/TMS Annual Dinner and Awards Presentations will be held at 7:00 p.m. Monday, March 13, 2000 at the Opryland Hotel. The highlight of the AIME/TMS Annual Meeting will begin with a cash bar reception at 6:00 p.m. and dinner at 7:00 p.m. in the Presidential Ballroom. Dark business suits are appropriate attire for the gentlemen.

Prior to the banquet . . . 1999 TMS President J. Wayne Jones will present the TMS awards and then introduce Y. Austin Chang as the 2000 President of the Society.

Y. Austin Chang is a distinguished professor in the Department of Materials Science and Engineering at the University of Wisconsin at Madison. He received his B.S. in chemical engineering from the University of Washington at Seattle and his PH.D. in metallurgy from the University of California at Berkeley. Dr. Chang joined the faculty of the Materials Department at the University of Wisconsin at Milwaukee in 1967. In 1980 he joined the faculty of the Department of Materials Science and Engineering at the University of Wisconsin at Madison. He has received many honors and awards including the TMS William-Hume Rothery Award (1989), Educator Award (1990), Extraction & Processing Award (1993) and Champion H. Mathewson Medal (1996). He is also a TMS fellow. Dr. Chang is very active in the materials community. He served as honors and professional recognition director for TMS from 1996 through 1998.

Following dinner . . . 1999 AIME President Paul G. Campbell will serve as Master of Ceremonies for presentation of the Institute's major awards. The presentations will be followed by a short address by incoming 2000 AIME President Robert E. Murray.

Robert E. Murray is President, CEO and owner of the Ohio Valley Coal Company, Maple Creek Mining, Inc., Energy Resources, Inc., American Coal Sales Company, Powhatan Transportation Center, West Virginia Resources, Inc., Oneida Coal Company, Inc., and MonValley Transportation Center, Inc. Mr. Murray is also a passive investor in Ken American Resources, Inc. He served in most supervisory and executive positions with North American Coal Corporation between 1956 and 1987, including President and CEO. He is a graduate in mining engineering from Ohio State University and of Harvard University's Advanced Management Program. He is a past president and director of the Society for Mining, Metallurgy and Exploration, Inc. He is a Director of the National Mining Association and National Coal Association and the Pennsylvania and Ohio Coal Associations.

Award Recipients

Fellow Class of 2000
- **Reza Abbaschian** — *University of Florida*
- **Robert Cahn** — *University of Cambridge*
- **Lionel Kimerling** — *Massachusetts Institute of Technology*
- **Subra Surash** — *Massachusetts Institute of Technology*
- **Jeff Wadsworth** — *Lawrence Livermore National Laboratory*

Application to Practice Award
- **Dwaine Klarstrom** — *Haynes International*

John Bardeen Award
- **Y. Austin Chang** — *University of Wisconsin*

Bruce Chalmers Award
- **Angus Hellawell** — *Michigan Technological University*

Educator Award
- **Richard Hertzberg** — *Lehigh University*

Robert Lansing Hardy Award
- **Oscar Dubon** — *Harvard University*

William Hume-Rothery Award
- **Armen Khachaturyan** — *Rutgers University*

Institute of Metals/ Robert F. Mehl Award
- **Robert Rapp** — *The Ohio State University*

Leadership Award
- **Yoshio Wasida** — *Tohoku University, Sendai, Japan*

Champion H. Mathewson Award
- **Gary Was** — *University of Michigan*

Futureview . . . A Look Ahead

Keynote ADDRESS

Monday, March 13, 2000

11:30 noon-1:00 p.m.

Daniel Burrus

Burrus Research Associates, Inc.

Thanks to recent innovations in science and technology we are at the gateway to a renaissance in materials technology, in terms of not only developing new applications, but also in terms of the industry itself. Although we are at a time of tremendous opportunity, we are at the same time faced with problems of equal magnitude. This presentation will provide you with valuable insight into how best to capitalize on present and future opportunities, while artfully minimizing problems along the way.

Key information you will take with you and use . . .

- Switching from a Short-Range Mindset to a Long-Range R&D Focus
- Belt-tightening, Downsizing, and the Growing Threat to Global Science
- Materials Technology's Role in Miniaturization and the Environment
- An Entrepreneurial Look at Leveraging Time with Technology: Doing More with Less
- The Actionable Value of Sharing Knowledge and Wisdom
- The Visible Future: How You can Thrive in the New Millennium

About the Presenter: Daniel Burrus is one of the world's leading technology forecasters, and is the founder, president and CEO of Burrus Research Associates, Inc., a research and consulting firm that specializes in global innovations in science and technology, their creative application and future impact. The *New York Times* has referred to him as one of America's top three business gurus in the highest demand as a speaker.

Mr. Burrus is one of the most highly sought after speakers in the world today, as reflected by the 1,800+ speeches he has given corporations, associations, and professional organizations worldwide. Over the past sixteen years, he has established an exceptional record of accurately predicting the future of technological change. He has helped hundreds of clients develop successful competitive strategies based on the creative application of leading-edge technologies.

His client list includes a wide range of industries, including many Fortune 500 companies such as GE, Lucent Technologies, DuPont, Motorola, Bell Atlantic, Toshiba, CIBA-GEIGY, Hewlett Packard, Exxon, Minolta, and Xerox.

He produces a variety of technology publications, including the *Technotrends* Newsletter, and is the author of six books that have been published since 1990.

SYMPOSIA HIGHLIGHTS

Liquid Metal Atomization: Fundamentals and Practice

Sponsored by MPMD Powder Materials Committee

Part of this symposium will focus on the fundamentals of melt atomization: the energetics; fluid flow effects; two-fluid interactions; melt breakup mechanisms; modeling; visualization; process parametric effects on particle size, shape and distribution; and predicting particle size. Another part will focus on the practice of atomization: the various commercial methods; novel laboratory techniques; methods specific to particular alloy systems, e.g., reactive metals, refractory metals; and possible methods of controlling particle size and distribution. Ultra-fine particles, spherical particles, monodis-persed particles, and ultra-clean (oxide-free) particles will be discussed.

Magnesium Technology 2000

Sponsored by LMD Reactive Metals Committee, International Magnesium Association

This symposium will address fundamental issues in magnesium technology, including extraction and processing, mechanical properties (e.g., creep, fatigue), corrosion resistance, and alloy development.

Materials Issues in Microelectronics: Optical, Electrical, and Thermal

Sponsored by EMPMD Electronic Packaging & Interconnection Materials Committee

Focus will be on materials issues related to next generation design, fabrication, performance, and reliability of microelectronic packaging/interconnection technologies. The driving forces include <0.18 micron IC fabrication, die shrink & package miniaturization, GHx circuit speeds & wireless communications, increasing thermal performance and cost. Topics include materials issues relating to: system on chip devices, flip chip, chip-scale packages (CSP), multi chip modules (MCM), ball grid arrays (BGA), micro-processor packages (PGA-XGA), high performance thermal packages, including metal packages, heat pipes etc, microwave device packaging (SOP, BGA, DCA), integrated antenna structures for wireless communications, interconnects for 1st & 2nd level packaging (bumps, balls, wires, leads, sockets), discrete & board level polymer wave-guides for on-board optical interconnect, and photon to electron conversion devices (transceivers, lasers, etc).

Materials Processing in the Computer Age III

Sponsored by EPD/MPMD Processing Modeling Analysis & Control Committee

This is the third international symposium focussed on the use of computer technologies in the development and improvement of materials processing operations. In keeping with previous themes of the symposium, topics will include process modeling, physical modeling, use of AI techniques, and visualization and measurement. In addition, efforts to develop implement and evaluate computer based training using multimedia and distance learning technologies will be included. Particular emphasis themes for this symposium are (1) the development and use of computer based training (CBT), (2) process control, and (3) process optimization.

Opportunities for Materials & Engineering Research Funding from Government & Industry

Sponsored by TMS Professional Registration Committee, TMS Public & Governmental Affairs Committee, and TMS Young Leaders Committee

Organizations today face an uphill battle to obtain funding needed to do materials and engineering research and remain competitive. This symposium will focus on increasing the knowledge of how to obtain funds for research and development from government and industry. Invited speakers will include representatives from government agencies, industry, and academia. Speakers will describe the trends, opportunities, and initiatives in funding/being funded in basic and applied research. These include, for example, the existence of non-monetary opportunities such as use of equipment and facilities, or cost-share programs. The attendance should benefit students (high school through college graduate), young investigators (post-graduate), university faculty members, and researchers in industry.

Packaging & Soldering Technologies for Electronic Interconnects

Sponsored by EMPMD Electronic Packaging & Interconnection Materials Committee

This symposium will address the materials and manufacturing aspects of alloy design of lead-tin and lead-free solders, structure-property-processing relationships of bulk solders as well as solder joints, influence of underbump metallization on solderability and reliability of solder joints, microstructure modeling and control, reliability modeling and testing methodologies of electronic packages. Coverage will also include the materials for metal-semiconductor contacts, alternative interconnect technology for stress management at both wafer-level and chip to package level, and the issues involved in the design and integration of conductive adhesives in electronic packaging.

Light Metals Division

PLENARY SESSION

. . . on aluminum technology

The Light Metals Division will sponsor a special plenary session addressing the important issues facing modern aluminum processing technology and industrial development. The plenary session will take place Monday, March 13, from 8:00 a.m.-11:30 a.m. as a kick off to 3-1/2 days of aluminum-focused technical programming. Topics will cover: Overview of Aluminum—History, Trends Markets & Future; Raw Materials—Bauxite, Alumina & Carbon; Aluminum Electrolysis; Melting (including Recycling) & Metal Treatment; Aluminum Solidification Processing (Shapes, Ingot DC & EMC, Concast); and Downstream Aluminum Fabrication. Each topical area will have a notable speaker who is recognized as an expert in the field. Each presentation will contain: a review of the fundamental chemical reactions or processing steps; a brief historical review of the process area; an analysis of the significant processing problems; and what new advancements are foreseen over the next 25 years.

An Overview of the Aluminum Industry

An overview and outlook of the global aluminum industry will be presented, as well as, a focused look at aluminum's two largest markets, packaging and transportation.

Richard B. Evans, is the Executive Vice President of Alcan Aluminum Limited and President of the Alcan Global Fabrication Group. Mr. Evans also serves as President of Alcan Aluminum Corporation, the company's U.S. subsidiary. He was appointed Executive Vice President, Fabricated Products, North America, and President of Alcan Aluminum Corporation in July 1997. He is a graduate of Oregon State University with a bachelor's degree in engineering and earned his master's in management from the Stanford University Graduate School of Business. Mr. Evans serves on the board of directors of Alcan Aluminum Corporation and Logan Aluminum Inc., a joint venture in Kentucky. Additionally, he is currently serving a two-year term as Chairman of the board of directors of the Aluminum Association, a Washington, D.C-based trade organization that represents the interests of the U.S. aluminum industry.

Materials Used in Aluminum Smelting

The production of alumina, anode and cathode carbon will be reviewed from a historic and current point of view. Problems, challenges and new future advances will be discussed.

Harald A. Øye, is a Professor at the Institute of Chemistry, Norwegian University of Science & Technology. He has a M.Sc (Eng.) and a doctor of technology degree from The Norwegian Institute of Technology. He is also past president of The Norwegian Academy of Technological Sciences.

Professor Øye has authored more than 300 international papers of which half are related to aluminum smelting technology. Together with Dr. Morten Sørlie he published the book "Cathodes in Aluminum Electrolysis" which is the premier text on the subject. He is initiator, director and lecturer of the International Course on Aluminum Electrolysis which has had 1500 participants from 44 countries in the past 18 years. Professor Øye travels widely and gives Aluminum Smelter Courses and Cell Autopsy Courses at international aluminum smelters.

Legistlative Plaza at night

Advancing the Hall Heroult Electrolytic Process

The design and operating advances achieved in the last quarter century will ensure the Hall Heroult technology will maintain a competitive advantage over alternative aluminum production processes for some time into the future. The advantages were lead by magnetic compensation and computerized process control coupled with electrolyte optimization. These enable larger more economic cells to be designed. During the same time the fundamental studies have enabled a better understanding of the subtleties of the processes and secondary reactions that were ignored in the theoretical understanding whilst the cells performed poorly. These secondary processes, including reactions associated with impurities and anodes consumption, those leading to onset of anode effect, and alumina dissolution kinetic have not been fully exploited yet.

Today as the focus shifts to higher productivity, the dynamics of the cell and the impact operations have on the very finely tuned heat balance becomes more important. With the high current efficiencies and low margins for error in modern cells the present challenge is to refine designs, control strategy and operating practices so that further marginal gain and economic performance can be achieved. This will include better management of aluminum fluoride, prevention of anode effects, and earlier detection of the increasingly prevalent anode spikes.

Super structure design changes coupled with improved control and practice will also enhance productivity of future generations of cells.

Barry J. Welch, is a Professor at the Department of Chemical & Materials Engineering at The University of Auckland. Barry Welch joined Reynolds Metals Company in 1960. Despite subsequently becoming an academic he has maintained a continuing research and practicing interest in aluminum smelting. Over the years his research has covered a wide spectrum of topics encompassed by the Hall Heroult Process but more recently it has focussed on Process Dynamics, Cells Design and Materials Performance. He consults widely on design, operation, research and development for the industry and has served on both the Aluminum Committee and the Light Metals Division of TMS.

A Perspective on Aluminum Melting and Metal Treatment

Essentially all commercially significant aluminum produced shares a common processing history; melting and metal treatment. These two operations therefore have a monumental impact on production costs, the ultimate quality of end-use products, and also have an ancillary influence on environmental issues.

The technological heritage of aluminum melting and metal treatment will be chronicled, and, importantly, significant technical milestones identified. These milestones are associated with specific product/commercial imperatives or a revolutionary development. An example of the former is the emergence of the aluminum beverage container in the 1960 timeframe, while the later is exemplified by rotary impeller in-line treatment.

Finally, an inventory will be provided of contemporary aluminum melting and metal treatment technology, critical needs assessed, and a projection offered of future development.

