



***Let's Go to San Antonio for***  
**The 1998 TMS Annual Meeting & Exhibition**

15-19 February 1998 ★ Henry B. Gonzalez Convention Center  
San Antonio, Texas, U.S.A.

**Big Early Bird  
Registration Savings  
When You  
Register Before  
November 15, 1997!**

***See Page 1.***

# Table of Contents

General Information	
Location .....	1
Registration Information ---	1
Housing Accommodations -	1
Hotel Codes .....	2
Poster Session .....	3
Guest Hospitality .....	3
Travel and Destination Information .....	4
Student Information .....	5
Plant Tours .....	5
Optional Sightseeing Tours ---	6-7
TMS Dinner and Awards Presentation .....	8
Institute of Metals Lecture .....	9
Extraction & Processing Distinguished Lecturer .....	9
Technical Division Luncheons .....	10-11
Tutorial Luncheon Lectures	11-12
Short Course Program .....	13-18
Hume-Rothery Award Symposium .....	19
Symposia Highlights .....	19-24
Concurrent Publications ---	24-26
Exhibition '98 .....	26-28
Housing Form .....	29
Registration Form .....	31
TMS Foundation Golf Classic .....	inside back cover

**The 127<sup>th</sup> Annual Meeting & Exhibition of The Minerals, Metals & Materials Society (TMS)** was programmed with a single goal in mind — to bring you 1998's most comprehensive presentation of new knowledge and technology pertaining to the processing, design, production, and application of minerals, metals, and materials. We hope that you will find that we have achieved our goal.

During the week of February 15-19, 1998, you can join more than 4,000 science and engineering professionals, representing more than 70 different countries, who will come together for the opportunity to add to their own store of knowledge by capitalizing on the expertise and experience of their colleagues. More than 200 sessions and 1,000 individual presentations are scheduled. Whether your technical interests lie in precious metal extraction, aluminum processing, high-temperature superconductors, or just about any other materials field or metallurgical discipline, you will find programming that addresses your most pressing needs.

In addition, you will have plenty of other opportunities to build on your knowledge base by taking advantage of special lectures, tutorial presentations, plant tours, and short courses. You also can't overestimate the value of networking and socializing with colleagues from around the world.

You won't want to miss **Exhibition '98**, your opportunity for one-to-one information and hands-on examination of products and services that answer the needs of your organization. At least 160 exhibiting companies are expected to fill more than 250,000 square feet of the exhibit hall.

Adding to the excitement of the 1998 TMS Annual Meeting & Exhibition is the fact that the city of San Antonio may be one of the most enjoyable sites we have ever visited. The convenience of the facilities, the festive atmosphere of the city, the enjoyable climate, and the uniqueness of the famous Paseo Del Rio (River Walk) will combine with a host of other attractions to make everyone's meeting an enjoyable one.

**Come to the 1998 TMS Annual Meeting & Exhibition and be prepared to learn.**

**The 1998 TMS Annual Meeting & Exhibition features programming by the:**

- ★ Electronic, Magnetic & Photonic Materials Division
- ★ Extraction & Processing Division
- ★ Light Metals Division
- ★ Materials Design & Manufacturing Division
- ★ Structural Materials Division
- ★ TMS Education Committee
- ★ TMS Young Leaders Committee

*and the*

- ★ Materials Science Critical Technologies Sector of ASM International

# General Information

## LOCATION

The 1998 TMS Annual Meeting & Exhibition will take place in San Antonio, Texas. The Marriott Rivercenter and Marriott Riverwalk Hotels will be co-headquarters for the event. Technical sessions, registration, and the exhibition will take place at the Henry B. Gonzalez Convention Center.

## ADVANCED REGISTRATION

Take advantage of the discounted advance registration fees, complete the Advance Registration Form on page 31 of this brochure and return to The Minerals, Metals & Materials Society no later than **January 16, 1998**. **Advance registration is encouraged.** For your convenience, you may charge your registration fees.

## NEW FOR 1998... SPECIAL EARLY BIRD REGISTRATION FEE!

If you register for the 1998 TMS Annual Meeting & Exhibition by **November 15, 1997** you will save an additional **\$70** off the already discounted advance registration fees. This is a total savings of \$170 off the on-site fee.

**Don't miss out on this great offer. Complete the registration form in this brochure and mail it today!**

## Advance Registrant Packet Pick Up

Advance registrants should pick up their registration packets at the Henry B. Gonzalez Convention Center during the registration hours listed below. Full payment of registration fees and social function tickets must accompany the completed Advance Registration Form. For questions on advance registration, please contact:

TMS Customer Service  
420 Commonwealth Drive  
Warrendale, PA 15086-7514  
Telephone: (412)776-9000,  
ext.270

Fax: (412)776-3770  
E-mail: [csc@tms.org](mailto:csc@tms.org)

## REGISTER VIA TMS OnLine

You may now register any time day or night via the 1998 TMS Annual Meeting & Exhibition Home Page on the World Wide Web at <http://www.tms.org/Meetings/Annual-98/AnnMtg98Home.html>. TMS OnLine also provides detailed information on this and all TMS-sponsored conferences.

## Advance Registration Deadline: January 16, 1998

## AT-MEETING REGISTRATION

Registration will be held in the Henry B. Gonzalez Convention Center during the following hours:

Sunday, February 15  
9:00 a.m. - 9:00 p.m.

Monday, February 16  
7:00 a.m. - 5:00 p.m.

Tuesday, February 17  
7:00 a.m. - 5:00 p.m.

Wednesday, February 18  
7:00 a.m. - 5:00 p.m.

Thursday, February 19  
7:00 a.m. - 12:00 noon

## 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 Customer Service, 420 Commonwealth Drive, Warrendale, PA 15086-7514. No refunds will be issued after January 16, 1998. A \$30 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.

## HOUSING ACCOMMODATIONS

TMS co-headquarters hotels will be the Marriott Rivercenter and the Marriott Riverwalk. Special conference rates have been contracted at all the hotels listed below. To receive the special TMS convention rate, use the enclosed form to make your hotel reservation.

All room charges are subject to a 15% state and room tax. Triple and quad occupancy may incur additional charges.

Reservations are processed on a first-come, first-served basis until **Saturday, January 3, 1998**.

The Housing Bureau reserves the right to assign a hotel if your first choice is sold out and other choices are not indicated.

**DO NOT** fax **AND** mail your housing form, as this may result in a duplicate reservation.

An acknowledgment will either be mailed or faxed to you (allow up to two weeks) from the Housing Bureau. This is **not** a confirmation. A confirmation will follow from the **hotel** in approximately 4 - 5 weeks.

Cancellations/changes before January 2, 1998 must be made in writing to the Housing Department; after January 2, 1998 directly to the hotel. **DO NOT SEND TO TMS OFFICE.**

The Housing Bureau does not accept phone calls regarding reservations. Please mail your reservation form directly to the TMS

Housing Bureau, P.O. Box 2426, San Antonio, Texas 78298 or fax it to: 210-270-8702.

A credit card guarantee is required for all reservations. If you wish to guarantee your room with a check, you may send a first night's deposit, upon receipt of your confirmation slip, directly to your assigned hotel. **DO NOT mail cash or check with the Housing Reservation.**

**NOTE: The Housing Form does not indicate name of hotels. The form provides for six selections by code only. You must refer to this page for name of hotel, room rate and code. Refer to the numbers on the city map below for locations of various hotels.**

**STUDENT HOUSING**

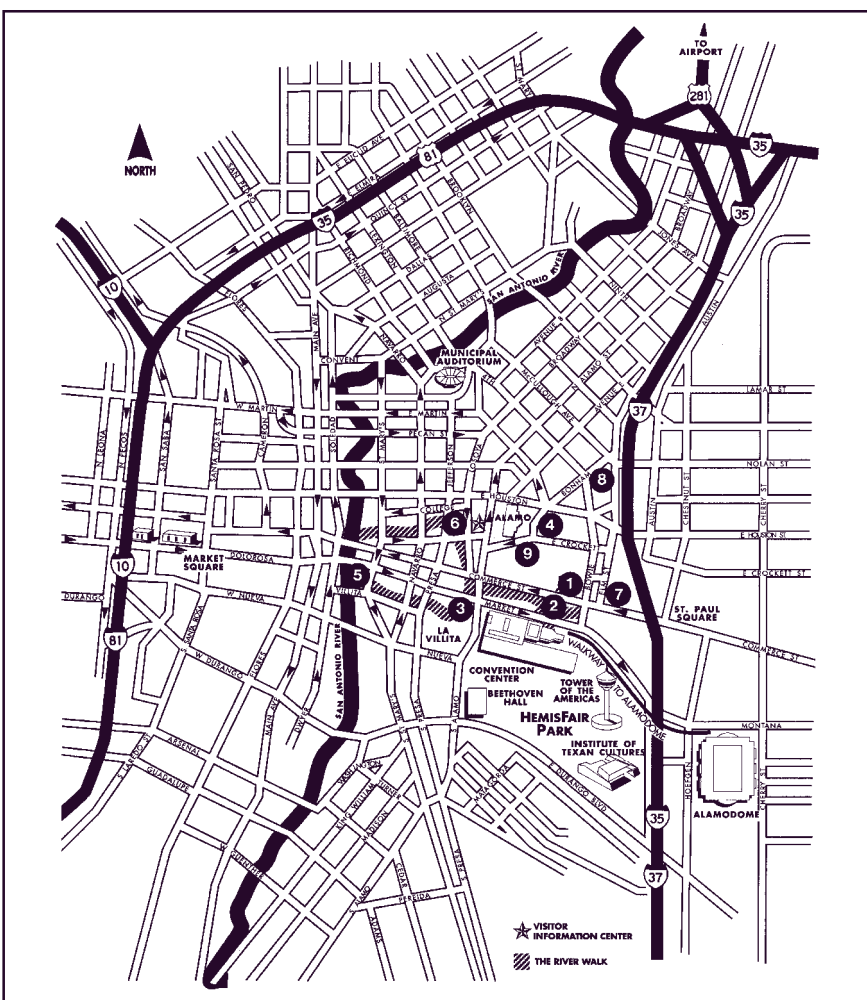
Triple and Quadruple room rates are offered at hotels listed on the housing form (rates are \$20 for each additional person per night). Please call the hotels for details.

**TECHNICAL SESSIONS**

Technical sessions will begin on Monday morning, February 16, 1998, and end on Thursday, February 19, 1997. Technical sessions will be held at the Henry B. Gonzalez Convention Center. **Abstracts will be printed in the November 1997 issue of JOM and will also be available via TMS OnLine on the World Wide Web at <http://www.tms.org/Meetings/Annual-98/AnnMtg98Home.html>.**

**AUDIO/VIDEO RECORDING POLICY**

The Minerals, Metals & Materials Society (TMS) reserves the rights 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 De-



<u>HOTEL</u>	<u>CODE</u>
(1) Marriott Rivercenter (Co-Headquarters Hotel), 101 Bowie Single \$159 ----- Double \$175 -----	MRC
(2) Marriott Riverwalk (Co-Headquarters Hotel), 711 E. Riverwalk Single \$159 ----- Double \$175 -----	SAM
(3) Hilton Palacio del Rio, 200 S. Alamo Single \$152 ----- Double \$167 -----	HPR
(4) Holiday Inn Crockett, 320 Bonham Single \$109 ----- Double \$119 Triple \$129 ----- Quad \$139 -----	HIC
(5) Homewood Suites - Riverwalk, 432 West Market Street Single \$109 ----- Double \$116 -----	HOM
(6) Hyatt Regency San Antonio, 123 Losoya Single \$158 ----- Double \$174 -----	HYR
(7) La Quinta Convention Center, 1001 E. Commerce Single \$96 ----- Double \$96 Triple \$102 ----- Quad \$102 -----	LQC
(8) Residence Inn by Marriott, 125 Bonham Single \$129 ----- Double \$129 -----	RIAP
(9) Menger, 204 Alamo Plaza Single \$99 ----- Double \$109 -----	MEN

## ATTENTION: ALL Non-member Registrants!

**Welcome!** If you attend the 127<sup>th</sup> TMS Annual Meeting and register at the non-member fee, you will automatically receive a one-year complimentary, introductory associate membership for 1998. 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 via the World Wide Web, plus an array of other personalized membership benefits and services.

You will receive 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.

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 412/776-9000 Ext. 213 or 215.

**Advance registrants:** Your 1998 TMS membership will be processed immediately. At the meeting, pick up your advance registration/new member packet and badge at the non-member advance registration area. Then, stop by the TMS Membership Desk and enter our grand prize drawing!