C. Edward Eckert, is President of Apogee Technology, Inc. and Quantum Environmental Dynamics, Inc. He is also an Adjunct Professor of Mechanical Engineering at Worcester Polytechnic Institute and provides retained consulting services for several companies. Eckert's primary research interests include fluid flow and phase separation, phase equilibria and reaction kinetics in metal treatment reactions, plasma based materials processing, and aerospace propulsion. Mr. Eckert performed his undergraduate work in Metallurgical Engineering at the University of Pittsburgh, and received his Ph.D. in Materials Engineering from Drexel University. Prior to his current positions, he managed the metal quality program at ALCOA, and was an engineering general supervisor at General Motors-Central Foundry Division. Mr. Eckert currently holds 122 US and international patents, has 39 technical publications.

SYMPOSIA HIGHLIGHTS

Pressure Technology Applications in the Hydrometallurgy of Copper, Nickel, Cobalt and Precious Metals

Sponsored by EPD Copper, Nickel, Cobalt Committee

Topics will include: the use of pressure oxidation in the decopperizing of anode copper slimes; the use of pressure oxidation in both alkaline and acidic circuits for the liberation of gold from gold bearing concentrates; the recovery of metals from solution by reduction with hydrogen; the use of pressure oxidation technology for the treatment of copper concentrates and Ni/Co/As sulphides; the use of pressure leaching for the recovery of cobalt and nickel from laterites or other oxidic minerals; the use of pressure oxidation for the extraction of tellurium and selenium from copper refinery slimes; the use of pressure technology in the leaching of precious metals-bearing copper/nickel mattes; and design considerations in construction of pressure reactors for high pressure hydrometallurgy including materials of construction, methods of fabrication, agitator design, heat transfer considerations, pressure choke design and flashing processes.

Process Synthesis and Modeling for the Production & Processing of Titanium & Its Alloys

Sponsored by MPMD Shaping & Forming Committee, SMD Titanium Committee

Areas to be discussed include primary and secondary melting and solidification, thermomechanical processing, investment casting and the relationship between processing and microstructure development.

Professional Development

Sponsored by TMS Professional Registration Committee, TMS Public & Governmental Affairs Committee, and TMS Young Leaders Committee

Obtaining professional licensing: how and why. We will hear perspectives from recent licensures, consultants, legalmen, state officials and the TMS Professional Registration Committee.

Rare Earths and Actinides; Science Technology and Applications IV

Sponsored by LMD Reactive Metals Committee

This symposium will be a venue for presenting the developments and current state of the art in the science, technology and applications of rare earth and actinides for the next century. Topics of interest for the rare earths include resources, markets, extraction, processing, purification, precipitation, electrolysis, physics and chemistry in the preparation of magnets, electronic materials, batteries, alloys, films, etc. and modeling the processes in the preparation and manufacture of the product. Topics relevant to actinides include discussions of the hydro-, electro-, and pyro-metallurgical processes and physical metallurgy of the metals and their compounds. Special emphasis is placed on the waste recovery, recycling, storage and remediation as well as the health and safety issues.

Research and Development Efforts on Metal Matrix Composites

Sponsored by TMS Young Leaders Committee, SMD/MSCTS

Composite Materials Committee Metal Matrix Composites are enjoying a resurgence of interest, and new research activities on a variety of materials systems are underway on a number of fronts. It is the purpose of this symposium to provide a forum for presentation and discussion of R&D efforts in the metal matrix composites field, with an emphasis on research at Universities and National Laboratories. Both oral presentations and a poster session will be part of this symposium.

An optional box lunch is planned during the poster session, Wednesday, March 15, noon–2:00 p.m., to allow interaction with industrial and government representatives involved in the MMC. The box lunch may be purchased for $15 via the conference registration form in this brochure.

Mid 20th century ore preparation

Aluminum Solidification Processing – prospective and retrospective views of the industry and the field

During the last 50 years, aluminum has evolved into one of the most important societal materials; it is used in a variety of diverse applications – construction, automotive, aerospace, packaging, furniture, jewelry and a vast number of products, which once were made from ferrous or other materials. Specifically, during the last decade, we have seen significant increases in the use of cast aluminum net-shaped manufactured components. For example, in 1980 there were 800,000 tons of aluminum casting shipments in North America versus 1,800,000 tons in 1998. In this plenary lecture, a prospective review of the science and technology of aluminum metalcasting will be presented, for both primary aluminum production as well as metalcasting. This will be followed with a retrospective presentation of the emerging technologies and challenges we face. The plenary lecture will be a holistic review of solidification processing of aluminum, addressing: where we have been, where we are going, and what are the exciting frontiers facing the industry.

Diran Apelian is Howmet Professor of Engineering and Director of the Metal Processing Institute at Worcester Polytechnic Institute (WPI). He received his B.S. degree in metallurgical engineering from Drexel University in 1968 and his doctorate in materials science and engineering from MIT in 1972. He worked at Bethlehem Steel's Homer Research Laboratories before joining Drexel University's faculty in 1976. At Drexel he held various positions, including professor, head of the Department of Materials Engineering, associate dean of the College of Engineering and vice-provost. He joined WPI in July 1990 as the Institute's Provost. In 1996 he returned to the faculty and headed the acivities of the Metal Processing Institute. He is credited with pioneering work in various areas of solidification processing, including molten metal processing and filtration of metals, aluminum foundry engineering, plasma deposition, and most recently, spray casting/forming. Apelian is the recipient of many distinguished honors and awards, has over 300 publications to his credit, and serves on several technical and corporate boards.

Aluminum Fabrication and Applications

Modern manufacturing strategies combine solidification and thermomechanical process technologies for optimum efficiency, product quality and reliability, and product performance. The present and future importance of incorporating melt processing and solidification considerations into the sequence of down-stream operations for satisfying product requirements and for developing new competitive market capabilities forms an essential basis for these strategies.

The majority of aluminum is consumed in fabricated forms ranging from rolled products to components formed by powder metallurgy. Remelted and cast products represent a rapidly growing manufacturing sector. The evolution of processes for aluminum's multivaried commercial shapes and forms paralleled the industry's successes in determined applications and market penetration. The history of the aluminum industry's development of casting, forging, extrusion and rolled products and the significance of process and product developments to the dramatic evolution of aluminum as the metal of the twentieth century is reviewed, and current and projected developments are outlined.

Elwin L. Rooy, after receiving his Bachelor of Science in Metallurgy from Case Institute of Technology, and serving in the US Air Force for four years, Elwin L. Rooy began an energetic career in the Aluminum Industry. Elwin served in a number of operational and corporate staff positions within the Aluminum Company of America spanning primary production to cast and rolled products. Elwin has been granted seven patents, and has published 19 papers. He received Best Paper Awards from American Foundrymen's Society in four different years. He also received the Arthur Vining Davis Award from Alcoa. Elwin has been active in the Aluminum Association, the American Die Casting Institute, the American Foundrymen's Society, the Institute of Scrap Recycling Industries, and TMS. Since retiring from Alcoa, Elwin has begun an active second career as a consultant to the Aluminum Industry.

Institute of Metals LECTURE . . . & Robert F. Mehl Medalist

WEDNESDAY, MARCH 15 ▩ 12:00 NOON

Some Generalities in the Analyses of Equilibria in Ionic Solutions

Prof. Robert A. Rapp

Distinguished University Professor Emeritus
The Ohio State University

About the topic: Despite great differences in the physical and chemical properties of various ionic media, common methods for analyzing internal equilibrium provide useful and simple means for interpreting and predicting their behavior. The formalism of M. Pourbaix for analyzing the activities and solubilities of solutes in aqueous solutions has provided a foundation for interpreting corrosion and other electrochemical phenomena in such solutions. Although perhaps not so obvious, the formalism of Kroger-Vink in plotting the point defect concentrations for ionic solids derives from the same mathematical method. Likewise, the activities and solubilities for solutes in fused salts, e.g. fused sodium sulfate, can be treated by exactly the same sort of simultaneous resolution of equilibria for reactions in an ionic medium. Suggestions for extension of this analysis to analyze cryolite-base fused salt solutions important to aluminum extraction are discussed.

About the presenter: Prof. Rapp studied at Purdue University, Lafayette, Indiana (B.S. 1956) and Carnegie Institute of Technology, Pittsburgh, Pennsylvania (M.S. 1958, Ph.D. 1959).

He has taught and conducted research in the areas of corrosion mechanisms, coating and protection, and high-temperature materials. His research contributions are characterized by their scientific/technical rigor, creativity and relevance to practical problems. He has published about 245 papers, books, courses and chapters in the open literature and authored 20 patents. His outstanding research contributions and accomplishments have been recognized by many major awards, including: Guggenheim Fellowship (1972-73), Henry Marion Howe Medal of ASM (1980), Edward DeMille Campbell Memorial Lecture of ASM (1983), Willis Rodney Whitney Award of NACE (1986), Outstanding Achievement Award of the High Temperature Materials Division of ECS (1990), and Ulrich R. Evans Award, British Corrosion Society (1992). In addition he has been elected a Fellow of four professional societies (ASM, 1980; TMS, 1982; ECS, 1993; and NACE, 1994). In 1988 he was elected a member of the National Academy of Engineering in recognition of his many distinguished contributions to engineering, engineering science and technology.

Extraction & Processing Division DISTINGUISHED LECTURER

TUESDAY, MARCH 14, 2000 ▩ 12:00 NOON

Aspects of Technology Transfer

Derek J. Fray

Professor, University of Cambridge

About the topic: In recent decades, those working in extractive metallurgy have made tremendous progress in the understanding of thermodynamics, kinetics and modelling of metallurgical systems. However, as is well known, the subject of extractive metallurgy has suffered a severe decline in the number of universities and other institutions offering teaching and research activities. This is beginning to be reflected in the lack of publications in the area compared to those in competing areas of polymers, ceramics and composite materials. This decline may affect future innovation in extractive metallurgy but, fortunately, other areas of fundamental and applied science can offer innovative approaches to many problems. This presentation will explore such diverse areas as nanotechnology, battery and fuel cell technology, solid state chemistry and physical metallurgy and give examples where technology transfer from these areas may offer interesting benefits to the understanding of existing processes and the creation of new processes which are more energy efficient and less polluting. The examples will pertain to aluminum, titanium and other non-ferrous metals.

About the presenter: Since 1996 Derek Fray has been employed as Professor of Materials Chemistry, Department of Materials Science and Metallurgy at the University of Cambridge. From 1990 to 1996 he worked as Professor of Mineral Engineering and Head of Department at the University of Leeds. From 1971 to 1990 he was also with the University of Cambridge as University Lecturer. From the years 1965 to 1971 he worked at both the Massachusetts Institute of Technology and Imperial Smelting Processes Ltd.

Prof. Fray has a B.S. in Metallurgy and a Ph.D., in Extractive Metallurgy, Imperial College, London University.

Surface Engineering in Materials Science I

Sponsored by MPMD Surface Engineering Committee

This symposium will address the scientific issues related to Surface Engineering phenomena in synthesis, characterization, and applications for all materials. The objective is to provide a multidisciplinary discussion on surface related phenomena by which materials performance may be enhanced through engineered interface and surface modification technologies. Specific topics include, but are not limited to: PVD and CVD processes, nanostructured and nanoparticles materials, thermal barrier coatings, biomedical coatings, functional coatings for electronic, optical and magnetic applications, surface modification by plasma, ion and laser beam techniques, direct fabricated materials, coatings for space, automobile and environmental industries, corrosion and oxidation resistance coatings, modeling, mechanical and tribological properties, interface properties and adhesion, advanced surface investigation techniques, ultrahard coatings.

Teaching Electronic, Magnetic and Optical Materials: A Symposium in Memory of Professor Gregory E. Stillman

Sponsored by EMPMD, TMS Education Committee

Electrical engineers currently constitute 35% of engineering undergraduates. Those engineers employed by the microelectronics industry account for between 40-45% of the field. Engineering education must keep up with this trend, the traditional engineering core is based primarily on the needs of mechanical and civil engineers. The traditional materials science course while focusing on the processing-structure-properties-performance chain, is no exception. Materials educators must respond to this challenge and 1) modify existing introductory courses so that the emphasis on electrical properties of materials is increased, 2) develop more advanced courses specifically addressing the electrical properties of materials. Portions of the symposium will be devoted to demonstrations and a panel discussion.

Ultrafine Grained Materials

Sponsored by MPMD Powder Materials Committee, Shaping & Forming Committee

This symposium will focus on all aspects of science and technology related to ultrafine grained materials with a grain size < 1 micron (and including nanocrystalline materials). The goal of the symposium is to bring together people working on the processing of ultrafine grained materials, the influence of microstructure on various functional and structural properties and current and potential future applications of these materials.

Extraction & Processing Division LUNCHEON

MARCH 14, 2000 ▪ 12:00 NOON

Bridging the Gap Between Technology Development and Commercial Applications

Edward C. Dowling, Jr.
Cleveland Cliffs Inc.

About the topic: How many times have new processes worked in the lab, but fail miserably in practice? How many great ideas remain on the shelf? This presentation will discuss methodologies that forge links between the tool-builder and tool-user communities to accelerate progress.

About the presenter: Edward (Ed) Dowling is Senior Vice President-Operations with Cleveland-Cliffs, Inc. the largest North American iron producer, located in Cleveland, OH. He is responsible for six large-scale mining operations with more than 6,000 employees, as well as two research and development laboratories, engineering and development. Dowling has held a progression of technical and operating positions throughout his career. Prior to joining Cleveland-Cliffs in 1998, he was Senior Vice President and Director of Process Management and Engineering with Cyprus Amax Minerals Company (CO), the largest US based mining enterprise. While with Cyprus, he led its subsidiary Climax Molybdenum Company and its affiliates Climax Specialty Metals and Climax Performance Chemicals. Prior to joining Cyprus, Dowling was General Manager of Chino Mines Company (NM) a subsidiary of Phelps Dodge Mining. He is recognized in the industry for his process engineering expertise leading to operations and business improvement accomplishments. Dowling is also a veteran of the US Navy.

Dowling holds Bachelor of Science degrees in Mining Engineering and Metallurgical Engineering, and Master of Science and Doctor of Philosophy degrees in Mineral Processing all from The Pennsylvania State University. As a graduate student at Penn State, he won the Sigma Xi: Annual Research Award and has been recognized since graduation with Alumni Achievement Awards and is a Centennial Fellow of the University. For his contributions, Dowling has received a number of industry awards, both in the US and abroad.

Dowling is a member of the National Materials Advisory Board of the National Research Council. He is a member the Executive Committee of the Board of Directors of the Society for Mining, Metallurgy and Exploration, Inc. (SME) and is Past-Chairman of the Minerals and Metallurgical Processing Division. He is also an active member of the National Mining Association, The Minerals, Metals & Materials Society (TMS), Sigma Xi, the Mining and Metallurgical Society of America (MMSA) and others. He has published more than 50-articles with an emphasis on pro-cessing engineering approaches to operations and business optimization.

Light Metals Division LUNCHEON

MARCH 15, 2000 ▪ 12:00 NOON

The Aluminum Industry of the Future Partnership

Denise F. Swink
Deputy Assistant Secretary, Department of Energy, Office of Industrial Technologies

About the topic: Since joining the "Industry of the Future" partnership with the U.S. Department of Energy Office of Industrial Technologies (DOE-OIT) in 1996, the aluminum industry has identified ambitious technology research and development goals which are being actively pursued through collaborative, cost-shared R&D. The Aluminum Industry of the Future R&D portfolio addresses processing efficiency priorities identified in the Aluminum Industry Roadmaps, with particular emphasis on advanced cell development, recycling, and secondary aluminum production. Additional industry priorities, such as development of high performance aluminum for transportation applications, are being addressed through other DOE and federal government programs. In addition to its R&D portfolio, DOE also provides assistance to industry through information and training on already available technologies and business practices, through national laboratory user centers and programs, and through regional and state industries of the future activities.

About the presenter: Since February 1995, Denise F. Swink has been Deputy Assistant Secretary for Industrial Technologies. The Office of Industrial Technologies' mission is to manage a program designed to improve resources efficiency and fuel flexibility in the industrial sector and thereby reduce overall production costs. From 1991 to 1995, she was the Associate Deputy Assistant Secretary for Industrial Technologies.

From 1987 to 1991, Ms. Swink was the Director, Office of Planning and Environment, Office of Fossil Energy. In that office, Technology, Regulatory, and Economic Impacts related to the extraction, distribution and use of fossil fuels were analyzed and input to national policy decision-making. From 1983 to 1987, she worked in program development, planning and management for the Nation's Clean Coal Technology Program. In addition, her previous experience included 13 years with the U.S. Environmental Protection Agency in research and development, water monitoring, and toxic substances regulation.

Ms. Swink has a B.A. in mathematics, American University, and a M.S. in Environmental Sciences, Johns Hopkins University.

Special Honorary LUNCHEONS & DINNERS

Gregory E. Stillman Memorial Luncheon and Symposium on Teaching Electronic, Magnetic and Optical Materials

TUESDAY, MARCH 14, 2000 ▩ 12:00 NOON–2:00 P.M.

Sponsored by the TMS EMPMD Division

Opryland Hotel

This luncheon and symposium is dedicated to the late Professor Gregory E. Stillman of the University of Illinois, as a tribute to his long and dedicated contributions to compound semiconductor epitaxy understanding of high performance, high speed devices and development of young faculty and students throughout the country.

Luncheon tickets are $25 and may be purchased via the TMS Annual Meeting registration form in the attached registration form packet.

Professor Ole J. Kleppa Honorary Dinner and Symposium

TUESDAY, MARCH 14, 2000 ▩ 6:00 P.M.–10:00 P.M.

Sponsored by the TMS EPD Division-Process Fundamentals Committee and ASM International MSCTS Division-Thermodynamic & Phase Equilibria Committee

Opryland Hotel

This special dinner and symposium is in honor of Professor Kleppa's more than 50 years of scientific contributions in thermochemistry.

Dinner tickets are $50 and may be purchased via the TMS Annual Meeting registration form in the attached registration form packet.

Professor Campbell Laird Honorary Dinner and Symposium

TUESDAY, MARCH 14, 2000 ▩ 6:00 P.M.–10:00 P.M.

Sponsored by the Joint Mechanical Behavior of Materials Committee of the TMS Structural Materials Division and ASM International MSCTS Division

Opryland Hotel

This special dinner and symposium is in honor of Professor Laird's contribution to materials science and engineering.

Dinner tickets are $50 and may be purchased via the TMS Annual Meeting registration form in the attached registration form packet.

Professor Oleg D. Sherby Honorary Dinner and Symposium

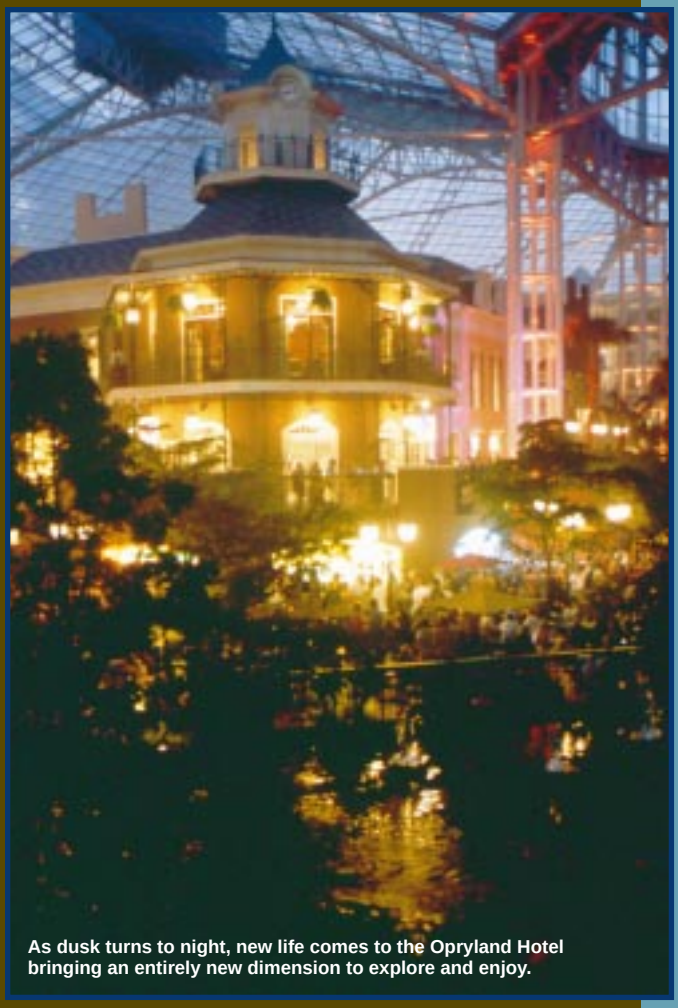
TUESDAY, MARCH 14, 2000 ▩ 6:00 P.M.–10:00 P.M.

Sponsored by the TMS Structural Materials Division-Structural Materials Committee

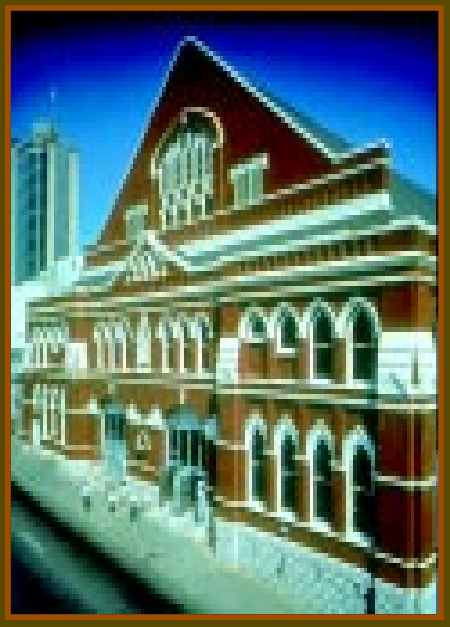
Opryland Hotel

This special dinner and symposium is in honor of Professor Sherby's contributions in understanding the behavior of structural materials and for his 30 years at Stanford University where he also made significant contributions to education, helping to produce an entire generation of materials scientists and engineers.

Dinner tickets are $50 and may be purchased via the TMS Annual Meeting registration form in the attached registration form packet.



As dusk turns to night, new life comes to the Opryland Hotel bringing an entirely new dimension to explore and enjoy.



Extensive renovation has revived the historic Ryman Auditorium, returning it to the ranks of America's greatest performance halls.

PROCEEDINGS PUBLICATIONS

Pre-Order Your 2000 TMS Annual Meeting Concurrent Proceedings Publications

The concurrent publications listed on these pages may be pre-ordered on the meeting registration form found in this brochure. Each of these titles contain the proceedings from a symposium being presented at the 2000 TMS Annual Meeting & Exhibition and will be available for pick-up on site, or you may indicate on the registration form to have them mailed directly to you.

While attending the 2000 TMS Annual Meeting & Exhibition, be sure to stop by the TMS Publications Sales Area. There you will be able to examine and select from more than 150 proceedings volumes, textbooks, monographs, and CD-ROMs, many at reduced prices. Information on nearly every aspect of minerals, metals, and materials technology will be available.

Advanced Technologies for Superalloys Affordability

K-M. Chang, S.K. Srivastava, D. Furrer, and K.R. Bain, editors

Research & Development into new processing technologies that increase the affordability of advanced superalloys for aerospace and industrial applications is the focus of this symposium proceedings volume. The papers are divided into four areas of investigation: *Processing Improvement*, *New Processes/New Alloys*, *Process Modeling*, and *Simulation of Microstructure/Properties*.

Approx., 316 pp., illus., index, hardcover
Order No. 4577
Meeting Attendee Price $80

Deformation, Processing, and Properties of Structural Materials

E.M. Taleff, D.R. Lesuer, and C.K. Syn, editors

This is the proceedings of the symposium held to honor Prof. Oleg D. Sherby,of Stanford University, for his numerous, outstanding contributions to the understanding of the behavior of structural materials. These papers focus on three key areas of research: creep deformation of structural materials, superplastic materials, and the processing and properties of ultrahigh-carbon steels.

Approx., 360 pp., illus., index, hardcover
Order No. 4585
Meeting Attendee Price $82

Hume-Rothery AWARD SYMPOSIUM

MONDAY, MARCH 13, 2000

Theoretical Characterization of Alloy Structures at Microscopic and Mesoscopic Scales

Prof. Armen G. Khachaturyan
Rutgers University

Sponsored by: Jt. EMPMD/SMD Alloy Phases Committee

About the topic: Development of the theory of alloy structure from atomic to nanoscale level is discussed. It is shown that the structure on the atomic scale is described by the occupation probability function, which can be formulated in terms of Static Concentration Waves. Amplitudes of the waves are the long-range order parameters, the wave vectors are the superlattice reciprocal lattice vectors. This approach is especially effective in the mean-field approximation. However, it was also successfully used if the correlation effects are taken into account. The Concentration Wave method describes both the atomic scale and the nanoscale (if the variation of lro parameters becomes considerable). With this feature, this method provides a bridge between the scales. It is shown how this method can be used to make an accurate transition to the Phase Field theory of evolution of the microstructure on the mesoscopic scale. The Phase Field theory of the mesoscopic microstructure evolution in coherent structurally inhomogeneous alloys with multivariant domains of ordered intermetallics is discussed. The evolution is driven by the minimization of transformation strain. This theory is based on the Phase Field micromechanics incorporated in the alloy thermodynamics. This approach allows one to realistically simulate the mesoscopic microstructure evolution for a wide spectrum of materials (metal and ceramics) with different types of transformations (diffusional and displacive). Input data required to carry out the computer simulation are the crystal lattice parameters, compositions and elastic moduli of phases, and the interfacial energy.

About the Presenter:

Prof. Khachaturyan studied at Steklov Institute of Mathematics of the Soviet Academy of Sciences, Moscow, USSR (Ph.D. 1963), and Metal Physics Institute of Ukrainian Academy of Sciences, Kiev, USSR (Doctor of Science 1971)

- 1962-1973 Senior Research Scientist of the Theoretical Physics Lab of the Metal Physics Institute of the Central Research Institute for Ferrous Metallurgy, Moscow
- 1973-1986 - Senior Research Scientist in the Institute of Crystallography of the Academy of Science of the USSR.
- 1986-1988 - Senior Scientist at the Lawrence Berkeley Lab, Berkeley, CA.
- 1988-Present - State of New Jersey Chair Professor at Rutgers, The State University, New Brunswick, NJ

Prof. Khachaturyan has received the following honors and awards: B. T. Mathias Scholar Award, Los Alamos National Laboratory; "The Theory of Structural Transformation in Solids" was named the Most Outstanding Book in Engineering in the 8th Annual Professional and Scholarly Book Awards, The American Association of Publishers; two papers recognized as Best Soviet Paper of the Year (1969 and 1975) in Solid State Theory, Soviet Academy of Science; two awards of the Institute of Crystallography of the Academy of Science; Visiting Professor, Department of Materials Science and Engineering, Berkeley, CA.

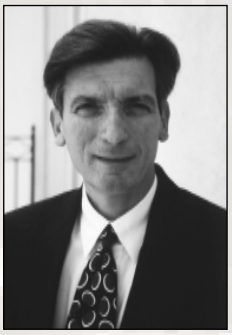
Matte casting circa 1960

Tutorial LUNCHEON LECTURES

TMS will once again present its extremely popular Tutorial Luncheon Lecture Series at the 129th TMS Annual Meeting. This series offers an informal seminar atmosphere for expert presentations on subjects designed either as theoretical review or as informal discussion of experimental techniques and leading edge scientific advancements. The lecture format includes an optional "brown bag" lunch for $15, which must be purchased in advance using the meeting registration form in this brochure. Lunch begins at 12:00 noon, followed by a 40 minute tutorial lecture beginning at 12:20 pm. There will be no charge for those attending the lecture who do not wish to purchase the lunch.

MONDAY, MARCH 13, 2000 ▩
12:00 NOON–1:30 PM

Advanced Rechargeable Batteries: a Materials Science Perspective



Donald R. Sadoway
Massachusetts Institute of Technology

Sponsored by the TMS Continuing Education Committee.