**On-site registrants:** Proceed directly to the non-member only registration area, where your form will be processed quickly. Receive your new member sticker/packet on the spot; then stop by the TMS Membership Desk to enter our grand prize drawing.

## **Hertz**® RENT A CAR SYSTEM

*...has been selected as the Official Car Rental Company for the 1998 TMS Annual Meeting & Exhibition*

Special rates are being offered and will be honored up to one week before or one week after the meeting dates. Rates are available for your convenience on rentals at all Hertz Corporate locations in all Texas 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 rental location) and identifying yourself as an attendee of the TMS Annual Meeting and reference the CV number which follows.

**You must give the reservations agent the Hertz Discount # 24424**

Rates being offered are as follows:

Car Class	DAILY Per Day	WEEKEND Per Day	WEEKLY 5-7 Days
A COMPACT 2DR	\$34.99	\$24.99	\$154.99
B COMPACT 4DR	\$37.99	\$26.99	\$169.99
C MIDSIZE 2/4 DR	\$40.99	\$28.99	\$184.99
D FULLSIZE 2DR	\$43.99	\$33.99	\$199.99
F FULLSIZE 4DR	\$47.99	\$35.99	\$214.99
I LUXURY	\$65.99	\$65.99	\$319.99
R MINIVAN	\$65.99	\$65.99	\$299.99

### Terms and Conditions

- UNLIMITED MILEAGE ALLOWANCE ON ABOVE RATE.
- One-way service fee will apply, when cars are not returned to renting location.
- Additional daily Charges for optional coverages (Loss Damage Waiver, Personal Accident Insurance, Personal Effects Protection, refueling and state tax) are not included in the above rates.
- Drivers must meet standard Hertz age, driver and credit requirements.
- Hertz rent a Car System is a frequent flyer partner with American Airlines, Delta, Northwest, US Airways and United. Frequent flyer information may be requested at time of car booking.
- Rate cannot be combined with other corporate or association discounts.

partment to obtain a copy of the waiver release form.

### POSTER SESSION

A poster session will be held in conjunction with the 1998 TMS Annual Meeting. Presentations will be displayed on 4 x 8 foot poster boards; no formal presentation is required. The Poster Session will begin Monday, February 16 and remain in place through Wednesday, February 18. Abstracts of 150 words or less must be submitted to TMS by **January 1, 1998**. Mail to: Peggy Weiss, TMS Poster Session, 420 Commonwealth Drive, Warrendale, PA 15086-7514; or fax to 412-776-3770.

### GUEST HOSPITALITY

A special guest hospitality area will be hosted each day of the meeting from 7:00-10:00 a.m. in the Henry B. Gonzalez 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 departure. In addition, local highlights, shopping information, transportation schedules, and dining details will be available.

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 Exhibit 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.**

### EMPLOYMENT REFERRAL BOARD

An employment referral board will be located in the TMS membership area where attendees may leave their resumes, and employers may post job open-

ings. Also look for the table-top display promoting the new TMS Resume Link service. Information and resume forms are available with the display.

## **TRAVEL AND DESTINATION INFORMATION**

### **Airlines**

San Antonio International Airport is 13 miles from the downtown River Walk area and is directly linked via expressway.

### **Highway Access**

San Antonio has major interstate freeways leading into it from every direction. All freeways lead into the central business district where the Henry B. Gonzalez Convention Center and major hotels are located.

### **Climate**

The average daytime high temperature in February is 66 degrees Fahrenheit and nighttime lows average 47 degrees.

## **AIRPORT TRANSIT SERVICE Super Van Shuttle**

Express van service from 6:00 a.m. to 6:45 p.m. departs both terminals every 15 minutes. From 6:45 p.m. until 12:00 midnight, vans depart every 45 minutes. Departure from all designated hotels downtown will be on a request basis.

Fares: \$6.00 adults

\$3.00 children (age 5-11)

### **Taxicab**

Metered service. Time to the central business district is approximately 15 minutes, with fares averaging about \$12-\$14 plus tip.



***Fly American Airlines Official Co-Carrier***

## **1998 TMS ANNUAL MEETING & EXHIBITION San Antonio, Texas**

American Airlines, in cooperation with TMS, is offering special discount fares for attendees traveling on American Airlines to the 1998 TMS Annual Meeting & Exhibition. The special offer for meeting attendees allows for 15% off American's regular (Y26) coach fare. Travel to and from San Antonio must be between February 12-22, 1998. Reservations must be made and tickets issued at least 7 days prior to your departure.

These special fares are available only through the number listed below for American's Meeting Services Desk. Reservations for any other American published fare can be made with a 5% discount savings (all fare tariff rules apply as published). Note that your travel on American Airlines will ultimately benefit TMS. These discounts only apply to attendees from the Continental USA, Hawaii, San Juan, St. Thomas, St. Croix and Canada.

### **FOR RESERVATIONS AND INFORMATION:**

**Call Toll Free 1-800-433-1790**

*from anywhere in Canada and the USA*

*7 days a week from 7:00 AM to 12:00 Midnight, Central Time*

**Ask for Star Number 10162**

---

## **U-S AIRWAYS**

US Airways agrees to offer an exclusive low rate for the attendees traveling to The 127<sup>th</sup> TMS Annual Meeting & Exhibition. This special fare will offer a 5% discount off First Class and any published US Airways promotional round trip fares. A 10% discount off unrestricted coach fares will apply with 7 day advance reservations and ticketing required. These discounts are valid providing all fare rules and restrictions are met and is applicable for travel from the Continental United States, Bahamas, Bermuda, Canada and San Juan PR. Meeting discounts are not combinable with other discounts or promotions.

Additional restrictions may apply on international travel.

**OFFICIAL CO-CARRIER**  
**The 127<sup>th</sup> TMS Annual Meeting & Exhibition**

For Reservations Call US Airways Meeting and Convention Reservation Office

**1-800-334-8644**

8:00 AM - 9:00 PM (Eastern Time)

Refer to GOLD FILE NUMBER #34200049

Once your reservations are confirmed, we will mail the tickets to you or suggest several other convenient methods of purchase.

If you normally use the services of a travel agent or corporate travel department, please have them place the call so that they may obtain the same advantages for you. The special meeting fare is only available through the Meeting and Convention Reservation Office.

# Student Information

The 1998 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 student and professionals in their fields.

## Non-Member Students Get a Free Year of TMS Membership!

Student members of TMS may attend the technical sessions, exhibits and lectures held Monday through Thursday for \$40. Registration for students who are not members is \$60, which will be applied toward a 1998 TMS Student Membership.

## Fiesta '98 Student/Faculty Mixer Sponsored by the TMS Student Affairs Committee

Sunday, February 15, 1998  
7:30 p.m. - 9:30 p.m.

The traditional TMS Student/Faculty Mixer is scheduled for Sunday evening, February 15, from 7:30 p.m. to 9:30 p.m. Beer\*, soft drinks and snacks will be provided.

This year's Mixer features a Southwestern Fiesta-style party. All attendees should come in casual attire, prepared for an evening full of fun! We'll dance to the DJ and have plenty of prizes. Watch your student chapter mail for further details.

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

## Student 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 of their scheduled sessions. Monitors' positions are limited and will be assigned on a first-come basis. To obtain work forms and schedule, contact Peggy Weiss, TMS, 420 Commonwealth Dr., Warrendale, PA 15086, Telephone: 412-776-9000, ext. 227, Fax: 412-776-3770, Email: weissp@tms.org. The deadline to submit completed work forms is **January 9, 1998**.

**Come... meet some old friends and make some new ones!**

## YOUNG LEADERS

All TMS members under age 35 are welcome to attend the Young Leaders Business Meeting from 4:00-5:30 p.m., and Reception from 5:30-6:30 p.m., on Sunday, February 15, 1998, in the Marriott Rivercenter Hotel.

## Plant Tours

Advance registration for these tours is strongly recommended, as seating is limited. You may register for the plant tours via the conference registration form found in this brochure. All tours depart from the Henry B. Gonzalez Convention Center in San Antonio.

### Zeotech Corporation Thursday, February 19 Fee: \$30 (fee includes box lunch)

Zeotech Corporation mines and processes a unique zeolite mineral ore near Tilden, Texas, approximately 80 miles south of San Antonio. The ore is composed of the zeolite mineral, clinoptilolite, and lesser amounts of montmorillonite clay. This distinctive

mineral ore contains pore spaces within each zeolite crystal. The pore spaces and large surface area make an ideal product for moisture absorption, filtration, absorption of selected ions from waste water streams and a carrier for many chemical compounds.

Activities at the Zeotech facility include the mining, crushing, screening, drying, and packaging of clinoptilolite ore. They also modify the zeolite ore to make organo-zeolites and other products for environmental applications.

The tour of the quarry and processing facility will last approximately one and one-half hours and the bus trip approximately two hours each way.

### Southwest Research Institute Thursday, February 19 Fee: \$25

Get an inside glimpse into materials research and development activities at Southwest Research Institute, just outside San Antonio, Texas. Institute projects encompass the formulation and synthesis of new materials, evaluation of their performance under service conditions, and assessment of the remaining useful life of critical components. Composites, metals, polymers, ceramics, cements, and adhesives are some of the materials being evaluated. An integrated approach to structural mechanics embraces the analysis, design, and testing of a variety of aerospace, land, and sea-based structures.

# Optional Sightseeing Tours

Operated by Destination: San Antonio

**Sunday, February 15, 1998**

## **Half Day San Antonio Tour**

1:00 - 4:30 p.m.

Cost per person: \$22

An introductory city tour that attempts to meld the two most influential cultures that took a major role in shaping the early days of our city - Spain and Germany. The most important historical building, The Alamo, is our first stop, followed by visits to the Southwest Craft Center, the King William Historic District, Mission San Jose, and El Mercado - the Mexican Market, with lunch at a restaurant in the Market. A great way to get to know San Antonio, it's history and it's people!

**Monday, February 16, 1998**

## **Spain and San Antonio Tour**

9:00 a.m. - 12:00 noon

Cost per person: \$20

The San Antonio of today still reflects the influence of the Spanish adventure into the New World. Claimed by Spain, inhabited by Indians and dominated by nature's beauty, Texas still maintains a magical spirit of large expanse and human challenge. Our stops today include The Alamo, Mission San Jose, San Fernando Cathedral and the Spanish Governor's Palace.

## **New Braunfels and Gruene Tour**

9:30 a.m. - 3:00 p.m.

Cost per person: \$52

A short ride takes us to the Hummel Museum to see the beautiful charcoals, pastels and oils lovingly created by Sister Maria Innocentia Hummel, a nun who lived in Germany during

World War II. We continue to a beautiful spot on the Guadalupe River, Gruene, Texas (pronounced "Green"). We will have lunch at The Grist Mill, followed by time to shop the antique stores and pottery shops in a town that time forgot. Gruene is the site of the oldest dance hall in Texas, Gruene Hall.

**Tuesday, February 17, 1998**

## **Hill Country Adventure**

9:00 a.m. to 5:00 p.m.

Cost per person: \$52

Early morning departure takes you to the LBJ National Historical Site and the State Historical Park. You will gain a new perspective of our late President Johnson here. You will see the school he attended as a child and visit the Johnson family burial site. Mrs. Lady Bird Johnson still resides at the ranch. We continue to a well-known spot in the road, Luckenbach, Texas, which can be easily missed, so don't blink your eyes too fast! Our next stop is the town noted for its strong German Heritage, Fredericksburg. With wide streets, enough to accommodate a 16 horse team turning around, this frontier town is brimming with antique stores and quality restaurants. We will enjoy a German-style lunch, with time for shopping and browsing, or visiting the Admiral Nimitz State Historical Park and Museum of the Pacific War.

## **Northern San Antonio Tour**

9:00 am- 1:00 p.m.

Cost per person: \$22

The military has played an active role from the earliest times when Spanish soldiers came through

here in the late 1500's. The largest military complex of its kind during the 1870's was Fort Sam Houston. Our first stop at Ft. Sam is the Quadrangle, home to deer and peacocks and the former living quarters for a captured Indian, Geronimo. We will drive past General's Row to spot homes once occupied by various military leaders of distinction, General Eisenhower and General MacArthur. We continue to the peaceful Botanical Gardens, with exotic plants and flora from around the world. Next we visit a Mediterranean villa housing the McNay Museum of Art, with originals from Calder to Picasso. Our last stop is San Antonio's "other riverwalk", Los Patios shopping at the specialty stores offering unique and unusual items.