The market for rechargeable batteries this year is estimated to exceed several billion dollars in such applications as cellular phones, laptop computers, and consumer electronics. Beyond this, electric vehicles represent yet another potentially enormous market. Batteries for these applications need to satisfy a range of requirements, including (1) high energy density, (2) low materials and processing costs, and, (3) avoidance of environmental, safety and health hazards. To a large extent, device performance is throttled by limitations in materials behavior. The tutorial will present an overview of the field of rechargeable batteries along with specific reference to the major battery technologies: *lead acid; nickel metal-hydride; sodium sulfur; zinc-air, lithium ion;* and *lithium solid polymer electrolyte.* Each technology will be assessed in terms of its performance attributes and in terms of the materials problems that remain unsolved.

About the Presenter: Donald R. Sadoway is John F. Elliott Professor of Materials Chemistry in the Department of Materials Science & Engineering at the Massachusetts Institute of Technology. He obtained the B.A.Sc. in Engineering Science, the M.A.Sc. in Chemical Metallurgy, and the Ph.D. in Chemical Metallurgy, all from the University of Toronto. After a year of postdoctoral study at MIT as a NATO Fellow, Dr. Sadoway joined the faculty in 1978. The author of over 100 scientific papers and holder of 11 US patents, his principal research interests are high-temperature physical chemistry, electrochemical processes in molten salts and cryogenic liquids, and rechargeable lithium solid polymer batteries. In 1995 he was named a MacVicar Faculty Fellow, MIT's highest award for excellence in undergraduate education.

TUESDAY, MARCH 14, 2000 ▩ 12:00 NOON–1:30 PM

Ancient Arts of Sword Making

Dr. Daniel Eylon
University of Dayton

Sponsored by the TMS Young Leaders Committee.

The making of swords requires the use of steels and structures which combine high strength, to retain the blade edge sharpness, and high toughness, to resist fracture during combat. As metallurgists know very well, it is difficult to combine strength and fracture toughness as any increase in one property, typically, reduces the other. During three thousand years of sword making, sword smiths in different corners of the earth developed alloys and methods to produce superior blades with unrivaled quality. This presentation will concentrate on the ancient art of making Egyptian, Greek, Chinese, Roman, Damascus, and Japanese Samurai swords. Accurate details on making these swords are not entirely known, but some recent studies have cast more light on the subject. It is surprising to find out that some of these ancient methods were so advanced that only recent developments in aerospace structures, tool steels, and metal matrix composites produced materials with similar combinations of properties.

About the Presenter: Dr. Daniel Eylon received his B.Sc. in mechanical engineering and his M.Sc. and D.Sc. in materials engineering from the Technion-Israel Institute of Technology. He has worked in association with the US Air Force Research Laboratories, Materials Directorate at Wright Patterson air Force Base from 1972 to 1985 on research in the area of titanium alloys for aerospace applications. Since 1986, he is a professor in the Graduate Materials Engineering program at the University of Dayton and is now the program director. In the past ten years most of his research effort has been in titanium powder, casting, and high temperature titanium alloy metallurgy. He is a Fellow of the ASM and enjoys researching the history and archeology of metals.

PROCEEDINGS PUBLICATIONS

EPD Congress 2000

P. Taylor, editor

Since 1990, the TMS Extraction & Processing Division Congress volume has been relied upon as the yearly update of technological advances in process metallurgy. Coverage areas include lead and zinc extraction; copper, nickel, cobalt, and their byproducts; materials processing fundamentals; leaching; aqueous processing; and general recycling.

Approx. 750 pp., illus., index, hardcover
Order No. 4593
Meeting Attendee Price $71

Global Innovations in Materials Processing and Manufacturing – Rapid Manufacturing

J. Smugeresky, D. Thoma, and D. Bourell, editors

This international symposium proceedings volume deals with the materials aspects of rapid tooling and freeform fabrication. Areas of discussion include structure-property relationships, kinetics, manufacturing process simulation, and thermal modeling.

Approx. 300 pp., illus., index, hardcover
Order No. 4607
Meeting Attendee Price $74

Iridium

E. Ohriner, R. Lanam, H. Harada, editors

This volume includes coverage of all aspects of the metallurgy, production and applications of iridium and iridium-containing materials. Attention is given to refining and recycling; processing of iridium compounds; processing, structure, and properties; iridium coating technology; component design and applications of iridium components and coatings; applications of iridium isotopes; iridium as an alloying element; and applications of iridium catalysts.

Approx., 430 pp., illus., index, softcover
Order No. 4615
Meeting Attendee Price $68

Light Metals 2000

R.D. Peterson, editor

For nearly 30 years the *Light Metals* series has provided the international aluminum production community with an annual technological update. For 2000 its comprehensive coverage includes advancements in cast shop technology, alumina and bauxite, carbon technology, aluminum reduction, recycling, and more.

Approx. 1,000
Order No. 4623
Meeting Attendee Price $120

Light Metals 2000 on CD-ROM

The CD-ROM version of Light Metals 2000 may be purchased separately for the same price as the printed version, or for a discounted price you may purchase the set (both printed volume and CD-ROM).

CD-ROM Only
Order No. 4631
Meeting Attendee Price $96

Continuing Education

SHORT COURSE PROGRAM

The Minerals, Metals & Materials Society (TMS) will conduct a selection of four (4) learning intensive courses designed to enhance your technical and professional expertise. Programmed in conjunction with the 129th TMS Annual Meeting & Exhibition, these courses were developed in response to the training and information needs of today's engineering professional.

With such a diverse and carefully selected list of topics, you may select one or more of the courses suited to your needs:

- Molten Salt Chemistry and Process Design: from Smelter to Foundry
- Safe Practices for Handling Molten Aluminum
- Titanium Science & Technology
- Aluminum Smelter Cell Dynamics

We invite you to read over this brochure carefully and consider the merits of each course, as well as the qualifications of the respective presenters, and you are sure to find something of benefit to you and perhaps one of your colleagues.

If you need additional information on a particular course, please contact:

TMS Continuing Education Department
184 Thorn Hill Road
Warrendale PA 15086 USA
Tel: 724-776-9000 ext. 212
Fax: 724-776-3770
E-mail: raabe@tms.org

Sponsored by the TMS Light Metals Division.

SUNDAY, MARCH 12, 2000 ▩ 8:30 A.M.–5:00 P.M.

Safe Practices for Handling Molten Aluminum

John E. Jacoby
Consultant

Seymour G. Epstein
Aluminum Association, Inc.

Fees:

Members $425
Non-members $510

Who Should Attend: This one-day course is intended for plant managers, cast shop superintendents, metallurgical engineers, process engineers, production supervisors, safety engineers, and cast shop operators who are involved with cast shop operations and are concerned with maintaining a safe work environment.

Course Overview: This course deals with the causes of and prevention of molten aluminum-water explosions. Each year representatives from companies throughout the world voluntarily report to the Aluminum Association 50 to 100 molten metal incidents. The actual number of explosions occurring is probably much higher resulting in numerous injuries and extensive property damage. *These explosions can be prevented by acquiring the current knowledge and implementing it in your operation!*

A lecture/discussion format reinforced by videotapes and descriptions of actual molten metal explosions will be used. All aspects of cast shop operations will be covered. They include: metal storage, furnace charging, alloying, metal transfer, ingot casting and protective measures for personnel and equipment. Special emphasis will be focused on specific causes of the explosions encountered most frequently in recent years. The problem areas are: scrap charging, sow charging, dumping molten aluminum in drain pans and starting of ingot drops. Participants will also be familiarized with extensive safety programs of the Aluminum Association.

About the Presenters:

John E. Jacoby is a metallurgical engineering graduate of Lehigh University. He retired from the Aluminum Company of America in 1994 after 38 years of service. His entire career was spent on technical (metallurgical) assignments. He worked in production operations for 19 years and performed casting research for 19 years. Mr. Jacoby continues to be active in the aluminum industry as a consultant. Cast shop safety has been a major focus of his consulting work.

Seymour G. Epstein is Technical Director at the Aluminum Association, Inc. He has B.S. and M.S. degrees in metallurgy, and spent 10 years in research with Battelle Memorial Institute and Brookhaven National Laboratory. He has been with the Aluminum Association for 30 years and has been intimately involved with the industry's research on causes and prevention of molten metal explosions. Mr. Epstein has authored numerous papers on aluminum and the aluminum industry.

SATURDAY, MARCH 11, 2000 ▩ 8:30 A.M.–5:00 P.M.
SUNDAY, MARCH 12, 2000 ▩ 8:30 A.M.–12:00 P.M.

Aluminum Smelter Cell Dynamics

B.J. Welch
The University of Auckland

Alton Tabereaux
Reynolds Metals Company

Fiona Stevens McFadden
Comalco Aluminum

Who Should Attend: This 1-1/2 day course is intended for managers, supervisors, engineers and scientists employed in either research or operations associated with aluminum smelting.

Fees:

Members $525
Non-members $610

Course Overview: There is a wide range of different cell designs and technologies operating in the world. While all striving to improve their performances, subtle differences make it difficult to simply translate practices from other smelters – the difficulties are most commonly linked with operating practices and the consequential cell dynamics. This course is aimed at providing an understanding of the causes of cell dynamics, their relative importance, early detection of the trend towards poor cell performance, and options for minimization of these so that smelter performance is maximized.

Contents of the course will include an overview of electrolytes, cell conditions, and practices for different technologies. Operating causes of process variability and the importance of super heat and heat balance. Variability in aluminum fluoride concentrations and their minimization. Options for (and importance of) regular monitoring of cells; early diagnosis of poor cell conditions; cell diagnostics. The use of models and process control for minimization of process variability.

About the Presenters:

Professor Barry Welch is in his 40th year of research and development associated with aluminum smelting technology. He has worked in the industry as well as consulting, directing research programs, and publishing extensively on aspects of smelter technology.

Dr. Alton Tabereaux has worked with Reynolds Metals Company for 30 years. In that time he has become an acclaimed world leader in cell diagnostics and operations as well as being a regular contributor to the TMS Light Metals publications. 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.

Fiona Stevens-McFadden has worked with Comalco for 10 years becoming their expert in modelling and design of smelting cells. She has also implemented new technology features in operating potrooms as well as having an interest in advanced process control. She has been on the Aluminum Committee of TMS and served as Light Metals Division sub-editor for the Aluminum Committee for JOM.

Restaurants throughout the Opryland Hotel offer delectables, prepared by award-winning chefs, that will please every palate.

PROCEEDINGS PUBLICATIONS

Phase Transformations and Evolution in Materials

P.E.A. Turchi and A. Gonis, editors

This book addresses both theoretical and experimental aspects of phase transformations and evolution in solids. It provides an assessment of our current understanding of phase transformations and mechanical properties of structurally heterogeneous systems, simulations of structural transformations, large scale modeling of microstructure evolution in martensites, and the application of the concentration wave method to the prediction of ordering phenomena in substitutional alloys and ceramic materials.

Approx. 350 pp., illus., index, hardcover
Order No. 4682
Meeting Attendee Price $104

Process Synthesis and Modeling for the Production & Processing of Titanium and Its Alloys

J.A. Hall, F.H. Froes, I. Weiss, K-O. Yu

Coverage provided by this proceedings volume focuses on primary and secondary melting and solidification, thermomechanical processing, investment casting, and the relationship between processing and microstructure development for titanium and its alloys.

Approx. 300 pp., illus., index, hardcover
Order No. 4690
Meeting Attendee Price $82

Rare Earths and Actinides: Science, Technology and Applications IV

R.G. Bautista and B. Mishra, editors

The papers from this symposium present a vision of the state of the art in the science and technology of rare earths and actinides as we enter the next century. Topics discussed relevant to rare earths include resources, markets, extraction, processing, purification, precipitation, electrolysis, physics and chemistry in the preparation of magnets, electronic materials, batteries, alloys, and films. Actinide coverage includes the hydro-, electro-, and pyrometallurgical processes and physical metallurgy of the metals and their compounds.

Approx., 500 pp., illus., index, softcover
Order No. 4704
Meeting Attendee Price $90

SATURDAY, MARCH 11, 2000 ▩ 8:30 A.M.–5:00 P.M.
OR SATURDAY, MARCH 11 & SUNDAY, MARCH 12, 2000 ▩ 8:30 A.M.–5:00 P.M.

Molten Salt Chemistry and Process Design: from Smelter to Foundry

Georges J. Kipouros
Dalhousie University

Donald R. Sadoway
Massachusetts Institute of Technology

C. Edward Eckert
Apogee Technology

Who Should Attend: This course will be available as either a one or two day course. Anyone engaged in the processing of light metals or reactive metals will find this course useful. The course is aimed at practicing engineers and laboratory scientists who wish to acquire a rudimentary understanding of this unique by very important class of liquids. Instruction is systematic, self-contained, and presumes no prior specific knowledge of molten salts on the part of the participants. Participants can customize the course by raising questions during two lengthy open forum discussions which serve as clinics.

Fees:

One Day
Members $425
Non-members $510

Two Day
Members $625
Non-members $710

The course is structured so that those interested exclusively in molten salt electrolysis can finish in one day. For those interested in a broader range of applications, including extraction of reactive metals, casting, and purification of reactive metals, these topics and more of the relevant science are presented on the second day.

DAY ONE OVERVIEW:

Introduction
- What are molten salts? Comparison of the physical properties of 1 M $NaCl_{(aq)}$ and pure molten NaCl
- Statement of objectives

The breadth of the use of molten salts in industry with specific examples e.g., a partial list of applications includes:
- electrometallurgy - winning, refining, plating
- chemical/process metallurgy - casting, metallothermic reduction, welding
- power sources - batteries, fuel cells
- materials synthesis - flux assisted crystal growth, electrodeposition of compounds

Properties of molten salts classified according to types of anion e.g., fluoride, chloride, etc on a single Periodic Table dedicated to chlorides, for example, show melting points, boiling points, electrical conductivities, vapor pressures, etc. of the salts of each of the elements.
- For a subset of elements compare these properties as the anion varies: for a given element, M, look at MF_x, MCl_x, MBr_x, MI_x, and even MO_y and MS_z

One component systems:
- Thermodynamic and transport properties: density, molar volume, DV_{fusion}, vapor pressure, electrical conductivity, thermal conductivity, diffusivities (cation and anion), viscosity atomistics/ melt structure, distinction between molten salts and ionic melts, examples of molecular melts and polymeric melts.