**Wednesday, February 18, 1998**

## **Outlet Mall Shopping**

9:00 a.m. - 3:00 p.m.

Cost per person: \$25

San Marcos Outlet Mall and Tanger Outlet Mall are adjacent to each other, and are only 45 minutes North of San Antonio, offer shopping at over 150 factory outlet stores. A food court offers sustenance for the shopping-weary! Here you can definitely shop 'til you drop!

**Thursday, February 19, 1998**

## **Europe, Texas Style**

1:00 - 4:30 p.m.

Cost per person: \$25

Germans once out-numbered Hispanics in San Antonio during the mid-1800's. Germans seeking freedom and fortune founded several communities around San



Antonio which thrive to this day. Here we shall visit the Institute of Texan Cultures to see how 30 diverse cultures shaped the Texas character. Then we visit the Southwest Craft Center, formerly an old French girls school, it is now a thriving art center. The King William Historic District contains blocks of Victorian mansions constructed by successful German families. We shall step inside the Steves Homestead to see how they lived in the late 1800's.

*NOTE: All tours are priced based on a minimum of 35 participants per motorcoach. Destination: San Antonio reserves the right to re-price or cancel the tour if participation falls below 35. Participants may cancel with a full refund up to 7 days prior to tour operation without penalty. A cancellation after 7 days will result in a 50% cancellation fee. A cancellation within 48 hours of the tour operation will result in no refund to participant. Full refunds will be given to participants if tour is canceled by Destination: San Antonio.*

Tour confirmations will be sent within 10 days of receipt of reservation form. Actual tour tickets will be available at the Tour Registration Desk in the Convention Center during registration hours. See page 1 for registration hours.

**Liability:**

A. In all matters relating to making of arrangements for hotel and/or motel accommodations, sightseeing tours and services provided incident thereto, entertainment, and transportation by air, railroad, motor bus, automobile or steamship, Destination: San Antonio, Inc. will act only in the capacity of agent for the suppliers of travel services.

B. Because of its status as an agent, and because it maintains no control over the personnel,

equipment or operation of these travel service suppliers, Destination: San Antonio, Inc. assumes no responsibility for and shall not be held liable for any personal injury, property damage, or other loss, accident delay, inconvenience, or irregularity which may be occasioned either by reason of (1) any wrongful or negligent acts or omissions on the part of any of

the suppliers, (2) any wrongful, negligent, unauthorized acts or omissions on the part of any vehicle equipment or instrumentally owned, operated or otherwise used by any of these suppliers, or (3) any wrongful or negligent acts or omissions on the part of any other party not under the control, direct or otherwise, of Destination: San Antonio, Inc.

## Optional Sightseeing Tours

### Official Tour Registration Form

MAIL THIS FORM ALONG WITH CHECK OR MONEY ORDER TO:  
 DESTINATION: SAN ANTONIO, 110 BROADWAY, SUITE 440,  
 SAN ANTONIO TX 78205

<u>TOUR COST PER PERSON</u>	<u>COST</u>	<u>NUMBER OF TICKETS</u>	<u>TOTAL</u>
<b style="color: red;">Sunday, February 15, 1998</b>			
Half Day San Antonio Tour (1:00 - 4:30 pm) -----	\$22.00	x	_____
<b style="color: red;">Monday, February 16, 1998</b>			
Spain and San Antonio Tour (9:00 am-12 noon) -----	\$20.00	x	_____
New Braunfels & Gruene Tour (9:30 am-3:00 pm) -----	\$52.00	x	_____
<b style="color: red;">Tuesday, February 17, 1998</b>			
Hill Country Adventure (9:00 am-5:00 pm) -----	\$52.00	x	_____
Northern San Antonio Tour (9:00 am-1:00 pm) -----	\$22.00	x	_____
<b style="color: red;">Wednesday, February 18, 1998</b>			
Outlet Mall Shopping (9:00 am-3:00 pm) -----	\$25.00	x	_____
<b style="color: red;">Thursday, February 19, 1998</b>			
Europe, Texas Style (1:00 -4:30 pm) -----	\$25.00	x	_____

TOTAL AMOUNT (US DOLLARS ONLY):                    \$ \_\_\_\_\_

PLEASE PRINT NAME(S): \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_

ZIP: \_\_\_\_\_ TELEPHONE: (    ) \_\_\_\_\_

FAX: \_\_\_\_\_ E-MAIL: \_\_\_\_\_

SAN ANTONIO HOTEL: \_\_\_\_\_

# TMS Dinner and Awards Presentation with Installation of 1998 TMS President

The Annual TMS Dinner and Awards Presentations will be held at 7:00 p.m. Tuesday February 17, 1998 at the Marriott Rivercenter. This highlight of the TMS Annual Meeting will begin with a cash bar reception at 6:00 p.m. and dinner at 7:00 p.m. A presentation and recognition of the Society and Technical Division award recipients will be followed by the annual address to the Society by 1997 President Robert H. Wagoner, who will then introduce Euel R. Cutshall, the 1998 President. Tickets may be purchased either in advance through the TMS Advance Registration Form or at the meeting registration desk.

Euel R. Cutshall is manager of Manufacturing Technology Laboratory of Reynolds Metals Company. He earned his B.S. in chemistry and mathematics from the University of North Alabama in 1972 and his Ph.D. in physical chemistry from the University of Florida in 1977.

At Reynolds Metals Company, he is responsible for R&D activities dealing with extractive metallurgy, process



**Robert H. Wagoner**  
1997 TMS President



**Euel R. Cutshall**  
1998 TMS President

Alabama.

Dr. Cutshall's research interests include the fields of carbon anode technology and environmental science. He was instrumental in developing the Reynolds spent potliner treatment process, which is currently being commercialized at the company's facilities in Gum Springs, Arkansas. He holds several patents and is the author of numerous articles.

He has served as chair of the Light Metals Division and on the Division's Aluminum Committee as well as Light Metals Division Council. He has also been a member of Society's Honors and Awards, Membership Development, and Programming Committees.

metallurgy and optimization, process automation, data acquisition and analysis, materials science pertaining to carbon electrodes and refractory materials, chemical engineering, environmental science, and waste material recycle and recovery. Prior to joining Reynolds Metals Company, he served as an officer in the U.S. Army, being trained at the army's chemical school at Fort McClellan in

## Award Recipients

### **Fellow Class of 1998**

Richard J. Arsenault,  
University of Maryland

Ye T. Chou, Lehigh  
University

Siegfried S. Hecker,  
Los Alamos National  
Laboratory

Ryoichi Kikuchi,  
University of California,  
Berkeley

James C. Williams,  
G.E. Aircraft Engines

### **Application to Practice Award**

Francois M. d'Heurle, IBM  
Thomas J. Watson  
Research Center

### **John Bardeen Award**

Subhash Mahajan,  
Carnegie Mellon University

### **Bruce Chalmers Award**

Robert F. Sekerka,  
Carnegie Mellon University

### **Distinguished Service Award**

Fiona M. Doyle,  
University of California,  
Berkeley

Garry G. Warren,  
University of Alabama

### **Educator Award**

Reza Abbaschian,  
University of Florida

### **Robert Lansing Hardy Award**

Stuart A. Maloy,  
Los Alamos National  
Laboratory

### **William Hume-Rothery Award**

Ryoichi Kikuchi,  
University of California,  
Berkeley

### **Institute of Metals Lecturer/Robert F. Mehl Medalist**

Paul G. Shewmon,  
Ohio State University

### **Leadership Award**

Gordon H. Geiger,  
Qualitech Steel Corporation

### **Champion H. Mathewson Award**

Charles Vives,  
University of Avignon

### **Extraction & Processing Distinguished Lecturer Award**

Michael J. Nicol,  
Murdoch University

### **Extraction & Processing Technology Award**

(To be announced)

### **Extraction & Processing Science Award**

Mark D. Pritzker,  
University of Waterloo

### **Light Metals Paper Award - 1997**

(To be announced)

### **Structural Materials Distinguished Scientist/ Engineer Award**

(To be announced)

### **JOM Best Paper Award - 1997**

(To be announced)

### **Light Metals Technical Service Award**

(To be announced)

### **Structural Materials Distinguished Service Award**

(To be announced)

## 1998 Institute of Metals Lecture and Robert F. Mehl Medalist

### About the topic:

Engineers and scientists have known that alloys often come apart at grain boundaries for at least a thousand years. The control of such failures has played an important role in corrosion, high temperature alloys, and steel pressure vessels, to mention only a few. The importance of trace impurities will be emphasized in a sketch of the history of our knowledge of such fractures.

### About Prof. Shewmon:

Dr. Shewmon studied Metallurgical Engineering at the University of Illinois (B.S. 1952) and Carnegie Institute of Technology (Ph.D 1955). His first job was at the Westinghouse Research Laboratory where he studied thermal diffusion in alloys and surface diffusion. In 1958 he moved to Carnegie Institute of Technology where he served as a professor until 1967. The text 'Diffusion in Solids' was published in 1963. A NSF Fellowship was used to study in Prof. C. Wagner's Max Planck Institute (Goettingen, Germany) in 1963.

From 1968 to 1973 he was at Argonne National Laboratory, serving successively as Associate Director of the Metallurgy Division, Associate Director of the EBR-2 Project, and Director of the Materials Science Division. The text 'Transformations in Metals' was published in 1969. Materials behavior in fast breeder reactors was the main theme of his work during this period.

He was the Director of the Division of Materials Research at the National Science Foundation from 1973 - 1975. From 1975 to 1993 he was Professor at Ohio State University in the Department of Metallurgical Engineering (later Materials Science and Engineering), serving as chairman from 1975 to 1983. Research interests during this period were hard particle erosion and hydrogen induced cracking of steel (hydrogen

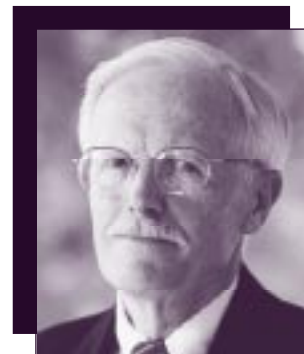
### Lecturer:

Prof. Dr. Paul Shewmon  
Prof. Emeritus  
Ohio State University

### Topic:

Grain Boundary Fracture

**Wednesday, February 18  
12:00 Noon**



attack'). From 1977 to 1993 he served on the Advisory Committee on Reactor Safety for the U.S. Nuclear Regulations Committee, serving a Chair for 3 of those years.

Dr. Shewmon was elected to the National Academy of Engineering in 1979, and has been awarded the standing of Fellow in the TMS, ASM, ANS, and AAAS. He has received several outstanding paper awards (Noble-AIME, Raymond-TMS, Mathewson-TMS, and Howe-ASM). He received the Distinguished Alumnus Award of the University of Illinois in 1981 and in 1984 a Humboldt Foundation Senior Scientist Prize.

## 1998 Extraction & Processing Distinguished Lecturer

### About the topic:

The extraction, separation, purification and production of metals from their ores, concentrates, mattes and other intermediate and recycled materials by means of processing in aqueous solutions has become an increasingly important technology. It has evolved from a largely empirical base to a sophisticated discipline requiring the interaction of scientists with chemical, physics, mineralogical, and materials expertise with extractive metallurgists and chemical, control, and environmental engineers. The interdisciplinary development, implementation and operation of hydrometallurgical processes will be sketched with examples from the author's experience and some ideas generated for possible future directions of this exciting discipline.

### About Dr. Nicol:

#### Professional Experience:

7/97-Present

Chair of Mineral Science, Professor of Hydrometallurgy

Murdoch University, Perth, Australia

5/94-7/97

Professor of Chemical and Metallurgical Engineering University of Witwatersrand, Johannesburg, South Africa

1/71-3/94

Council for Mineral Technology Randburg, South Africa

8/67-12/70

Lecturer: Chemistry University of Natal, Durban, South Africa

9/65-7/67

Assistant Professor: Chemistry Purdue University, West Lafayette, Indiana, USA

9/64-9/65

Post-Doctoral Research Fellow: Chemistry

### Lecturer:

Michael J. Nicol  
Murdoch University

**Topic:** "Hydrometallurgy - The Crossroads of Science and Engineering"

**Tuesday, February 17  
1:45 p.m.**



Texas A & M University, College Station, Texas, USA

### Awards and Scientific Recognition:

1985—Gold Medal of the South African Institute of Mining and Metallurgy

1982—Intel Gold

- Over 90 publications, conference proceedings and patents

## TMS MDMD/SMD/IMM Luncheon

### About the topic:

Throughout the years the plastics technologists have discovered a number of ways in which to make notch brittle polymers tough by mostly empirical approaches based on often charming but untenable propositions that offer little predictive capability for further improvement. While the basic directions to be taken are remarkably simple, full explanations can be quite beautifully complex and may require a full complement of high power research techniques to satisfactorily establish their validity. A few dramatic examples will be presented.