Binary and Multicomponent Systems:
- Isothermal variation with composition of key thermodynamic and transport properties in selected binary systems: density, molar volume, vapor pressure, activity from emf measurements, calorimetric data, electrical conductivity, viscosity
- Melt structure and how it varies with composition: as deduced from modeling some of the data cited earlier and as revealed by direct measurements such as Raman spectroscopy
- Formation of complexes

Applications presented via illustrative case studies:
- An electrolyte system for metal extraction: design considerations
- Look at the electrolytic production of aluminum, magnesium, and lithium, and justify the choice of electrolyte composition, cell design, and set points of various engineering parameters

Resources
- How to learn more about molten salts: books, journals, conferences, key laboratories in the world and their emphasis

Clinic
- Instructors will field questions from course participants in an open forum

DAY TWO OVERVIEW:

High-temperature physical chemistry or thermodynamics and kinetics of metallurgical reactions:

- the keys to understanding how to manage everything from metallothermic reduction to metal purification
- Ellingham diagrams
- Rate laws
- Effects of temperature and composition
- Behavior of reactive gases and liquid metals
- Data sets
- Sample calculations

Applications presented via illustrative case studies:

Thermochemical processes (metallothermic) for extraction of reactive metals: titanium, tantalum, neodymium, magnesium, calcium

- Process design considerations
- In the light of the fundamentals presented earlier in the course, justify the choice of reactor feed and reductant, reactor design, and set points of various engineering parameters

Metal purification: aluminum case study

- Sources of impurities, stoichiometry and energetics of in situ salt formation, fluxing reactions, salts as inclusions, salt management
- Waste treatment and other salt intensive processing operations
- Technology of molten salts: production and preparation, containment, disposal, characterization and analysis

Clinic

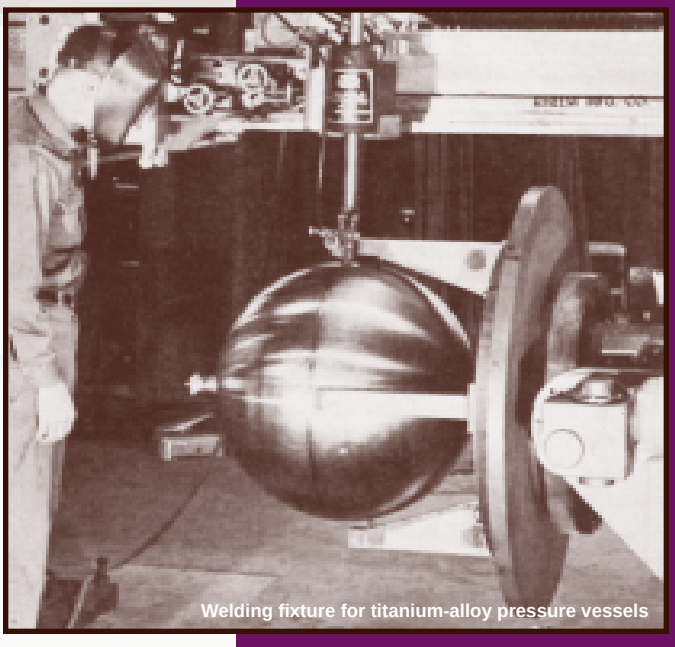
- Instructors will field questions from course participants in an open forum

About the Presenters:

Georges J. Kipouros is a professor and Head of the Department of Mining and Metallurgical Engineering at DalTech-Dalhousie University (formerly Technical University of Nova Scotia). He obtained his Dipl. Eng. from the National Technical University of Athens, Greece and the MASc and the Ph.D. in chemical/process metallurgical engineering from the University of Toronto. After three years as a Post-doctoral Research Associate at the Massachusetts Institute of Technology (MIT), he joined the Physical Chemistry Department of the General Motors Research Laboratories in Warren, Michigan as a Senior Research Scientist, where he worked in the development of processes for the production of neodymium-iron alloys and magnesium metal. The author of over 60 scientific papers, books, and proprietary research reports is currently the Vice-Chair of the Dalhousie University Senate.

Donald R. Sadoway is John F. Elliott Professor of Materials Chemistry in the Department of Materials Science and Engineering at the Massachusetts Institute of Technology. He obtained the B.A.Sc. in Engineering Science, the M.A.Sc. in Chemical Metallurgy, and the Ph.D. in Chemical Metallurgy, all from the University of Toronto. After a year of postdoctoral study at MIT as a NATO Fellow, Dr. Sadoway joined the faculty in 1978. The author of over 100 scientific papers and holder of 11 U.S. patents, his principal research interests are high-temperature physical chemistry, electrochemical processes in molten salts and cryogenic liquids, and rechargeable lithium solid polymer batteries. In 1995 he was named a MacVicar Faculty Fellow, MIT's highest award for excellence in undergraduate education, and in 1997 he won the Bose Award which is given to the outstanding teacher in MIT's School of Engineering.

C. Edward Eckert is President of Apogee Technology, Inc. and Quantum Environmental Dynamics, Inc. He is also an Adjunct Professor of Mechanical Engineering at Worcester Polytechnic Institute and provides retained consulting services for several companies. Dr. Eckert performed his undergraduate work in Metallurgical Engineering at the University of Pittsburgh, and received his Ph.D. in Materials Engineering from Drexel University. Prior to his current positions, he managed the metal quality program at ALCOA, and was an engineering general supervisor at General Motors-Central Foundry Division. Dr. Eckert currently holds 122 US and international patents, has 39 technical publications, is Editor of the TMS book and CD-ROM, Light Metals 1999, and is a member of Sigma XI, Alpha Sigma Mu, TMS-AIME, The American Foundryman's Society (AFS), ASM International, ant he Society of Automotive Engineers (SAE). He was the 1998-99 Chairman of the TMS/LMD Aluminum Committee, and continues to serve on a number of committees for these organizations.



Welding fixture for titanium-alloy pressure vessels

SHORT COURSE REGISTRATION

To register for a course, please use the short course registration form in this brochure. All courses will be held at the Opryland Hotel & Convention Center, Nashville, Tennessee the weekend prior to the meeting, Saturday and Sunday, March 11-12, 2000.

You may register any time prior to the Annual Meeting and on site, but if you register by the advanced registration deadline of February 18, 2000, you will save an additional $50 late registration penalty. Course size is limited and a sufficient number of pre-registered attendees are necessary to offer each course, so please register early!

CANCELLATION POLICY

TMS reserves the right to cancel any courses due to low pre-registration. All pre-registered attendees will be notified of the cancellation and offered either a transfer or a full refund.

REFUND POLICY

Written requests must be sent to TMS Headquarters, 184 Thorn Hill Road, Warrendale PA 15086 postmarked no later than February 18, 2000. A $25 processing fee will be charged for all cancellations; this processing fee is separate from and in addition to the fee charged for cancellation of meeting registrations. Absolutely no refunds will be issued after the February 18, 2000 deadline.

Note to US residents: A tax deduction may be taken for expenses of continuing education (including registration fees, travel, meals, and lodging) undertaken to maintain and improve professional skills. For more information concerning applicability, contact your local Internal Revenue Service office.

sponsored by the TMS Structural Materials Division

SATURDAY & SUNDAY, MARCH 11-12, 2000 ▩ 8:30 A.M.–5:00 P.M.

Titanium Science & Technology

F.H. (Sam) Froes
Institute for Materials & Advanced Processes
University of Idaho

Fees:

Members	$625
Non-members	$710

Who Should Attend: The two-day course will cover the science and technology of titanium and its alloys including the intermetallic alloys and metal matrix composites. It will be of value to those involved in research and development activities in this area, and those managers who must make decisions on new directions for research and development.

The course will also emphasize applications of titanium based materials including commercial and military aerospace; the consumer market, including golf clubs, developing applications in architecture; oil and gas exploration; and desalination plants.

Course Overview: This course will present the science, technology and application of titanium and its alloys. The basic science will include phase diagrams, alloying strategies and processing procedures used. It will also include microstructure development and mechanical property relationships. Attention will then be given to the commercial practices used to fabricate titanium and its alloys; including conventional alloys such as Ti-6Al-4V and newly developed alloys such as Ti-10-2-3, b 21S, Ti-62X, the titanium aluminides and titanium metal matrix composites. Applications will include engine and airframe use and non-aerospace markets including automobiles, armored vehicles, body implants, down-hole oil/gas use and golf clubs.

About the Presenter:

Sam Froes has spent more than 30 years working in the area of titanium and its alloys for a primary metals producer, for the US Air Force and in academia. He received his BS., MS and Ph.D. in Physical Metallurgy. He has received numerous awards for his work on titanium and its alloys including Fellow of ASM, Academician of the Russian Academy of Natural Sciences, and Outstanding Researcher at the University of Idaho.

The Wildhorse Saloon is part dance club, part restaurant, part television studio and all fun.

Nashville Area PLANT TOURS

Advance registration for these tours is strongly recommended, as seating is limited. You may register for the plant tours via the Accompanying Persons and Plant Tour Registration Form in the attached registration form packet. All tours depart from the Opryland Hotel.

THURSDAY, MARCH 16, 2000 ▩ 9:00 A.M.–12:00 NOON

Saturn Corporation

Fee: $20

It's a short 40-minute bus ride to Spring Hill, Tennessee, the home of Saturn Corporation the makers of Saturn automobiles. There, you will be able to experience a tram ride-tour of the Saturn manufacturing facility, famous for its team approach to building quality automobiles. The tour will conclude with a visit to the Saturn Welcome Center where you can learn more about Saturn's lost foam casting process and enjoy the many interactive and hands-on technology displays.

THURSDAY, MARCH 16, 2000 ▩ 9:00 A.M.–8:00 P.M.

Oak Ridge National Laboratory

Fee: $50 (includes a box lunch)

** This tour is limited to U.S. citizens only*

The Oak Ridge National Laboratory (ORNL) tour will include an approximate 2 1/2-hour bus ride each way.

ORNL conducts basic and applied research and development to create scientific knowledge and technological solutions that strengthen U.S. leadership in key areas of science; increase the availability of clean, abundant energy; restore and protect the environment; and contribute to national security.

Your tour will include the following research areas:

ADVANCED MATERIALS RESEARCH — High Temperature Materials Laboratory (HTML)

Visitors will begin with a tour of the High Temperature Materials Laboratory (HTML) where research is performed on metals and ceramics, including high-temperature superconductors and synthetic diamonds. The quest for higher fuel efficiency and lower emissions makes the use of ceramics in automobiles desirable. The HTML researchers explore possible uses of ceramics via joint projects between ORNL and industry to develop high technology ceramics for automobiles, trucks, and heavy-duty vehicles.

ENERGY EFFICIENCY AND BUILDING TECHNOLOGIES — Buildings Technology Center (BTC)

The Energy Division is responsible for wide-ranging research in all phases of energy use and development.

Tour participants will also visit the ORNL Buildings Technology Center (BTC), the premier U.S. research facility devoted to the development of technologies that improve the energy efficiency and environmental compatibility of residential and commercial buildings. The BTC is housed in a cluster of six buildings offering 20,000 square feet of space and state-of-the-art experimental facilities valued at over $6 million. The BTC is home to the Fridge of the Future, a 1kWh per day refrigerator that will someday be available in homes nationwide. Tour participants will see science at work on real time problems to which everyone can relate.

THURSDAY, MARCH 16, 2000 ▩ 9:30 A.M.–11:30 A.M.

Aerostructures Corporation

Fee: $20

Aerostructures is a global aerospace company designing and building large airframe structures for customers worldwide. The plant in Nashville, Tennessee, employs more than 2,110 people.

Aerostructures' research and development has resulted in significant contributions to the advancement of aerospace technology. The company developed and implemented an autoclave forming and aging process for manufacturing large panels of varying thicknesses and configurations. The process provides repeatable results at much higher production rates than conventional processes. Advanced aluminum alloys, metal matrix and hybrid composites, and computer process models are other innovations Aerostructures has contributed to the industry.

This 1-hour long tour will give you an opportunity to see advanced materials utilized in modern aerospace applications.

Accompanying Persons TOUR PROGRAM

March 11 – 15, 2000

Helen L. Moskovitz & Associates has been designated the official tour company of The Minerals, Metals & Materials Society (TMS) and has scheduled the following events for your enjoyment. Tours depart from the Opryland Hotel/Veranda Canopy. You may reserve the tour of your choice in advance by completing the enclosed registration form. DO NOT MAIL THE FORM TO TMS. Please complete form and mail along with check to: Helen L. Moskovitz & Associates, 95 White Bridge Road, Suite 500, Nashville, TN 37205. Tickets will not be mailed in advance. Upon arrival in Nashville, your tickets will be ready for you to pick up at the Tour Desk located near the conference registration desk. In order to guarantee operation of tours, please make your reservation before coming to Nashville.

Evening at the Grand Ole Opry

The Grand Ole Opry has showcased performers every Friday and Saturday night since it went on the air in 1925.

SATURDAY, MARCH 11, 2000 ▩ 8:30 P.M.–12:30 A.M.

$38.75 per person, inclusive of tax.

Originally called "The Barn Dance", The Grand Ole Opry was a radio program sponsored by National Life & Accident Insurance Company. Always seeking ways to connect with the "rural" clients, agents for the company could discuss the latest programs and build good will. A new name for the program came from the announcer George D.Hay "The Solemn Old Judge" who compared the show to the classical program "The Grand Opera". He joked, " For the past hour we have been listening to music taken largely from Grand Opera, but from now on we will present the Grand Ole Opry."

For over 70 years, the Grand Ole Opry has given us performances by the legendary entertainers who represent country music's elite. It is the longest continuous running radio program in history featuring "Hall of Famers", legends and hot new stars on the famous Grand Ole Opry stage.

Belle Meade Plantation and Lunch at Belmont Mansion

Slow your pace and step back into an era remniscent of the historical Old South, just a stones throw from contemporary Nashville.