### About Mr. Argon:

Ali S. Argon (ScD) Quentin Berg Professor of Mechanical Engineering at

the Massachusetts Institute of Technology, has experimentally studied and theoretically modeled inelastic deformation and fracture mechanisms in most engineering materials and model solids - with considerable recent emphasis on solid polymers.

He has published extensively on the above subjects and received a number of awards. He is a fellow

### Sponsored by:

TMS Materials Design & Manufacturing Division, Structural Materials Division, and Institute of Mechanics and Materials

### Speaker:

Ali S. Argon  
Massachusetts Institute of Technology

**Topic:** "Contributions to Manufacturing Through the Mechanics/Materials Linkage"

**Monday, February 16, 1998  
12:00 Noon**



of the American Physical Society and a member of the National Academy of Engineering.

## Extraction & Processing Division Luncheon

### About the topic:

The talk will provide a brief overview of the Rare Earths Industry, describing the balancing required to separate and produce products from ores that contain 15 or more marketable elements. Several applications will be selected to highlight how products made from separated rare earths, such as magnets, colored pigments and new catalytic materials that contribute to our modern life, were developed by adapting processes to achieve unique performance properties.

### About Dr. Bounds:

Dr. Bounds began his industrial research and development career with St. Joe Minerals Corporation in 1971, progressing from Team Leader to Manager of Extractive

Metallurgy Research. His principal technical activities included Process Analysis/Development and Mineral Economics of Zinc, Lead, Gold and related materials. Chuck remained with St. Joe until 1987 when the company was split into parts and sold.

From 1987 to 1989 he worked for Horsehead Industries as Director of R&D, focusing on the exploitation of the Flame Reactor, a flash smelting device for waste processing.

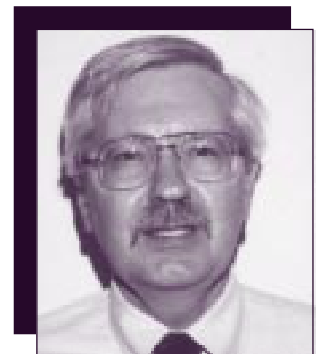
### Speaker:

Charles O. Bounds  
Rhone-Poulenc

### Topic:

"The Rare Earths: Enablers for Modern Living"

**Tuesday, February 17  
12:00 Noon**



In 1989 Chuck joined the Rare Earths and Gallium Enterprise of Rhone-Poulenc to start-up an R&D activity to support the operation and growth of a metal and alloy plant, recently acquired from Nucor. As the Director of North American R&D for Enterprise, Chuck is now responsible for the R&D for the chemical as well as the alloy product line.

## Light Metals Division Luncheon

### About the topic:

The talk and slide presentation will be a history of the beverage can starting in the 1930's with the cone top can to the emergence of the three-piece can of the 1950's, to the early version of the aluminum two-piece can, to today's lightweight aluminum beer and beverage can. The talk will also look at the competition between steel and aluminum, opinions on where we are in the lifecycle of the can and a glimpse of what the can of the future may look like, as well as what we need to do to keep the can in the mainstream of beer and beverage packaging.

### About Mr. Nieder:

Norm is originally from Pittsburgh, Pennsylvania. There he attended

Duquesne University where he majored in Physics and minored in Mathematics. He also has a degree in Business Management from LaSalle University.

For the last 14 years Norm has been employed by Anheuser-Busch, where he is Director of the Packaging Technology Department. His group has total responsibility for all of the packaging specifications used by the Anheuser-Busch Company worldwide.

Norm is past President of the National

### Speaker:

Norman F. Nieder  
Anheuser-Busch, Inc.

**Topic:** "Tracing the History of the Beverage Can"

**Wednesday, February 18  
12:00 Noon**



Beverage Packaging Association, and was a professional member of the Packaging Institute. He is listed in the Who's Who of Packaging. He also serves on the editorial board of the *Canmaker Magazine*, a world-wide publication published in Great Britain. Norm has authored many articles on packaging technology.

## 1998 TMS Annual Meeting & Exhibition Tutorial Luncheon Lectures

TMS will once again present its extremely popular Tutorial Luncheon Lecture Series at the Annual Meeting on Monday, February 16, 1998. This series offers an informal seminar atmosphere for expert presentations on subjects designed either as theoretical re-

view or as informal discussion of experimental techniques and leading edge scientific advancements. The lecture format includes optional "brown bag" lunch for \$15, which should be purchased in advance using the

Registration Form. 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.

## "The Role of Minerals in Papermaking and Paper Recycling"

White minerals and inorganic chemicals derived from minerals play an important role in papermaking. The primary minerals used include kaolin, calcium carbonate, magnesium silicates (tal), and titanium dioxide.

As a result of being important paper ingredients, these minerals have a significant impact on recycling. Recycling concerns include:

- Should the minerals be separated from the cellulose fibers? This depends on the type of paper to be made from the recycled cellulose fibers. If they are not separated, what is their effect on papermaking?
- When separating minerals from cellulose fibers, what unit operations are used? How can the efficiency of mineral separation be improved?
- How can the separated minerals be used or disposed of in an environ-

mentally acceptable manner?

The answers to these questions will be discussed.

### About the presenter:

John Borchardt received his B.S. degree in chemistry from the Illinois Institute of Technology and his Ph.D. in organic chemistry from the University of Rochester. After two years post-doctoral research at the University of Notre Dame, he began working for Hercules, Inc. as a synthetic organic chemist. He began working for Halliburton Services in 1977. There he worked on the development of water-soluble polymers for various oilfield applications. In 1984, he

**Sponsored by the  
TMS Young Leaders  
Committee**

### Presenter:

John K. Borchardt,  
Shell Chemical Company

**Monday, February 16  
12:00 Noon - 1:30 p.m.**



began working for Shell Development Company. There he has worked on surfactant development for paper industry, oil industry, industrial cleaning, and household cleaning applications.

Borchardt is the author of more than 80 scientific and technical publications and holds 29 U.S. and more than 100 foreign patents.

## “Perspectives on Industry-University Cooperative Research Centers”

Research programs at both industrial research laboratories and academic institutions have changed significantly over the past several years. Industry-university cooperative research centers (I/UCRC) offer unique opportunities to support the needs of both industries and universities. In this presentation, the operation and management of the Advanced Steel Processing and Products Research Center (ASPPRC), which was established in 1984 through the NSF I/UCRC program, will be reviewed from both the industrial and academic perspectives. ASPPRC is a center with 23 corporate sponsors and is dedicated to ferrous metallurgy with research focused to manufacturing industries which both use and produce steel. Corporate participants include steel producers, automotive manufactures, heavy equipment companies, and component and parts suppliers. Observations with respect to successes and pitfalls in

center operations will be discussed and summarized to provide insights to those interested in establishing centers in other disciplines.

### About the Presenters:

Dr. Joseph D. Defilippi is currently the Division Manager of Materials Technology and Services for U. S. Steel Research. Educated at Carnegie Mellon University, he has contributed to development of a number of significant new products throughout his career, most recently high strength riser pipe and API 2Y-50 steel for offshore applications. He serves on the Advisory Boards of four universities and is currently the Financial Officer of TMS.

Dr. Matlock received his B.S. degree in engineering science from the University of Texas at Austin, and his M.S. and Ph.D. degrees in materials science and engineering from Stanford University.

**Sponsored by the TMS  
Continuing Education  
Committee**

### Presenters:

Joseph D. Defilippi, USS  
Technical Center  
David K. Matlock,  
Colorado School of Mines

**Monday, February 16  
12:00 noon - 1:30 p.m.**

He is the Armco Foundation Fogarty Professor in the Department of Metallurgical and Materials Engineering at Colorado School of Mines (CSM), Golden, Colorado and the Director of the Advanced Steel Processing and Products Research Center, an industry-university cooperative research center at CSM.

## “Advanced Rechargeable Batteries: A Materials Science Perspective”

The market for rechargeable batteries is estimated to be \$1 billion by the year 2000 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 lecture 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*; *lithium ion*; *lithium solid poly-*

*mer 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 a professor of materials chemistry in the Department of Materials Science and Engineering at the Massachusetts Institute of Technology. He obtained the BAsC in engineering science, the MASc in chemical metallurgy, and the PhD in chemical metallurgy, from the University of Toronto. After a year of post-doctoral study at MIT as a NATO Fellow, Dr. Sadoway joined the faculty in 1978. The author of over 65 scientific papers and holder of 9 US patents, his principle research inter-

**Sponsored by the TMS  
Continuing Education  
Committee**

### Presenter:

Donald R. Sadoway,  
Massachusetts Institute  
of Technology

**Monday, February 16  
12:00 noon - 1:30 p.m.**

ests are high-temperature physical chemistry, electrochemical processes in molten salts, and their use in environmentally sound technologies for the extraction, refining and recycling of metals.

# 1998 TMS Annual Meeting & Exhibition

## Short Course Program

The Minerals, Metals & Materials Society (TMS) will conduct a selection of 9 learning intensive courses designed to enhance your technical and professional expertise.

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  
Education Department  
420 Commonwealth Drive  
Warrendale PA 15086 USA  
Telephone: 412-776-9000  
ext. 226 and 245  
Fax: 412-776-3770  
E-mail: bradel@tms.org

### REGISTRATION

To register for a course, please use the registration form in this brochure. All courses will be held at the Marriott Rivercenter Hotel, San Antonio, Texas the weekend prior to the meeting, Saturday and Sunday, February 14 and 15, 1998.

You may register any time prior to the Annual Meeting and on site, but if you register by the advanced registration deadline of January 16, 1998, 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 course 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, 420 Commonwealth Drive, Warrendale PA 15086 postmarked no later than January 16, 1998. 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. No refunds will be issued after the January 16, 1998 deadline.

*Note: A tax deduction can be taken for all expenses of continuing education (including registration fees, travel, meals, and lodging) undertaken to maintain and improve professional skills. For more information concerning applicability, contact the Internal Revenue Service.*

---

### "Influence of Raw Materials on the Properties of Anodes & Their Behavior in the Hall-Heroult Cells"

**Saturday, February 14**  
**8:30 a.m. - 5:00 p.m.**

**Sponsored by:**  
TMS Light Metals Division

**Presented by:**  
Markus Meier, R&D Carbon Ltd.

**Fees:** \$425 AIME Member  
\$510 Nonmember

#### Who Should Attend:

This course is intended for plant managers, superintendents, and process and plant production engineers who are involved with reduction and anode plant operations. It is also intended for graduate level students in chemical, metallurgical and mechanical engineering with a special interest in the aluminum industry.

#### Course Overview:

The course will begin with an overview of world aluminum production and costs for aluminum and anode production. Then the course will outline different process steps and describe the influence of raw materials, such as petroleum coke,

coal tar pitch and anode butts on the properties of anodes and their behavior in Hall-Heroult cells. Anode manufacturing, in particular green anode production, anode baking and quality control will also be discussed in detail.

#### About the Presenter:

After graduation as a mechanical engineer at the Institute of Technology in Zurich in 1991, Dr. Markus Meier joined R&D Carbon Ltd. to write a dissertation about the cracking of anodes used for the aluminum production. He completed this thesis in 1995 and published his first book "Cracking Behavior of Anodes." Dr. Meier now works as a Research and Project Engineer at R&D Carbon Ltd. in Switzerland and is a member of TMS.

---

### "Molten Salts: Bath Chemistry and Process Design in Aluminum, Magnesium, & Lithium"

**Saturday, February 14**  
**8:30 a.m. - 5:00 p.m.**

**Sponsored by:**  
TMS Light Metals Division

**Presented by:**  
Georges J. Kipouros,  
Dalhousie University  
Donald R. Sadoway, Massachusetts  
Institute of Technology

**Fees:** \$425 AIME Member  
\$510 Nonmember

#### Who Should Attend:

The course is designed for those wishing to learn (1) the fundamentals of this unique class of liquids and (2) how molten salts are utilized in a number of representative industrial applications.