MONDAY, MARCH 13, 2000 ▩ 9:00 A.M.–2:00 P.M.

$52.00 per person, inclusive of tax.

Belle Meade Plantation, a Greek Revival mansion, was once the center of a 5,400 acre plantation, which developed into a world-famous thoroughbred nursery and stud farm. Completed in 1853, Belle Meade was the "Queen of Tennessee Plantations" as well as a survivor of the Civil War.

Inside the beautifully restored mansion are antique furnishings and decorative arts of the 19th Century exemplifying the way prosperous Southern plantation owners lived during this bygone era. Each room has been decorated with special attention to historic detail, down to the colors of the walls and the type of carpeting. Also many original mementos of the halcyon days of the stud farm remain, including a splendid collection of oil paintings of Belle Meade and other equine greats.

Through the mansion-filled streets of Belle Meade, the tour arrives at the Italian villa-style Belmont Mansion built in the 1850's by Col. Joseph and Adelicia Acklen as a summer home to escape the blazing heat of her 8,400 acre Louisiana cotton plantation. Adelicia Acklen, a true southern belle as well as an astute businesswoman, was indeed the original "Steel Magnolia" - sweet as honey on the outside, tough as steel on the inside. She even drew-up the first pre-nuptial agreement of that time to protect her wealth from her later husbands.

We will have a wonderful southern lunch served in the Grand Salon at Belmont Mansion. Today, Belmont Mansion is part of Belmont University and contains her treasures collected during this by-gone era.

Music City Swing

TUESDAY, MARCH 14, 2000 ▩ 9:00 A.M.–3:00 P.M.

$51.25 per person, inclusive of tax

On this exciting tour your guests will see the many surprising facets of Music City, USA. We will blend old and new, country music and culture as you travel around the sights and sounds of Nashville. The tour begins with a drive through historic downtown Nashville. Here you will tour the newly restored Ryman Auditorium, former home of the Grand Ole Opry. We won't let you miss Second Avenue, known as "The District," with its unique shops, restaurants and, of course, a multitude of entertainment venues. Downtown is home to Tootsie's Orchid Lounge and the Wildhorse Saloon, the country's premier dance club where The Nashville Network films many star-studded programs.

At the head of Music Row sits the Country Music Hall of Fame—keeper of country music's colorful history and treasured memorabilia.

Then it is on toward Music Row and the Country Music Hall of Fame. At the Country Music Hall of Fame we will get a behind-the-scenes look at country music's beginnings and development. Established in 1958, the museum highlights all of the stars from the early greats to contemporary artists. Further on down Music Row is where all of the "hot licks" are put together in the major recording studios.

After learning all there is to know about Country Music you will need some good ole Tennessee barbecue to satisfy that hunger. We will eat at Jack's Barbecue for some country favorites.

Our final journey is a drive through Centennial Park, home of the Parthenon. Built for Nashville's Centennial Celebration in 1897, this is the only full-scale replica of the original Parthenon in Athens, Greece. Behind the largest bronze doors in the world, stands the awe-inspiring 42-foot sculpture of the Greek goddess Athena. Nashville's Athena is the tallest indoor sculpture in the western world. Further inside the Parthenon is an impressive art museum containing permanent and traveling art exhibits, as well as castings of the famous Elgin Marbles from the British Museum.

Family Tour to the Nashville Zoo

WEDNESDAY, MARCH 15, 2000 ▩ 9:00 A.M.–12:00 P.M.

$21.25 per adult, inclusive of tax., $19.50 per child, inclusive of tax

At the Nashville Zoo you'll see over 500 endangered and exotic animals from all over the world, including rare White Bengal Tigers, the Komodo Dragon and the Red panda. They're all in wild, naturalistic habitats, just 20 minutes from downtown Nashville.

Go wild at the Nashville Zoo.

Cheekwood Botanical Gardens and Fine Arts Center

WEDNESDAY, MARCH 15, 2000 ▩ 1:00 P.M.–5:00 P.M.

$25.25 inclusive of tax

The tour will begin with a drive through Belle Meade, one of the world's richest and most impressive housing communities, constructed on the lands of the original Belle Meade Plantation.

At the end of Belle Meade Boulevard, is Cheekwood, the estate of Leslie Cheek and home of the family who brought Maxwell House coffee to our tables. Their home is considered one of the finest examples of Georgian architecture in the South.

A meandering sculptured trail leads to impressive art galleries renowned for their incomparable American pieces.

Cheekwood has been newly renovated to combine the classic pieces of the time as well as the magnificent art galleries which has made Cheekwood famous. The first two floors of the home are decorated with beautiful furniture of the period. The top floor is an art gallery filled with priceless American art and a rotating gallery for guest artists.

Outside the mansion you will go through a sculpture trail that will lead you to the contemporary art galleries located in the renovated stables and the Frist Learning Center which houses art from regional artists.

After you have strolled through the gardens and visited the home, browse through the museum gift shop for some lovely souvenirs. After experiencing the elegance and grandeur of the Old South, you will find it hard to return to your hotel and this modern age.

Exhibition . . . 2000

Opryland Convention Center /Nashville, Tennessee

Join 4,500 of your colleagues for a 30,000 square foot display of state-of-the art processing, fabrication, and design technology presented by more than 200 international companies. Examine first-hand the products, processes, and services that can solve your most pressing needs and make a difference for your organization.

Show Dates and Hours

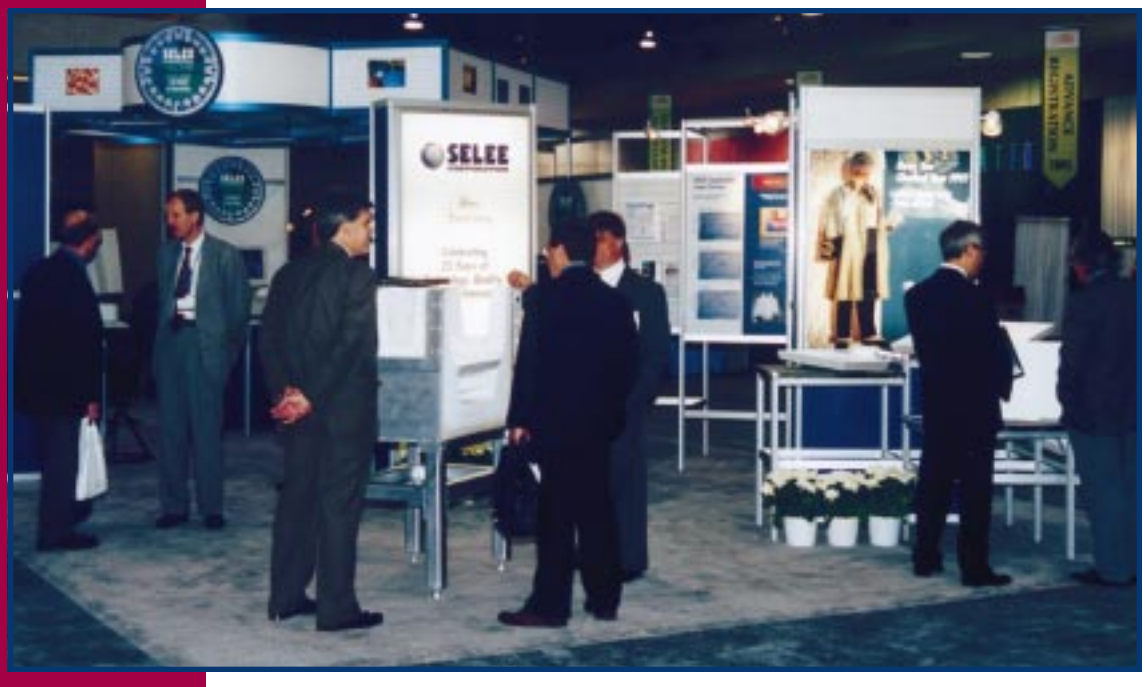
Monday, March 13, 2000 ..... 2:00 p.m.–7:00 p.m.

Tuesday, March 14, 2000 ..... 9:30 a.m.–5:00 p.m.

Wednesday, March 15, 2000 ..... 9:30 a.m.–3:00 p.m.

To visit the exhibition, complete and send the registration form included in this mailer.

For information on being a part of the show, contact us for a complete exhibit prospectus: Cindy A. Wilson, Sales Coordinator, Telephone: 724/776-9000, ext. 231, Fax: 724/776-3770, E-mail: wilson@tms.org



The Opryland Hotel's Delta Garden houses the Ryman Exhibit hall, a 289,000 square foot venue ideal for the most discriminating conventioneer.

Special Attractions during the 2000 show:

- **Grand Opening Reception**

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

- **Complimentary Box Lunch for all meeting registrants**

  Tuesday, March 14 ..... 11:45–1:15 p.m.

- **Afternoon Snack for all meeting registrants**

  Wednesday, March 15 ..... 12:30–2:30 p.m.

PLUS: Exhibits only luncheon concessions—Featured in the 'Exhibit Central Relaxation Station - Attendees of the Show will have the chance to enjoy lunch, relax and unwind at the Relaxation Station provided by Show Management. Located in the center of the exhibition floor.

EXHIBITORS AS OF 9/15/99

COMPANY	BOOTH #
ABB Industrie AG	526
Advanced Dynamics Corp Ltd.	458
AEA Technology Engrg Svcs Inc	559
Air Products & Chemicals	642
AISCO Systems, Inc.	633, 635, 637
Alan Worswick Ltd	355
Albany Research Center, US Dept of Energy	848
Alcan International Ltd	228, 230
Almeq Norway AS	214, 216
Altek	843(4 sp)
Alu-Cut International	435
Aluminium Today	650
Alusuisse	328
Applied Research Laboratories	231
Asbury Fluxmaster of Utah Inc	652, 654
B & P Process Equip & Systems	834, 836
Benchmark Structural Ceramics	751
BetzDearborn	927, 929
BHA Group Inc	746
Blasch Precision Ceramics	555
Bloom Engineering	925
BNZ Materials Inc	552
Bomem, Inc.	224, 226
Borgestad Fabrikker	244, 246
Cambridge Scientific Abstracts	655
Casthouse Technology	537
Christy Refractories Co	750, 752
Clemex Technologies Inc	664
Consolidated Ceramic Products	531, 533
CSM Industries	659, 661
Eirich Machines Inc	330, 332
Elsevier Science	658, 660
Erico Products Inc	545, 547
ESM Software	118
Exploranium	232
FCB / Procedair	335 (4 sp)
Fonderie Saguenay	460, 462
Fosbel	832
Gillespie & Powers	534
Glama Maschinenbau GmbH	352, 354
GOUDA VUURVAST N.V.	543
Hamilton Research & Technology	549
Harbison Walker Refractories Co	735, 737
Hatch Associates	431, 433
Hencon B.V.	742
Heraeus Electro-Nite Co	926, 928
Saint Gobain Industrial Ceramics—High Performance Refractories	835, 837
Holcan Constructions P/L	554
Holton Conform	636
Hoogovens Technical Services	645, 647
Hosokawa MikroPul	135
Hotwork Corp.	830
Hydelko North America	324, 326
Hydro Aluminium Hycast a.s.	243 (8 sp)
Jayne Industries Inc.	449
Jervis B Webb Co.	743, 745
Kabert Industries	721
Kaiser Aluminum	821 (4 sp)
KB Alloys Inc	827, 829
KBM Affilips B.V.	343
Kempe International	930, 932, 934
KHD Humboldt Wedag AG	945
Kluwer Academic Publishers	844
Kvaerner Buss CPS AG	242
Leco Corporation	644
Lem Dynamp Inc.	125
Light Metal Age	446
LOI Inc	651, 653
Loma Machine Mfg. Co.	831
London & Scandinavian Metallurgical	425, 427
Louis A. Grant Inc	459 (4 sp)
maerz-gautschi Industrial Furnaces Ltd	334, 336
Mag Chem	119
Master Alloys Co.	347
Maxon Corporation	450
McAllister Mills, Inc.	451, 453, 455
Mechatherm International Ltd	437
Megaquip	237
Menardi Criswell	137
Metal Bulletin	253

Special Product and Technology MINI-SESSIONS

Due to the great success of the inaugural Mini-Sessions held in San Antonio, we are expanding the program, topics and hours.

As a complement to the 2000 TMS Annual Meeting technical program, many of the organizations participating in the exhibition will be offering brief presentations of their new technologies, equipment, and processes in special presentation areas near the entrance to the exhibit hall.

At these sessions you will have the opportunity to

- Learn of the latest techniques, products, and processes directly from producer, manufacturer, and supplier representatives
- Receive detailed information on products and services as featured on the exhibit floor
- Identify and locate the companies who provide the solutions for your most pressing needs
- If you are involved in selection or specification of products, materials, and services to meet the needs of your organization, you don't want to miss these informative presentations.

The product and technology mini-sessions will be held:

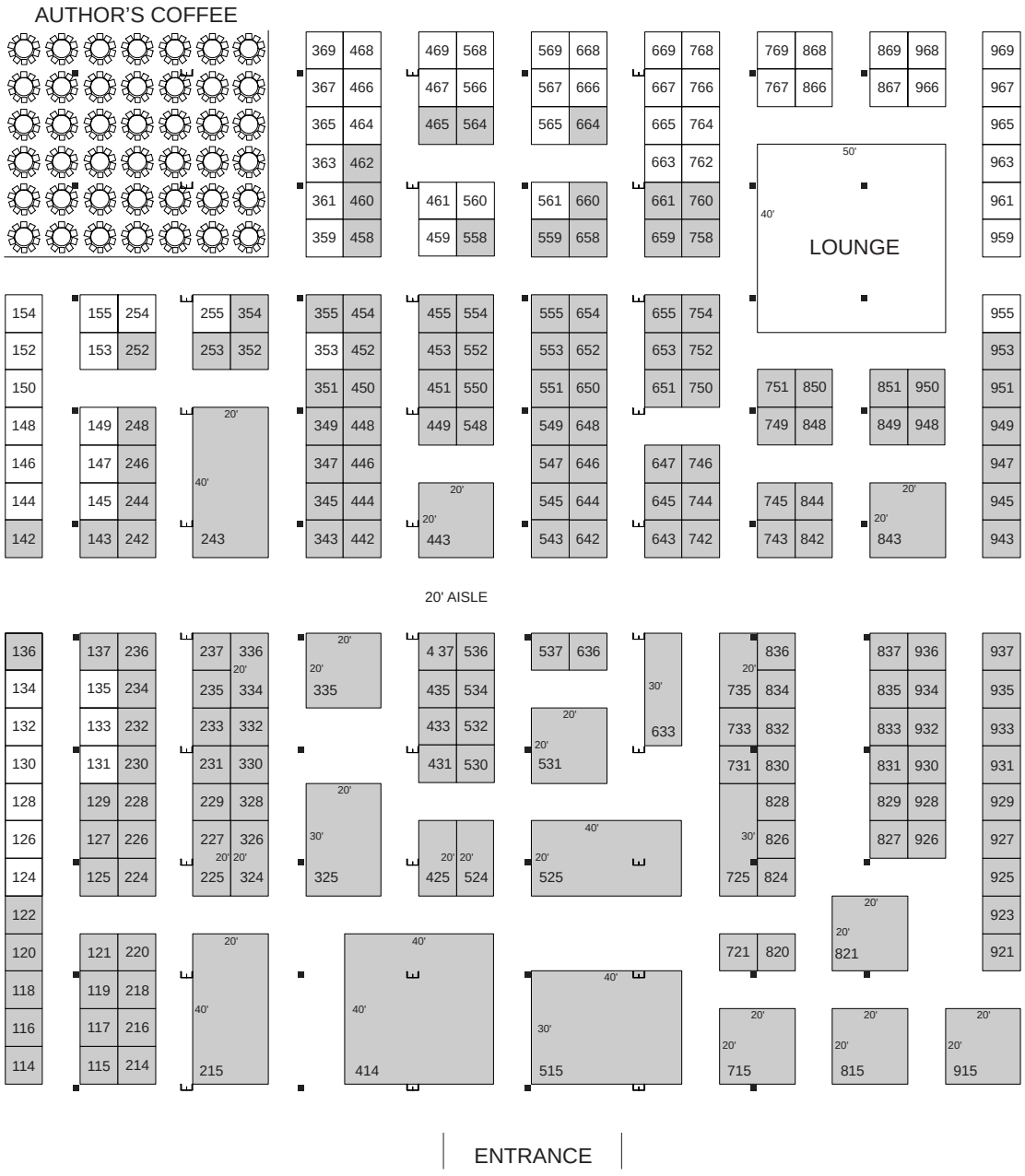
Monday, March 13, 2000 ..... 12:00 Noon–2:00 p.m.

Tuesday, March 14, 2000 ..... 12:00 Noon–2:00 p.m.

Wednesday, March 15, 2000 ..... 12:00 Noon–2:00 p.m.

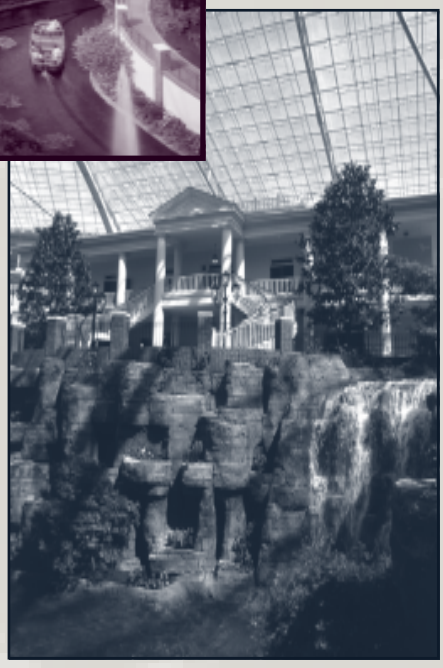
A detailed schedule of presentations and exhibitor presenters will appear on the 2000 TMS Annual Meeting Program World Wide Web site at http://www.tms.org/Meetings/Annual-00/AnnMtg00Home.html later this year, and in the final meeting program booklet.

Convention Center Floorplan



COMPANY	BOOTH #
Metallurgical Society Of CIM	142
Metaullics Systems Co. L.P.	525 (6 sp)
Mid-Mountain Materials	233, 235
Milward Alloys	345
Modern Metals	758
Moeller GmbH	949
Moltech	551, 553
Molten Metal Equip Innovations	943
Murlin Chemical Inc	842
Nalco Chemical Co	715 (4 sp)
NASA Materials Science Program	248
Natl Cnter for Manufacturing Sciences	951, 953
National Refractories & Minerals	820
NKM	537
Noell Crane & Service Inc	143
North American Manufacturing	646, 648
North American Refractories Co.	921, 923
Opsis	136
Pc + 0 M Raadts	252
Parker-Hannifin	349, 351
Pechiney Corporation	725, 727, 729
Performance Assoc. Intl. Inc.	121
Plibrico	234, 236
Poco Graphite	117
Port of Longview	561
Precision Inc.	833
Premelt Systems	530, 532
Premier Refractories Inc	815 (4 sp)
Procedair Industries / FCB	335 (4 sp)
Procon	444
Pryor Giggey Co.	448
Pyradia	452, 454
Pyrotek Inc.	414 (16 sp)
R&D Carbon Ltd.	524
Reftech	115
Rex Roto Corp	915 (4 sp)
Scharf-Westfalia GmbH	936
Seco/Warwick	828
Selee Corporation	215 (8 sp)
Sentech Corporation	218, 220
Sermas AS	229
Shieldalloy Metallurgical Corp	425, 427
Silver Needle Inc	465, 564
Skamol A/S	731, 733
STAS	225, 227
Stellar Materials Inc	754
Techmo Car & Engineering	548, 550
Texsem Laboratories	749
Thermal Ceramics & Thermic Refractories	325 (6 sp)
Thermal Systems America	114, 116
Thermcon Ovens BV	643
Thorpe Technologies	443 (4 sp)
U S Dept of Energy Office of Industrial Technologies	931, 933
Unifrax-Fibers Division	935, 937
VAW Aluminium Technology	947
Vesuvius Foundry Group	824, 826
Wagstaff Inc	515 (12 sp)
Western Industrial Ceramics	442
Zircar Products	120, 122
ZYP Coatings Inc	127

129th ANNUAL MEETING & EXHIBITION TMS 2000



You will enjoy your stay in the expansive Opryland Hotel, a veritable glitterdome encompassing impressive gardens, spectacular waterfalls, distinctive restaurants and specialty shops not to mention nearly 3,000 well appointed guest rooms and suites. It is truly an unparalleled meeting venue.

Nashville's colorful surrounding area possesses unique sights and points of interest for every personality. Punctuate your trip with a visit to Music Row and learn the A to Z of country music, kick up your heels at the Wildhorse Saloon, spend an evening at the Grand Ole Opry, or admire some of Nashville's architectural wonders and artistic masterpieces. Play a challenging round on Nashville's four-star golf course, tour a plantation home from a bygone era, ride a genuine river paddleboat, take a brisk walk along the avenues of contemporary Nashville, or stroll lazily through fragrant gardens and hedge mazes.

However you choose to spend your time, you will agree that it was time well spent. Nashville will capture you with Southern charm and leave you wanting more.

Registration FORM PACKET

Please be sure to follow directions and fully complete forms.

TMS 2000

You do not want to miss this event.

INCLUDES:

- **Third Annual TMS Foundation Golf Classic Registration Form**
  Enjoy a challenging day on the links beside the banks of the beautiful Cumberland River at the renowned Hermitage Golf Course.

- **Advance Registration Form**
  Take advantage of low pre-conference registration rates and ensure that the latest publications are reserved for you.

- **Housing Registration Form**
  Make reservations now and begin to plan your stay at the incomparable Opryland Hotel—truly a Southern wonderland.

- **Accompanying Persons and Plant Tours Registration Form**
  Register early to ensure your inclusion in the enlightening plant tours and local excursions.

- **Continuing Education Short Course Registration Form**
  Plan to attend one of the informative courses designed to enhance your technical and professional expertise.

Advance REGISTRATION FORM

NOTE: *Please complete the additional questions on the next page and submit along with your registration.*

WEB Take advantage of the convenience of on-line pre-registration via the TMS website: **http://www.tms.org** Web registration requires credit card payment.

FAX Fax this form to TMS Meeting Services **USA 724-776-3770** Fax registration requires credit card payment.

MAIL **Return this form with payment to** Meeting Services, TMS, 184 Thorn Hill Road, Warrendale, PA 15086

129th ANNUAL MEETING & EXHIBITION TMS 2000

Advance Registration Deadline: February 18, 2000

PAYMENT MUST ACCOMPANY FORM.
Forms received past this date will be processed at the on-site fee.
Instructions: Check your selections and fill in the necessary information.
Please print or type

Member of: ☐ TMS ☐ ISS ☐ SME ☐ SPE Member Number: _____

This address is: ☐ Business ☐ Home Employer/Affiliation: _____

☐ Dr. ☐ Prof. ☐ Mr.

☐ Mrs. ☐ Ms. _____
LAST NAME FIRST NAME MIDDLE INITIAL

Address: _____

City: _____ State/Province: _____ Zip/Postal Code: _____ Country _____

Telephone: _____ Fax: _____
COUNTRY AREA/CITY LOCAL NUMBER COUNTRY AREA/CITY LOCAL NUMBER

E-Mail Address: _____ Guest/Spouse Name: _____
GUESTS DO NOT RECEIVE ADMISSION TO TECHNICAL SESSIONS.

REGISTRATION FEES:

	ADVANCE FEES (until 2/18/00)	ON-SITE FEES (after 2/18/00)
☐ Member	$385 M	$485 ML
☐ Non-Member Author	$385 A	$485 AL
☐ Non-Member *	$510 NM	$590 NML
☐ Student Member ##	$0 S	$0 SL
☐ Student Non-Member ## *	$25 SN	$25 SNL
☐ TMS Retired Member	$200 R	$200 RL
☐ Exhibit Booth Personnel	$0 E	$0 EL
☐ Exhibit Only	$35 EO	$35 EOL

** Includes TMS membership for 2000*
Students must attach a copy of their school's student identification card.

PUBLICATION ORDERS:

ALL pre-ordered books not indicated for shipment MUST be picked up at the Publications Sales area in the convention center. Orders not picked up will be delayed, pending payment of shipping fees.

Please ship to the above address: No. of books _____
$15 per book $_____(SB)

- ☐ 4577 Advanced Technologies for Superalloys Affordability $80
- ☐ 4585 Deformation, Processing, and Properties of Structural Materials $82
- ☐ 4593 EPD Congress 2000 ..... $71
- ☐ 4615 Iridium $68
- ☐ 4623 Light Metals 2000 ..... $120
- ☐ 4631 Light Metals 2000 on CD-ROM $96
- ☐ 464X Light Metals 2000 Printed Volume with CD-ROM $187
- ☐ 4658 Liquid Metal Atomization: Fundamentals and Practice $62
- ☐ 4666 Magnesium Technology 2000 ..... $113
- ☐ 4764 Materials Processing in the Computer Age III $62
- ☐ 4682 Phase Transformations and Evolution in Materials $104
- ☐ 4704 Rare Earths and Actinides: Science, Technology and Applications IV $90
- ☐ 4712 Surface Engineering in Materials Science I $107
- ☐ 4720 Ultrafine Grained Materials $107

TUTORIAL LUNCHEON LECTURE TICKETS:

OPTIONAL BOX LUNCHES — FEE — NO. — TOTAL

Monday 3/13/00

☐ Advanced Rechargeable Batteries: A Materials Science Perspective ..... $15 _____ $_____ MB

Tuesday 3/14/00 (SPONSORED BY YOUNG LEADERS)

☐ Ancient Arts of Sword Making ..... $15 _____ $_____ TB

SOCIAL FUNCTION TICKETS:

FEE — NO. — TOTAL

Monday 3/13/00

- ☐ AIME/TMS Banquet ..... $60 _____ $_____ AD
- ☐ Tables of 8 ..... $480 _____ $_____ AD8
  Table Sign to Read: _____

Tuesday 3/14/00

- ☐ Extraction & Processing Division Luncheon ..... $25 _____ $_____ EP
- ☐ Tables of 8 ..... $200 _____ $_____ EP8
  Table Sign to Read: _____
- ☐ Gregory E. Stillman Memorial Luncheon ..... $25 _____ $_____ GL
- ☐ Prof. Ole J. Kleppa Honorary Dinner .... $50 _____ $_____ KD
- ☐ Prof. Campbell Laird Honorary Dinner .. $50 _____ $_____ LD
- ☐ Prof. Oleg D. Sherby Honorary Dinner . $50 _____ $_____ SD

Wednesday 3/15/00

- ☐ Light Metals Division Luncheon ..... $25 _____ $_____ LL
- ☐ Tables of 8 ..... $200 _____ $_____ LL8
  Table Sign to Read: _____
- ☐ Research & Development Efforts on Metal Matrix Composites Poster Session - Box Lunch ..... $15 _____ $_____ PL

DIETARY RESTRICTIONS:

☐ Vegetarian ☐ Kosher ☐ Diabetic

2000 MEMBERSHIP DUES:

Advanced registrations received after December 31, 1999 must be accompanied by your 2000 dues payment to be processed at the member fee.

- ☐ Full Member ..... $90 FM
- ☐ Junior Member ..... $55 JM
- ☐ Senior/50 Year/Retired Member ..... $30 SM

TOTAL FEES: _____

PAYMENT ENCLOSED:

☐ Check, Bank Draft, Money Order
Make checks payable to TMS. Payment shall be made in US dollars drawn on a US bank.

☐ Credit Card Expiration Date: _____

Card No.: _____

☐ Visa ☐ MasterCard ☐ Diners Club ☐ American Express

Cardholder Name: _____

Signature: _____

REFUND POLICY: Written requests must be mailed to TMS, post-marked no later than February 18, 2000. A $50 processing fee will be charged for all registration cancellations.