#### Course Overview:

The course begins with a comprehensive overview of the field of molten salts including resources in the literature, databases, etc. Then, using as case studies the electrolytic production of aluminum (Hall-Heroult), magnesium (anhydrous),

and lithium, the course presents the physical and chemical properties of molten salts and discusses how to tailor bath chemistry in order to meet the requirements of process design. The course ends with a clinic, i.e. an open forum in which the instructors field questions from the participants. A complete set of notes along with an exhaustive bibliography will be provided.

#### **About the Presenters:**

Before joining the faculty of Dalhousie University (formerly Technical University of Nova Scotia) in 1989 where he is presently a professor and department head of the mining and metallurgical engineering department, George J. Kipouros was a senior research scientist at the General Motors Research Laboratories in Warren, Michigan.

Donald R. Sadoway is a professor of materials chemistry in the Department of Materials Science and Engineering at the Massachusetts Institute of Technology. The author of over 65 scientific papers and holder of 9 US patents, his principle research interests are high-temperature physical chemistry, electrochemical processes in molten salts, and their use in environmentally sound technologies for the extraction, refining and recycling of metals. In 1995 he was named a MacVicar Faculty Fellow, MIT's highest award for excellence in undergraduate education.

---

### **“Safe Practices for Handling Molten Aluminum”**

**Sunday, February 15  
8:30 a.m. - 5:00 p.m.**

**Sponsored by:**  
TMS Light Metals Division

**Presented by:**  
John E. Jacoby, consultant  
Seymour G. Epstein,  
Aluminum Association, Inc.

**Fees:** \$425 AIME Member  
\$510 Nonmember

#### **Who Should Attend:**

This 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 explosions.

A lecture/discussion format reinforced by videotapes of actual molten aluminum explosions and explosion scenes 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 the extensive safety programs of the Aluminum Association. **Participants are encouraged to bring their specific safety questions and concerns to the session for discussion.**

#### **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. 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 more than 25 years and has been intimately involved with the industry's research on causes and prevention of molten metal explosions. Mr. Epstein has authored more than 30 papers on aluminum and the aluminum industry.

### **“Coal: Laboratory Testing”**

**Sunday, February 15  
8:30 a.m. - 5:00 p.m.**

**Sponsored by:**  
TMS Extraction & Processing Division

**Presented by:**  
Henry E. Francis,  
University of Kentucky, Kentucky Geological Survey

**Fees:** \$425 AIME Member  
\$510 Nonmember

#### **Who Should Attend:**

This course is directed to those with little or no formal training in coal analysis/basic sciences or those desiring a review. It is suggested that laboratory technicians, coal broker and civil/mining engineers attend.

#### **Course Overview:**

The primary objective of this short course is to provide an introduction and review of the techniques of coal analysis, with emphasis on ASTM procedures. Specifically, the course will address analytical and applied chemistry and procedural difficulties.

A combination of lecture, audio-visual materials and hands-on exercises will be used to teach the course. Each participant will be given a packet of information for future reference.

#### **About the Presenter:**

Henry Francis is laboratory manager of the Laboratory Services Section of the Kentucky Geological Survey at the University of Kentucky and a member of ASTM committee D05 on Coal and Coke, D19 on Water and E11 on Quality and Statistics.

---

### **“Copper Converting Practices”**

**Saturday, February 14 thru Sunday, February 15  
8:30 a.m. - 5:00 p.m.**

**Sponsored by:**  
TMS Extraction & Processing Division

**Presented by:**  
Tony Eltringham, Vice-President Special Projects for BHP Copper and an international team of presenters.



**Fees:** \$375 AIME Member  
\$460 Nonmember

**Who Should Attend:**

Previously offered at the spring SME meeting, this course will emphasize the practical aspects of current converting operations along with developments away from the Peirce-Smith technologies. This course has been designed to the requirements and interests of operators as well as containing the necessary technical information for both metallurgists and management. The two days are designed to be both informative and challenging for all participants which have included operators, supervisors, metallurgists, plant management, engineering companies, professors and undergraduates.

**Course Overview:**

- History and Development of Technology
- Basic Chemistry
- Operating Practices, including Fluxing and Oxygen Usage
- Aisle Operations
- Keys to Process Control
- Training Techniques
- Maintenance
- Gas Handling
- Refractories
- Continuous Converting Options

**About the Presenters:**

Tony Eltringham is the Vice President, Special Projects for BHP Copper, based in San Francisco. Previously he held several positions in BHP/Magma Copper Research and Development Planning, including the Director of Smelting and Refining Operations for BHP Copper Metals, the smelting and refining arm of BHP Copper.

---

**“Industrial Diamond Synthesis & Tools”**

**Saturday, February 14**  
**8:30 a.m. - 5:00 p.m.**

**Sponsored by:**

TMS Materials Design & Manufacturing Division

**Presented by:**

James D. Dwan, RTC Tallaght

**Fees:** \$425 Member  
\$510 Nonmember

**Who Should Attend:**

The course should interest people from research and development, production, engineering and sales in the diamond tools industry.

**Course Overview:**

This course will cover the two main aspects of diamond technology, diamond synthesis and the manufacturing of diamond impregnated components used in diamond blades, core drilling and wire sawing applications. It will focus on the synthesis of industrial diamond using HP/HT process and the manufacture of the resultant diamond grit products. It will also cover the post-processing steps used in the classification and characterization of the diamond products.

The course will then focus on the sintering processes that are used in the manufacture of diamond impregnated composite materials. Sintering theory covering liquid phase and solid phase sintering will be covered including the effects of these thermal processes on the diamond grit. Sintering technology including hot pressing, infiltration and furnace conditions will be examined. The effects of the different types of metals matrices and the different sintering processes on the diamond grits will also be explored. Post-sintering operations including quality control methods, use of statistical methods, the development of new products and optimizing existing processes using experimental design will be examined.

**About the Presenter:**

James D. Dwan is a senior lecturer in the School of Engineering at the RTC Tallaght which is a third level institute of technology located in Dublin. Mr. Dwan has worked in the aerospace industry including the European Space Agency, Ariane V. rocket program. He has worked in the diamond industry since 1987 for GE Superabrasives as process engineer in diamond synthesis, and as applications researcher in Boart-Longyear, one of the largest diamond products manufacturers. Since 1993, he has been lecturing in the Mechanical Engineering Department in the RTC Tallaght. His research work in powder metallurgy and diamond impregnated

materials has produced a number of papers.

---

**“Fundamentals of Galvanizing”**

**Sunday, February 15**  
**8:30 a.m. - 5:00 p.m.**

**Sponsored by:**

TMS Structural Materials Division

**Presented by:**

Gary M. Michal,  
Case Western Reserve University

Frank E. Goodwin,  
International Lead Zinc Research Organization, Inc.

Arnold R. Marder, Lehigh University

**Fees:** \$425 AIME Member  
\$510 Nonmember

**Who Should Attend:**

This course is designed for people ranging from those involved with the production of zinc-based coated steel products to their applications and performance.

**Course Overview:**

The course will emphasize the interconnection among the processing, products and performance associated with galvanizing. A basic overview will be presented of the steps associated with commercial processing of both continuous hot dip and electrodeposited coatings. Key elements involved with the successful operation of modern hot dip and electrogalvanizing lines will be discussed in terms of product characteristics. A review will be presented of the performance characteristics of the wide range of galvanized steel products that currently exist including galvanneal, Galfan and others. A session will be devoted to discussing the defects that can occur in galvanized products, what causes them and how they can be minimized. A final area to be covered will be the paintability and corrosion characteristics of galvanized sheet steels. This section will discuss the many corrosion tests that are available to assess the performance of galvanized products.

*Short Courses Continued on page 18.*

**About the Presenters:**

Dr. Gary M. Michal currently holds the LTV Steel Chair in Metallurgy as Professor and Chairman of the Department of Materials Science and Engineering at Case Western University. Professor Michal's current research interests include precipitation reactions, failure analysis, metal coatings and surfaces and interfacial phenomena related to sheet steels. He has authored over 65 technical papers.

Dr. Frank Goodwin joined International Lead Zinc Research Organization, Inc. in 1982 as Manager of Program Development. Following his appointment as Manager of Metallurgy and Program Development in 1984, he was promoted to Vice President of Materials Sciences in 1986.

Arnold R. Marder is a Professor of Materials Science and Engineering at Lehigh University and the Associate Director of the Energy Research Center. He worked in industry for over 25 years. He has conducted both industrial and academic research on zinc coatings for the past two decades on both hot-dip and electrodeposited coatings and has published over 40 technical papers on these specific topics.

---

**"High Temperature Alloys"**

**Saturday, February 14 thru Sunday, February 15  
8:30 a.m. - 5:00 p.m.**

**Sponsored by:**

TMS Structural Materials Division

**Presented by:**

Norman S. Stoloff,  
Professor Emeritus, RPI

Gerhard E. Fuchs, consultant

**Fees:** \$625 AIME Member  
\$710 Nonmember

**Who Should Attend:**

This course is designed to present an overview of current high temperature materials technology and the potential of the advanced materials to managers, designers, fabricators and the potential users of these important classes of engineering materials.

**Course Overview:**

The need for materials with higher temperature capabilities, higher strength, improved environmental resistance and lower cost is driven by the increasing cost of energy and the realization that increased performance eventually leads to increased financial return. Superalloy technology and their protection along with their related processing techniques have rapidly developed to keep pace. Historically, the gas turbine engine has been the main application area with the greatest demand for these materials. Now, there are additional thermal power and other working systems demanding these new technologies. In addition, alternative materials such as composites and intermetallics are being considered for a variety of elevated temperature applications.

**About the Presenters:**

Professor Norman S. Stoloff has been employed by Pratt and Whitney Aircraft in Middletown, Connecticut and at Ford Motor Company Research Laboratory in Dearborn, Michigan. Dr. Stoloff joined the faculty of Rensselaer Polytechnic Institute, Troy, New York in 1965, was promoted to Full Professor in 1971 and retired from active faculty status in January 1997. He has authored or co-authored over 235 technical papers and has co-edited ten books on high temperature materials.

Gerhard E. Fuchs, Ph.D. is a consultant for Met-Tech Consulting and an Advisory Engineer for the Lockheed Martin Corporation, Schenectady, New York. He is also an adjunct faculty member of the Mechanical Engineering Department at Union College, Schenectady, New York.

**"Titanium Science & Technology"**

**Saturday, February 14 thru Sunday, February 15  
8:30 a.m. - 5:00 p.m.**

**Sponsored by:**

TMS Structural Materials Division

**Presented by:**

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

**Fees:** \$625 AIME Member;  
\$710 Nonmember

**Who Should Attend:**

The 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.

**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 Presenters:**

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 has received numerous awards for his work on titanium and its alloys.

## 1998 Hume-Rothery Award Symposium and Presentation of the Hume-Rothery Award

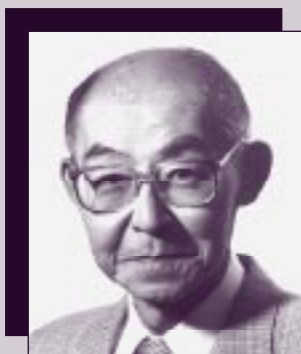
### 1998 William Hume-Rothery Medalist:

Prof. Ryoichi Kikuchi  
University of California, Berkeley

**Monday, February 16**

**Topic:** "Space is Continuous"

**Sponsored by:** Jt. EMPMD/SMD Alloy Phases Committee



### About the topic:

In theories of phase diagram calculations, the conventional way is to distribute atoms over lattice points and permit them to find the state of lowest free energy. Now the need is arising to allow atoms to move away from lattice points.

Two approaches of taking into account the continuous movement of atoms will be presented. One is to keep atoms on lattice points but to make the lattice constant decrease to infinitesimal. The other is to keep the lattice constant fixed, but to introduce freedom to let atoms move away from their assigned lattice points. These approaches are formulated as extensions of the conventional Cluster Variation Method (CVM).

### About Dr. Kikuchi:

1945 - 1950—Research Associate, Tokyo University, Department of Physics  
1951 - 1953—Research Associate, MIT, Solid State and Molecular Theory Group  
1953 - 1955—Assistant Professor, University of Chicago, Institute for the Study of Metals  
1955 - 1956—Research Physicist, Illinois Institute of Technology, Armour Research Foundation  
1956 - 1958—Associate Professor, Wayne State University, Department of Materials Science  
1958 - 1959—Member of Technical Staff, Hughes Research Laboratories  
1963 - 1985—Senior Scientist, Hughes Research Laboratories  
1985 - 1989—Research Professor, University of Washington, Department of Materials Science and Engineering

1991—Fellow, Japan Society for Promotion of Science  
1975 - 1996—Adjunct Professor, University of California, Los Angeles, Department of Materials Science and Engineering  
1997 - Present—Visiting Scholar at University of California, Berkeley

### Research Activities and Interests:

Prof. Kikuchi's research activities center on the Cluster Variation Method in the homogeneous phase treatments and the boundary studies. His interests extend to the Path Probability Method; A kinetic cooperative process can be treated by extending the CVM formulation and regarding the time as the fourth dimensional axis. He has authored over 140 papers on these topics.

## Symposia Highlights

More than 200 technical sessions are being programmed by the five technical divisions of TMS and the Materials Science Critical Technologies Sector of ASM International to bring to you the latest knowledge in materials science and metallurgical engineering. In addition special topical symposia have been programmed by the TMS Education Committee and the TMS Young Leaders 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 1997 issue of *JOM*.

**The entire program, including abstracts, will also be available beginning in November on the 1998 TMS Annual Meeting & Exhibition World Wide Web site at <http://www.tms.org/Meetings/Annual-98 AnnMtg98Home.html>.**

### ATTENTION ORGANIZERS, EDITORS, AND TECHNICAL COMMITTEE CHAIRS

At a special workshop on Tuesday, February 17, TMS will demonstrate its Conference Management System and review 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 412/776-9000, ext. 227 or e-mail [weissp@tms.org](mailto:weissp@tms.org).

## CASTING TECHNOLOGY

**Hard Coatings Based on Borides, Carbides and Nitrides: Synthesis, Characterization and Applications**  
Sponsored by MDMD Surface Modification & Coatings Technology Committee

This symposium addresses all aspects of hard coatings and synthesis, characterization and applications. It will serve as a forum to review the state-of-the-art in making superhard coatings, thin-film characterization and in using these coatings in corrosion, tribological and other applications.

**Zinc-Based Steel Coating Systems: Production and Performance**  
Sponsored by: SMD Ferrous Metallurgy Committee

This symposium presents zinc-based coatings research and technology development that will allow participants to assess the current technical status of zinc coatings production and performance and also determine technical needs for further advances. An international organizing committee has been assembled to assure an international scope for this symposium.

## EDUCATION

**Educational Approaches to Teaching Introductory Courses: How to Teach a Better Course**  
Sponsored by TMS Education Committee

This symposium will provide a forum for discussion on the pedagogy of introductory materials courses. Discussion topics will include: introductory courses for majors, introductory courses for non-majors, introductory courses for non-majors, introductory course content and interactive approaches, including multimedia. Speakers will include textbook writers and publishers, award-winning educators and multimedia experts.

## ELECTRONIC AND PHOTONIC MATERIALS

**High-Temperature Superconductors**  
Sponsored by Jt. EMPMD/SMD Superconducting Materials Committee

Topics include but not limited to: powder synthesis and scale up; chemistry, phase relationships; substrate development (RABiTs and IBAD); coated conductors; microstructure and properties; flux pinning; fabrication of wires, tapes, magnets, and bulk materials; and applications, future trends and new, novel superconductors.

**Materials Issues in Microelectronics: Interfacial Reactions, Solid State Transformations & Thermal Management**  
Sponsored by EMPMD Electronics Packaging and Interconnection Materiamittee

This symposium will explore the metallurgy, manufacturing and applications of interconnection materials such as solders, wire bonds, lead-frame alloys, electrically conductive materials, etc. The emphasis will be on these fundamental issues: interfacial reactions during soldering, joint formation, or field service; solid-state phase transformations related to microstructure, stability and reliability of various interconnections; and thermal issues, such as thermal design and management, thermal methods, and materials for better thermal conduction.

**Materials Science of Chemical-Mechanical Planarization**  
Sponsored by Jt. EMPMD/ASM-MSCTS Thin Films & Interfaces Committee

This symposium deals with the newly emerging technology of chemical mechanical planarization of materials surfaces. Topics of interest include but are not limited to: surface behavior and characterization, particle-surface interactions, electrochemistry of surfaces, colloidal science of slurries and other polishing media, multi-level metalization, flat panel display technology and micro-electromechanical systems.

## Transient Thermal Processing of Materials II

Sponsored by Jt. EMPMD/ASM-MSCTS Thin Films and Interfaces

The scope of the symposium will include the following: the status of transient processing techniques, application of processes to III-V, II-VI and other semiconductors; instrumentation, design, configuration and methodology of reactors for transient processing: non-contact sensors such as pyrometers and contact sensors for process monitoring and control: and modeling of transient processing techniques in semiconductors.

## LIGHT METALS

**Alumina & Bauxite**  
Sponsored by LMD Aluminum Committee

Papers addressing technological innovations in bauxite exploration and mining, alumina production using Bayer and non-Bayer processes, and alumina quality will be discussed.

**Aluminum Alloys for Packaging III**  
Sponsored by LMD Aluminum Committee

The science and technology of aluminum can stock, lid stock and tab stock alloys and coatings along with their related applications to can, lid and tab making will be the main focus of this symposium. Topics will include the physical and process metallurgy of aluminum packaging materials (rigid container sheets, flexible packaging and food container) using direct chill or continuous casting processes, alloy processing, structure and property characterization, package design, technology and performance.

**Aluminum Industry Initiatives**  
Sponsored by LMD Aluminum Committee

This symposium will provide a forum on general industry topics such as national and international perspectives on economic and sociopolitical trends affecting the aluminum industry, upgrading existing smelters to maintain competitiveness and meet new regulatory requirements, significant greenfield or brownfield smelter projects recently completed, the efficient use

of energy, occupational health and safety management, and improved processes for the treatment of smelter wastes.

**Aluminum Reduction Technology**  
Sponsored by LMD Aluminum Committee

Several sessions which will address all aspects of aluminum reduction, cell design, performance improvements and operating advances. Papers on smelting, energy and environment are encouraged. Also, there will be a session to cover cell cathode materials performance and modeling for cell design.

**Automotive Alloys II**  
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, alloy processing, structure and properties characterization, commercial and pilot applications in automotive market, technology and performance.

**Carbon Technology**  
Sponsored by LMD Aluminum Committee

Programming in several sessions will cover anode/cathode operations as they relate to the aluminum industry, including; raw materials, green anode manufacture, anode baking anode rodding, and all cathode operations. All aspects as they relate to properties, operations, and analytical procedures will be covered.

**Cast Shop Technology**  
Sponsored by LMD Aluminum Committee

Broad based scientific and engineering papers are expected in the areas of recycling, melting and melt preparation, alloying and grain refinement, metal treatment, ingot casting, continuous strip and slab casting, process and modeling, and safe melt handling practices.

**Lithium**  
Sponsored by LMD Reactive Metals Committee

Primary extraction, refining and recycling of Lithium alloys will be emphasized. Also utilization of alloys, batteries, and additive reagents will be discussed.

**Molybdenum and Molybdenum Alloy**  
Sponsored by SMD Refractory Metals Committee

Molybdenum is used in a broad spectrum of applications from electronic devices to structural materials for the aerospace industry. This symposium focuses on recent developments in the science and technology and the current and emerging applications of molybdenum and molybdenum alloys.

**Non-Aerospace Applications of Titanium and Its Alloys**  
Sponsored by SMD Titanium Committee

Coverage will include all aspects of new and developing non-aerospace applications of titanium and its alloys are solicited for this symposium.

**Reactive Metals -General Sessions**  
Sponsored by LMD Reactive Metals Committee

Coverage will include all aspects of the extraction, separation, purification, preparation, production, and application of reactive metals, including alkali metals, alkaline-earth metals, groups 4-6 refractory metals (Ti, Zr, Rf, V, Nb, Ta, Cr, Mo, W) rare earths, actinides, and the elements Ga, Ge, As, Se, In, Sb, Te, Tl, Bi, and Be.

**MATERIALS PROCESSING**

**10<sup>th</sup> International Symposium on Experimental Methods for Microgravity Materials Science**  
Sponsored by ASM-MSCTS Thermodynamic and Phase Equilibria Committee

The symposium will focus on the opportunities that a reduced gravity environment can offer in unique processing both in-space and with on-earth experiments.

**Adsorption, Ion Exchange and Solvent Extraction**  
Sponsored by EPD Aqueous Processing, Precious Metals, Copper, Nickel, Cobalt and Lead, Zinc, Tin Committees

This symposium will focus on adsorption, ion exchange and solvent extraction technologies that are used in the aqueous processing of the non-ferrous metals.

**Atomic-Level Simulation of Materials: New Methods and Novel Applications**  
Sponsored by ASM-MSCTS Computer Simulation Committee

The purpose of this symposium is to discuss new methods for carrying out atomic simulations, and also novel applications of new or existing methods. Topics include electronic structure, tight binding, empirical potentials, lattice monte carlo, etc.

**General Recycling of Non-Ferrous Metals**  
Sponsored by Jt. EPD/LMD Recycling Committee

This symposium will discuss practical and fundamental aspects for the recycling of metals such as aluminum, copper, lead, magnesium, tin, zinc, and other non-ferrous metals.

**International Symposium on Iron Aluminides: Processing, Properties and Applications**  
Sponsored by MDMD Powder Materials Committee, Jt. SMD/ASM-MSCTS Corrosion & Environmental Effects Committee, Jt. EMPMD/SMD Alloy Phases Committee, ASM-MSCTS Flow & Fracture Committee, ASM Intermetallic Materials Group

The symposium will cover recent advances in alloy design - effects of minor alloying elements on the mechanical properties, vacancy hardening, environmental embrittlement; electrical, physical, and thermal properties; oxidation and corrosion behavior, tensile, compressive, impact, creep and bend strengths of alloys and composites; processing by powder metallurgical techniques such as extrusion, sintering, reaction synthesis, hot pressing, tape casting, injection molding, and spray deposition along with conventional melting and casting techniques.

### **International Symposium on Processing of Metals & Advanced Materials: Modeling, Design & Properties**

Sponsored by Jt. EPD/MDMD Synthesis, Control & Analysis in Materials Processing Committee

This international symposium will provide a forum for discussion of issues concerning process modeling, process design and materials properties during processing of primary metals and advanced materials such as polymers, semiconductors, ceramics and composites.

### **International Symposium on Sulfide Smelting '98: Current and Future Practices**

Sponsored by EPD Pyrometallurgy Committee, EPD Copper, Nickel, Cobalt Committee

This symposium will focus on all aspects of the production of primary metals from sulfide concentrates. Some key areas to be explored are current operating practices, the predicted future of the sulfide smelting operations, issues related to the treatment of high strength sulfur dioxide off-gases and acid plant blow down streams, the production of alternative sulfur products, and the treatment of smelter flue dusts.

### **International Symposium on Value Addition Metallurgy**

Sponsored by EPD Process Fundamentals Committee

This international symposium is designed to emphasize the role of process engineering discipline in the processing and synthesis of advanced value-added materials such as coated films, intermetallic compounds, ultrapure metals and composites. Topics to be covered include: combustion and chemical synthesis, surface processing (e.g. CVD), plasma processing and synthesis, electrolytic processing, powder processing, microwave processing.

### **Materials Processing Fundamentals**

Sponsored by Jt. EPD/MDMD Synthesis, Control, & Analysis in Materials Processing Committee, EPD Process Fundamentals Committee

Topics include the experimental, analytical, and computer modeling aspects of the physical chemistry, thermodynamics, and transport phenomena in materials and metallurgical processes as well as

monitoring and control methodologies involved in these processes. Research related to processes involving iron and steel, non-ferrous metals, or light weight alloys and topics that relate to process monitoring and control and involve laboratory or in-plant validation will also be discussed.

### **Materials Science of Chemical-Mechanical Planarization**

Sponsored by Jt. EMPMD/ASM-MSCTS Thin Films & Interfaces Committee

Coverage includes: surface behavior and characterization, particle-surface interactions, electrochemistry of surfaces, colloidal science of slurries and other polishing media.

### **Microstructure & Properties of Direct Fabricated Materials**

Sponsored by SMD Physical Metallurgy Committee, MDMD Surface Modification & Coatings Technology Committee

This two session symposium is intended to provide an overview presentation of the variations of these metal fabricating techniques, a summary of what materials are being explored, and the range of microstructures and subsequent properties achievable.

### **Molybdenum and Molybdenum Alloy**

Sponsored by SMD Refractory Metals Committee

Molybdenum is used in a broad spectrum of applications from electronic devices to structural materials for the aerospace industry. This symposium focuses on recent developments in the science and technology and the current and emerging applications of molybdenum and molybdenum alloys.