129th ANNUAL MEETING & EXHIBITION

TMS 2000

March 12–16, 2000
Nashville ▪ Tennessee

Please provide . . .

the demographic information requested below and submit with your meeting registration via one of the following routes:

- Website: http://www.tms.org
- Fax this form to TMS Meetings Service, USA 724.776.3770
- Mail this form to:
  Meeting Services
  TMS
  184 Thorn Hill RD
  Warrendale, PA 15086

Please check the category which best describes your job function:

☐ Consulting
☐ Corporate Management/Supervisor
☐ Education
☐ Engineering/Design/Selection
☐ Materials Testing & Analysis
☐ Production/Manufacturing
☐ Purchasing
☐ Quality Assurance/Quality Control
☐ Research & Development
☐ Sales/Marketing
☐ Other: _____

Please check the category that best describes the type of organization at which you are employed:

☐ Advanced Engineered Materials Producers
☐ Aerospace
☐ Automotive
☐ Consulting
☐ Downstream Metal Processing
☐ Education
☐ Electrical/Electronic
☐ Finished Product Manufacturer
☐ Government
☐ Laboratory/Testing
☐ Machinery
☐ Primary Metal Production
☐ Publisher
☐ Research & Development

Please check all products of interest to you:

☐ Aluminum Production/Processing Products & Technology
☐ Automation/Computer Simulation/Robotics
☐ CAD/CAM Systems
☐ Design Services
☐ Instrumentation & Process Control
☐ Material Handling
☐ Materials Testing
☐ Microscopy
☐ Quality Control/Inspection Equipment
☐ Refractory & Insulating

Please check your department's annual purchasing budget in estimated US $(*check one*):

☐ Up to $100,000
☐ $100,000-$500,000
☐ $500,000 to $1 million
☐ $1-$5 million
☐ Over $5 million

Name: _____

. . . Thank you

Housing
REGISTRATION FORM

PLEASE COMPLETE THE FORM BELOW AND RETURN TO:

Opryland Hotel & Convention Center
Attn: Reservations Manager (c-mmm)
2800 Opryland Drive
Nashville, TN 37214
T: 615-883-2211
F: 615-871-5728

I Plan to arrive: _____ (DATE) I Plan to depart: _____ (DATE)

Please Check:

- ☐ Traditional Double ..... Single / Double ..... $145 / $155
- ☐ Traditional King ..... Single / Double ..... $145 / $155
- ☐ Garden Terrace Double ..... Single / Double ..... $185 / $195
- ☐ Garden Terrace King ..... Single / Double ..... $185 / $195

- Additional person charge over the age of 12 is $15.00 per night.
- Room Tax – 13.25%

ALL RESERVATION REQUESTS MUST BE GUARANTEED BY THE FIRST NIGHT'S ROOM AND TAX BY PERSONAL CHECK OR CREDIT CARD. CANCELLATIONS MUST BE MADE SEVENTY-TWO (72) HOURS PRIOR TO ARRIVAL TO AVOID FIRST NIGHT'S BILLING. EARLY DEPARTURE FEE OF $50.00 WILL APPLY IF DEPARTURE DATE IS CHANGED AFTER CHECK-IN.

- All reservations must be received by: Friday, February 18, 2000
- Requests prior to and after convention dates will be accepted on a space available basis only.
- Convention rate applies three days prior and three days following official meeting date. (One card per room)

Name: _____

Firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

Specific Requests: _____
(REQUESTS SUBJECT TO AVAILABILITY)

Payment Enclosed:

☐ Check ☐ Credit Card

Card No.: _____ Expiration Date: _____

☐ Visa ☐ MasterCard ☐ American Exptess ☐ Other:

Signature: _____

Please Note: Check-in time is 3:00 p.m. - Check-out time is 11:00 a.m.

Accompanying Persons and Plant Tours

REGISTRATION FORM

Please note: Registration deadline for all tours is February 25, 2000. Cancellations will be accepted provided a WRITTEN request is received prior to the tour deadline. A $3.00 cancellation fee will be charged for all refunds. No refunds will be issued after the cancellation date. No COD's, phone or fax orders will be accepted. Helen L. Moskovitz & Associates reserves the right to cancel any tour if the minimum number of participants to operate the tour is not attained. You will be notified in advance and a full refund will be issued if the tour is canceled.

Name: _____

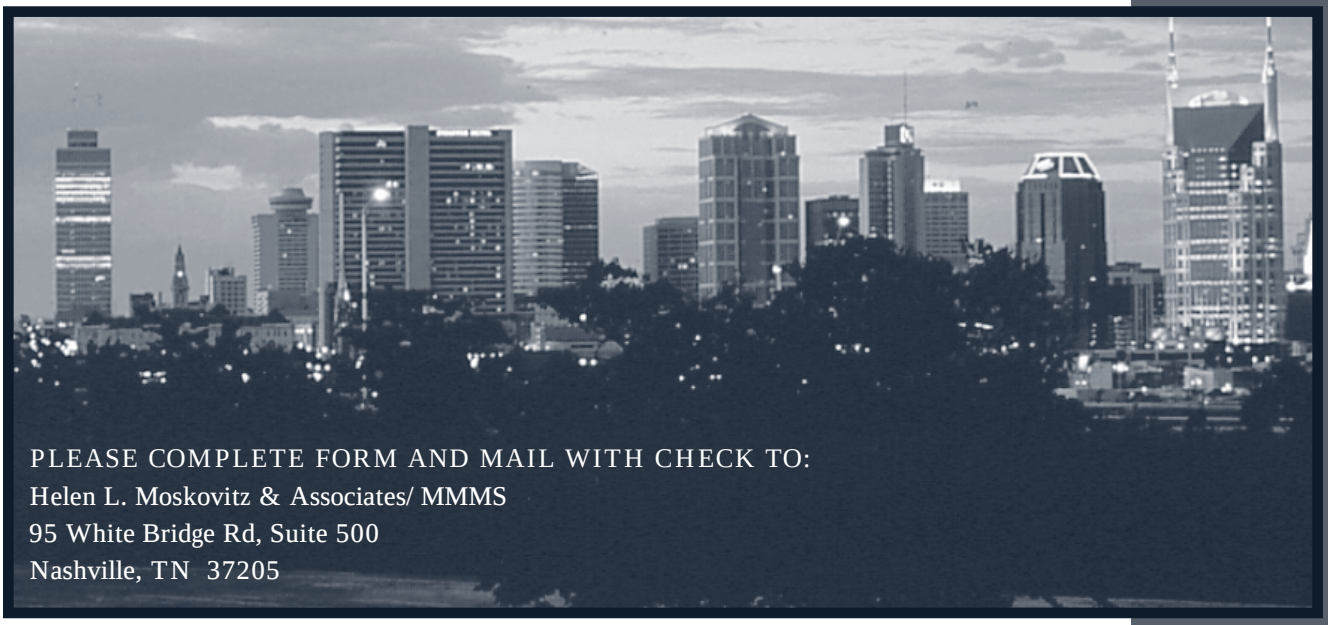
Firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Day Phone: _____ Evening Phone: _____

Date	Tour/Time	# of Tix	Price	Total
3/11/2000	Grand Ole Opry *8:30 p.m.–12:30 a.m.*	____	$38.75	$_____
3/13/2000	Belle Meade & Belmont Mansions *9:00 a.m.–2:00 p.m.*	____	$52.00	$_____
3/14/2000	Music City Swing *9:00 a.m.–3:00 p.m.*	____	$51.25	$_____
3/15/2000	Family Fun at Nashville Zoo *9:00 a.m.–12:00 p.m.*	____ ____	$21.25 (adult) $19.50 (child)	$_____ $_____
3/15/2000	Cheekwood *1:00 p.m.–5:00 p.m.*	____	$25.25	$_____
3/16/2000	Saturn Corp. Plant Tour *9:00 a.m.–12:00 p.m.*	____	$20.00	$_____
3/16/2000	Oak Ridge National Lab Plant Tour *9:00 a.m.–8:00 p.m.*	____	$50.00	$_____
3/16/2000	Aerostructures Corporation Plant Tour *9:30 a.m.–11:30 a.m.*	____	$20.00	$_____



PLEASE COMPLETE FORM AND MAIL WITH CHECK TO:
Helen L. Moskovitz & Associates/ MMMS
95 White Bridge Rd, Suite 500
Nashville, TN 37205

Continuing Education - Short Course
REGISTRATION FORM

WEB	FAX	MAIL
Take advantage of the convenience of on-line pre-registration via the TMS website: **http://www.tms.org** Web registration requires credit card payment.	Fax this form to TMS Educational Department **USA 724-776-3770** Fax registration requires credit card payment.	**Return this form with payment to** Educational Department TMS 184 Thorn Hill Road Warrendale, PA 15086

129th ANNUAL MEETING & EXHIBITION TMS 2000

Advance Registration Deadline: February 18, 2000
PAYMENT MUST ACCOMPANY FORM.
Forms received past this date will be processed at the next higher fee structure.
Please print or type

Member of: ☐ TMS ☐ ASM ☐ ISS ☐ SME ☐ SPE ☐ FS (Founders Societies)

Member Number: _____

☐ Dr. ☐ Prof. ☐ Mr. ☐ Mrs. ☐ Ms. _____ (LAST NAME) _____ (FIRST NAME) _____ (MIDDLE INITIAL)

Employer/Affiliation: _____

Address: _____

City: _____ State/Province: _____ Zip/Postal Code: _____

Telephone: _____ Fax: _____

E-Mail Address: _____ ☐ New Address

CONTINUING EDUCATION COURSES	ADVANCE TO 2/18/00		ON-SITE AFTER 2/18/00	
Check your selections. See brochure for cancellation and refund policies.	MEMBER	NON-MEMBER	MEMBER	NON-MEMBER
Safe Practices for Handling Molten Aluminum				
☐ Sunday, 3/12/00	$425	$510	$475	$560
Molten Salt Chemistry and Process Design: from Smelter to Foundry				
☐ One Day Option: Saturday, 3/11/2000	$425	$510	$475	$560
☐ Two Day Option: Saturday, 3/11/2000 & Sunday, 3/12/2000	$625	$710	$675	$760
Aluminum Smelter Cell Dynamics				
☐ Saturday, 3/11/2000 & Sunday, 3/12/2000	$525	$610	$575	$660
Titanium Science & Technology				
☐ Saturday, 3/11/2000 & Sunday, 3/12/2000	$625	$710	$675	$760
Total	$			

Payment Enclosed:

☐ Check made payable to TMS - Payment shall be made in US dollars drawn on a US bank.

☐ Bank Transfer - Attach a copy of your bank transfer document. Registration will not be processed without proof of payment. Wire payment to PNC Bank (routing number 043000096) for the account of TMS (account number 10-0825-9767); referencing "CE AM 00" and your name.

☐ Credit Card

Card No.: _____ Expiration Date: _____

☐ Visa ☐ MasterCard ☐ Diners Club ☐ American Express

Cardholder Name: _____

Signature: _____

THIRD ANNUAL

TMS FOUNDATION GOLF CLASSIC

All proceeds benefit the TMS Foundation.

HERMITAGE G.C.

Sunday, March 12, 2000 • Hermitage Golf Course • Nashville, Tennessee

Attendees of the 2000 TMS Annual Meeting & Exhibition are invited to participate in the Third Annual TMS Foundation Golf Classic at Hermitage Golf Course. This annual fundraiser has become one of the most popular events at the conference.

Home to the L.P.G.A. Sara Lee Classic and the Tennessee P.G.A. Championship, the General's Retreat Course at the Hermitage received a Four Star Rating from Golf Digest, the highest rating in Tennessee. Lying next to the banks of the Cumberland River, the challenge and natural beauty of the course are evident everywhere. Its rolling terrain, eight lakes, and multiple tee distances provide a challenging, yet fair, golf experience.

Tournament play will be a scramble format with teams of foursomes. We will get under way with a shotgun start at 7:30 a.m. There will be prizes for Longest Drive, both men's and ladies', and Closest-to-the-Pin contests, as well as a random drawing for door prizes. A Hole-in-One Contest with a grand prize of an automobile is also planned.

129th ANNUAL MEETING & EXHIBITION TMS 2000

Fees: All fees include bus transportation to and from the course, green fees, carts, continental breakfast, refreshments, and a post- tournament barbecue luncheon.

Tournament Fee:
$150 - per golfer
$550 - per foursome

TMS Minerals • Metals • Materials FOUNDATION

The registration deadline is **January 21, 2000**, however the field is limited to 144 players, so register today!

Sponsorship opportunities are available. Please contact Cindy Wilson at (724) 776-9000, ext. 231 or Dan Steighner, ext. 210. You may also contact us via e-mail at wilson@tms.org.

This Tournament is being held to benefit the TMS Foundation.

Note: Written cancellations must be received prior to February 15, 2000. No refunds will be issued after February 15, 2000. A $30 processing fee will be charged on all cancellations.

2000 TMS FOUNDATION GOLF TOURNAMENT REGISTRATION FORM

CHECK ONE: ❑ INDIVIDUAL GOLFER $150 (INDIVIDUALS WILL BE ASSIGNED TO A FOURSOME) ❑ FOURSOME $550

NAME _____ HANDICAP/AVG. SCORE _____

ORGANIZATION _____ ADDRESS _____

CITY _____ STATE _____ COUNTRY _____

ZIP/POSTAL CODE _____ TELEPHONE _____

FAX _____ E-MAIL _____

IF REGISTERING AS A FOURSOME, THE OTHER GOLFERS ARE:

1. _____ HANDICAP/AVG. SCORE _____

2. _____ HANDICAP/AVG. SCORE _____

3. _____ HANDICAP/AVG. SCORE _____

METHOD OF PAYMENT: PAYMENT MUST ACCOMPANY REGISTRATION

❑ CHECK OR MONEY ORDER CHARGE MY: ❑ VISA ❑ MASTERCARD ❑ AMERICAN EXPRES ❑ DINER'S CLUB

ACCOUNT NUMBER _____ EXPIRATION DATE _____

CARDHOLDER'S NAME _____ SIGNATURE _____

SEND TO: **TMS FOUNDATION, 184 THORN HILL ROAD, WARRENDALE, PA 15086-7528; FAX: (724) 776-3770**