### **Processing-Structure-Property Relationships of Composite Interfaces**

Sponsored by SMD/ASM-MSCTS Composite Materials Committee, EPD Process Fundamentals Committee

The symposium will cover processing-structure-properties relationships in composites with respect to the role of the interface. The emphasis of the symposium will be rational approaches to design, fabrication and evaluation of the interface, i.e., interface engineering.

### **Rapid Solidification: Modeling and Experiments**

Sponsored by MDMD Solidification Committee

This symposium will explore the latest modeling of rapid solidification and dendritic or cellular growth in deeply undercooled melts. Experiments on the measurement of solidification velocity and interface morphology of growth at moderate to high undercoolings will be presented.

### **Solidification and Deposition of Molten Metal Droplets**

Sponsored by MDMD Solidification Committee, Jt. MDMD/EPD Synthesis, Control & Analysis in Materials Processing Committee

This symposium will cover two aspects of the technology: (1) solidification behavior of undercooled droplets produced by techniques such as: atomization, spray forming, uniform droplet spray, levitation (electromagnetic, electrostatic, gas flow), electro hydrodynamic spray, and emulsification, and (2) the impact and solidification behavior of partially solidified droplets during deposition.

### **Superplasticity and Superplastic Forming**

Sponsored by MDMD Shaping and Forming Committee

Coverage includes fundamental and theoretical aspects of superplasticity, development of superplastic microstructures and nanograin structures, new observations for metal, intermetallic, ceramic, and composite material systems, analysis of forming operations, post-forming properties, and commercial applications of this technology.

### **Transient Thermal Processing of Materials II**

Sponsored by Jt. EMPMD/ASM-MSCTS Thin Films and Interfaces

The scope of the symposium will include the following: the status of transient processing techniques; application of processes to III-V, II-VI and other semiconductors; instrumentation, design, configuration and methodology of reactors for transient processing: non-contact sensors such as pyrometers and contact sensors for process monitoring and control; and modeling of transient processing techniques in semiconductors.

## **MICROSTRUCTURE AND PROPERTIES**

### **Atomic-Level Simulation of Materials: New Methods and Novel Applications**

Sponsored by ASM-MSCTS Computer Simulation Committee

The purpose of this symposium is to discuss new methods for carrying out atomic simulations, and also novel applications of new or existing methods. Topics include electronic structure, tight binding, empirical potentials, lattice monte carlo, etc.

### **Defects in Crystals: A Symposium Honoring the Contributions of John P. Hirth**

Sponsored by MDMD Shaping and Forming Committee, SMD Physical Metallurgy Committee, Jt. EMPMD/SMD Chemistry & Physics of Materials Committee

This symposium will honor the contributions of Professor John P. Hirth to the theory of defects in crystals. Topical areas will include nucleation, diffusion, dislocation theory and mechanical behavior of crystalline materials.

### **Hard Coatings Based on Borides, Carbides and Nitrides: Synthesis, Characterization and Applications**

Sponsored by MDMD Surface Modification & Coatings Technology Committee

This symposium addresses all aspects of hard coatings and synthesis, characterization and applications. The symposium will review the state-of-the-art in making superhard coatings, thin-film characterization and in using these coatings in corrosion, tribological and other applications.

### **High Temperature Environmental Impact on Performance**

Sponsored by SMD High Temperature Alloys Committee

The focus of this symposium will be toward investigating materials operating in high temperature environments, at or above 1000°F (550°C). The emphases will be in the areas of oxidation, corrosion, environmentally influenced failures or long term exposure impact on performance.

### **International Symposium on Iron Aluminides: Processing, Properties and Applications**

Sponsored by MDMD Powder Materials Committee, Jt. SMD/ASM-MSCTS Corrosion & Environmental Effects Committee, Jt. EMPMD/SMD Alloy Phases Committee, ASM-MSCTS Flow & Fracture Committee, ASM Intermetallic Materials Group

The symposium will cover recent advances in alloy design - effects of minor alloying elements on the mechanical properties, vacancy hardening, environmental embrittlement; electrical, physical, and thermal properties; oxidation and corrosion behavior, tensile, compressive, impact, creep and bend strengths of alloys and composites; processing by powder metallurgical techniques such as extrusion, sintering, reaction synthesis, hot pressing, tape casting, injection molding, and spray deposition along with conventional melting and casting techniques.

### **International Symposium on Processing of Metals & Advanced Materials: Modeling, Design & Properties**

Sponsored by Jt. EPD/MDMD Synthesis, Control & Analysis in Materials Processing Committee

This international symposium will provide a forum for discussion of issues concerning process modeling, process design and materials properties during processing of primary metals and advanced materials such as polymers, semiconductors, ceramics and composites. Papers are solicited in the areas of process modeling and simulation, direct and inverse process design, and microstructure formation and properties of materials.

### **Microstructology: Connecting Phase Diagrams, Kinetics & Stereology to Microstructural Evolution, A Symposium Honoring Frederick N. Rhines**

Sponsored by ASM-MSCTS Thermodynamics and Phase Equilibrium Committee, ASM-MSCTS Atomic Transport Committee

Frederick N. Rhines (1907-86) was an educator and researcher who was instrumental in the development of the field of physical metallurgy and in curricula in physical

metallurgy at Carnegie-Mellon University and in materials science and engineering at the University of Florida. The symposium honors his memory with sessions in four areas of research to which he contributed significantly: phase diagrams; diffusion in multicomponent and multiphase systems; stereology; and microstructology.

### **Microstructure and Its Effects on Amorphous Nanophase, and Nanocrystalline Materials**

Sponsored by Jt. EMPMD/SMD Chemistry and Physics of Materials, Jt. EMPMD/SMD Alloy Phases Committee, SMD Physical Metallurgy Committee, MSCTS Flow and Fracture Committee

The symposium will emphasize structural characterization at small dimensions, thermodynamics, kinetics, and properties (including mechanical, electronic, magnetic, optical and thermal) of nanocrystalline and amorphous metals, cermets and polymeric materials.

### **Microstructure & Properties of Direct Fabricated Materials**

Sponsored by SMD Physical Metallurgy Committee, MDMD Surface Modification & Coatings Technology Committee

This two session symposium is intended to provide an overview presentation of the variations of these metal fabricating techniques, a summary of what materials are being explored, and the range of microstructures and subsequent properties achievable.

### **Modeling the Mechanical Response of Structural Materials**

Sponsored by SMD Structural Materials Committee

This symposium will provide a forum for the discussion of recent advances in the modeling of mechanical response in various structural materials. Discussion is intended to address a wide array of materials, including metallic alloys, ceramics, glasses, polymers, and composites comprised of such.

### **Molybdenum and Molybdenum Alloy**

Sponsored by SMD Refractory Metals Committee

Molybdenum is used in a broad spectrum of applications from electronic devices to structural materials for the aerospace industry. This

symposium focuses on recent developments in the science and technology and the current and emerging applications of molybdenum and molybdenum alloys.

**New and Emerging Applications for Refractory Metals and Materials**  
Sponsored by SMD Refractory Metals Committee

The scope of this symposium encompasses new and emerging applications of refractory metals, their alloys, and their use in compound-based refractory materials. Emphasis will be placed on the physical, mechanical and process metallurgy of these materials in services such as aqueous, liquid metal and high-temperature corrosion, wear-resistant service, medical implants, high-energy physics and advanced energy systems

**Processing-Structure-Property Relationships of Composite Interfaces**  
Sponsored by SMD/ASM-MSCTS Composite Materials Committee, EPD Process Fundamentals Committee

The symposium will cover processing-structure-properties relationships in composites with respect to the role of the interface. The emphasis of the symposium will be rational approaches to design, fabrication and evaluation of the interface, i.e., interface engineering.

**Strengthening in High Temperature Intermetallics**  
Sponsored by SMD Mechanical Metallurgy Committee

This symposium will discuss the effects of composition, microstructure, processing and their combinations on strengthening at both room temperature and elevated temperatures. Properties of interest include tensile strength, creep resistance, fatigue resistance, and impact resistance. Types of strengthening will include solution hardening, precipitation strengthening, dispersion hardening, microstructure and texture effects, boundary strengthening, layer strengthening, and others.

**GENERAL ABSTRACT SESSIONS**

Designed to supplement the meeting's announced symposia, these sessions provide a forum for

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.

**Don't miss these special topical symposia brought to you by the TMS Young Leaders Committee**

**Entrepreneurship - The Risks and Rewards of Commercializing Innovation**

This symposium will explore the risks and rewards involved with commercializing technical innovations. This symposium will address the key features involved with starting and sustaining an entrepreneurial venture. The symposia will highlight entrepreneurs, at various stages in their careers, and in diverse materials industries who will discuss the rewards and pitfalls they have encountered on their journey to becoming successful entrepreneurs. Following the presentations the symposia will feature an interactive panel discussion allowing the audience to present their questions to the entrepreneurs.

**Project Management for Engineers and Scientists**

This symposium will address applications of project management for those with a technical background. Several components of project management, including a project integration, time management, cost management, risk management, quality control, communications, procurement, and human resources will be described. Invited speakers-including those from different sized companies and consulting firms in the materials community will address how project management works and will focus on facts and myths surrounding implementation of project management. Following the presentations, the symposia will feature a panel discussion with audience participation to discuss issues concerning project management.

## 1998 TMS Annual Meeting Proceedings Publications

Be sure to stop by the TMS Publications Sales area in the Henry B. Gonzalez Convention Center. There you will be able to examine more than 150 individual titles on nearly every aspect of minerals, metals, and materials technology, including many at special reduced prices. Also available will be the 13 concurrent publications listed below, which may also be pre-ordered on the meeting registration form found in this brochure. Each of these titles are proceedings from a symposium being presented at the 1998 TMS Annual Meeting and will be available for pick-up on site, or you may indicate on the registration form to have them mailed directly to you.

**\* Distribution of Authors' Complimentary Copies:** Distribution of concurrent complimentary copies to primary authors will only be done on site at the 1998 TMS Annual Meeting. Primary authors will receive a ticket with the authors' mailing that may be exchanged at the TMS Publications Sales area of the convention center for their complimentary copy. Arrangements to ship books must be made at the meeting and the standard shipping fees paid. TMS will accept no responsibility to provide complimentary copies after the conference, nor will TMS absorb shipping costs to distribute same.

**Aluminum Alloys for Packaging III**  
S.Das, editor

These proceedings document the third in a series of symposia organized to provide a comprehensive forum where the latest science and technology of aluminum can stock, lid stock, and tab stock alloys; coatings; and their related applications to can, lid, and tab making could be presented. Topics discussed include the physical and process metallurgy of aluminum packaging materials (rigid container sheets, flexible packaging, and food container) using direct-chill or continuous casting processes, alloy processing, structure and property characterization, package design, technology and performance.

Approx. 208 pp., illus., index, hard-cover  
**Order No. 3862**  
**Meeting Attendee Price \$54**



## **Automotive Alloys II**

S.Das, editor

A discussion of the most recent developments in the science and technology of aluminum and magnesium alloys as they relate to application in the automotive market is the focus of this book. Also included are updates to discussions presentations and discussions from the proceedings of the first symposium held during the 1997 TMS Annual Meeting & Exhibition in Orlando, Florida, February 9-13, 1997.

Approx. 270 pp., illus., index, hardcover

**Order No. 3872**

**Meeting Attendee Price \$55**

## **EPD Congress 1998**

B. Mishra, editor

The annual EPD Congress has become as important an annual update to the process metallurgy community as the TMS-published *Light Metals* series is to the aluminum production community. This volume is the ninth in the series and will include presentations on adsorption, ion exchange, and solvent extraction; exploration and development of mineral and energy resources; materials processing fundamentals; aqueous processing; Cu, Ni, Co, Pb, and Zn processing; precious metals; and recycling.

Approx. 700 pp., illus., index, hardcover

**Order No. 3880**

**Meeting Attendee Price \$50**

## **Hard Coatings Based on Borides, Carbides and Nitrides: Synthesis, Characterization and Application**

Y-W. Chung, R.W.J. Chia, and A. Kumar, editors

Recent advances have been made in the synthesis of hard coatings based on borides, carbides, and nitrides, leading to an increase in practical applications. This book addresses all aspects of the synthesis of superhard coatings, thin-film characterization, and the use of hard coatings in corrosive and tribological applications.

Approx. 616 pp., illus., index, hardcover

**Order No. 3899**

**Meeting Attendee Price \$103**

## **Light Metals 1998**

B. Welch, editor

For more than 20 years the *Light Metals* series has provided the international aluminum production community and related fields with an annual update of new technologies. The 1998 volume may be the most comprehensive ever, with complete coverage of advancements and current work in cast shop technology, alumina and bauxite, carbon technology, aluminum reduction, recycling, and more. There will also be a special section devoted to lithium and lithium alloys.

Approx. 1,450pp., illus., index, hardcover

**Order No. 3902**

### **Meeting Attendee Price \$139**

**Light Metals 1998** will also be available on CD-ROM shortly after the conference. The CD-ROM version of the proceedings will be presented in full-page, Adobe Acrobat format and will be completely searchable. The CD-ROM will be available for delivery within 30 days after the San Antonio meeting and may be pre-ordered via the registration form found in this brochure.

**Order No. 3902-CD**

**Meeting Attendee Price \$139**

### **Buy both the printed version and the CD-ROM and save!**

You can save money by purchasing both the *Light Metals* book and CD-ROM via the advance registration form.

**Order No. 3902-SET**

**Meeting Attendee Price \$239**

## **Modeling the Mechanical Response of Structural Materials**

E.M. Taleff and R. Mahidhara, editors

Researchers will find this volume to be a current review of recent work in the modeling of mechanical response in various structural materials. Predictive modeling of both elastic and plastic material responses in areas such as viscoelasticity, creep, superplasticity, ductile

fracture, and fatigue are addressed. Materials examined include metallic alloys, ceramics, glasses, polymers, and composites.

Approx. 210 pp., illus., index, hardcover

**Order No. 3929**

**Meeting Attendee Price \$64**

## **Non-Aerospace Applications of Titanium and Its Alloys**

F.H. Froes, M. Niimi, J.R. Wood, and P.G. Allen, editors

The many new and developing non-aerospace applications of titanium and its alloys are presented and examined within this volume. Applications include medical, consumer goods, sporting goods, transportation, and chemical and down-hole applications.

Approx. 420 pp., illus., index, hardcover

**Order No. 3945**

**Meeting Attendee Price \$95**

## **Processing of Metals and Advanced Materials: Modeling, Design and Properties**

B.Q. Li, editor

This book addresses the issues concerning the inter-relationship between process modeling, process design, and product properties during processing. Processing systems discussed include powder processing, thermomechanical processing, casting and casting-related operations, melting and solidification, welding, crystal growth, vapor deposition, and others.

Approx. 306 pp., illus., index, hardcover

**Order No. 3953**

**Meeting Attendee Price \$65**

## **Solidification 1998**

S.P. Marsh, J.A. Dantzig, W. Hofmeister, R. Trivedi, M.G. Chu, E.J. Lavernia, and J-H. Chun, editors

**Solidification 1998** will be the first volume in an annual series presenting a comprehensive update on current research in the areas of solidification and microstructural evolution. Coverage includes: microstructure evolution, microstructure description and characterization, microstructure modeling, modeling of rapid solidification and dendritic

or cellular growth in undercooled melts, and solid-ification of undercooled droplets.

Approx. 810 pp., illus., index, hardcover

**Order No. 3961**  
**Meeting Attendee Price \$95**

**International Symposium on Sulfide Smelting '98: Current and Future Practices**

R.L. Stephens and J. Asteljoki, editors

This international proceedings collection focuses on all aspects of the production of primary metals from sulfide concentrates, with particular emphasis on smelting and/or converting operations, and gas handling processes and equipment. Specific areas explored are current operating practices, the future of sulfide smelting operations, issues related to the treatment of high strength sulfur dioxide off-gases and acid plant blow down streams, the production of alternative sulfur products, and the treatment of smelter flue dusts.

Approx. 341 pp., illus., index, hardcover

**Order No. 397X**  
**Meeting Attendee Price \$57**

**Superplasticity and Superplastic Forming 1998**

A.K. Ghosh and T.R. Bieler, editors

This collection of research includes coverage of the fundamental and theoretical aspects of superplasticity; development of superplastic microstructures and nano-grain structures; new observations for metal, inter-metallic, ceramic, and composite material systems; analysis of forming operations; post-forming properties; and commercial applications of the technologies.

Approx. 257 pp., illus., index, hardcover

**Order No. 3988**  
**Meeting Attendee Price \$54**

**Value-Addition Metallurgy**

W.D. Cho and H.Y. Sohn, editors

The role of process engineering in the process and synthesis of advanced value-added materials such as coated films, intermetallic compounds, ultrapure metals, and composites is presented by this collection of papers. Experimental and theoretical processing techniques, as well as the characterization and

performance of value-added materials are discussed, including combustion and chemical synthesis, surface processing, plasma processing and synthesis, electrolytic processing, powder processing, and microwave processing.

Approx. 736 pp., illus., index, hardcover

**Order No. 3996**  
**Meeting Attendee Price \$124**

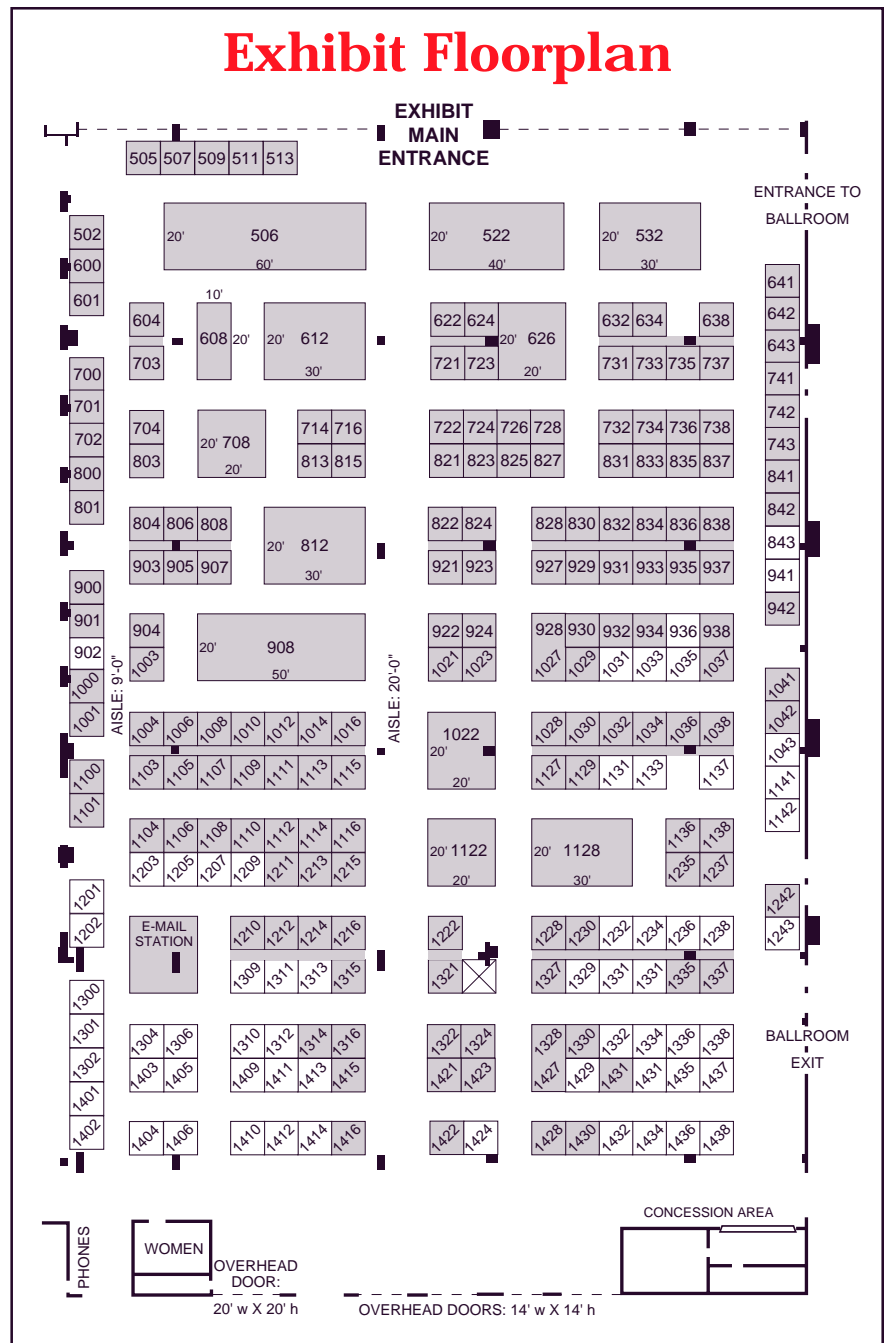
**Zinc-Based Steel Coating Systems: Production and Performance**

F.E. Goodwin, M. DuBois, and J-S. Kim

Zinc and zinc alloy coated sheet is one of the most rapidly growing sectors of the steel industry. This book presents new knowledge in the areas of coating structure, effects on steel properties, formability, corrosion performance, and production technologies that are making new applications possible.

Approx. 261 pp., illus., index, hardcover

**Order No. 4003**  
**Meeting Attendee Price \$55**



# EXHIBITION '98

**Henry B. Gonzalez Convention Center/South Exhibit Hall • San Antonio, Texas**

Join 4,000 of your colleagues for a 250,000 square foot display of state-of-the art processing, fabrication, and design technology presented by more than 160 international companies. Examine first-hand the products, processes, and services that can solve your most pressing needs and make a difference for your organization.

## Special Attractions during the 1998 show:

- ★ Grand Opening Fiesta Mariachi Reception  
Monday, February 16--5:00 - 6:30 PM
- ★ Complimentary Afternoon Snack  
*for all meeting registrants*  
Tuesday, February 17--11:00 AM - 3:00 PM
- ★ Complimentary Refreshments  
Wednesday, February 19--10:00 AM - 2:00 PM
- ★ PLUS: Exhibits only luncheon concessions



**Show Dates and Hours:** Monday, February 16, 1998--3:00 - 7:00 PM  
Tuesday, February 17, 1998--10:00 AM - 5:30 PM  
Wednesday, February 18, 1998--10:00 AM - 3:00 PM

## SPECIAL PRODUCT AND TECHNOLOGY MINI-SESSIONS

As a complement to the 1998 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 that can provide the solutions for your most pressing needs.

If you are involved in the selection of products, materials, and services to meet the needs of your organization, you won't want to miss these informative presentations.

### The product and technology mini-sessions will be held:

Monday, February 16--1:00-2:00 p.m.  
Tuesday, February 17--1:00-2:00 p.m.

A schedule of presentations and exhibiting companies will appear on the 1998 TMS Annual Meeting Program World Wide Web site at <http://www.tms.org/Meetings/Annual-98/AnnMtg98Home.html> later this year, and in the meeting program booklet.

To visit the exhibition, complete the registration form included in this mailer and send by fax or mail to TMS Registration.

**For information on being a part of the show, inquire about space reservation and exhibit prospectus by contacting:** Cindy A. Wilson, Marketing Coordinator, Telephone: 412/776-9000, ext 231, Fax: 412/776-3770, E-mail: [wilson@tms.org](mailto:wilson@tms.org)

# Exhibitor List

as of 9/1/97

ABB Industrie AG, 924  
Advanced Dynamics Corp Ltd., 938  
AEA, 1214, 1216  
AGA Gas Inc, 1108, 1110  
Air Products & Chemicals, 701  
AISCO Systems, Inc., 608, 707  
Alan Worswick Ltd, 907  
Alcan International Ltd, 1109, 1111  
Alcoa, (6 sp), 522  
Almeq Norway AS, 822, 824  
Altek International Inc., 708 (4 sp)  
Alu-Cut International, 505,507  
Aluminium Today, 643  
American Colloid Company, 942  
Anter Corporation, 832  
Applied Research Laboratories, 1012  
Asbury Fluxmaster of Utah Inc, 742  
ATAN-Sistemas de Automacao, 1128 (4 sp)  
B & P Process Equipment & Systems, 1036  
BetzDearborn Water Mgmt Group, 834, 836, 838  
BHA Group Inc, 1004  
Blasch Precision Ceramics, 1037  
Bloom Engineering Co, Inc., 801  
BMI France Refractories, 1322, 1324  
BNZ Materials Inc, 1315  
Bomem, Inc., 1114, 1116  
Brochot SCS, 1129  
Buehler, 1003  
Buss AG, 1014  
CAPCO, 1431  
Cargill Inc, 704  
CFC Systems Automate, 1112  
Consolidated Ceramic Products, 813, 815  
Dixon Ticonderoga, 1321  
DoAll Company, 1100  
Elsevier Science, 1029  
EMP Technologies Ltd., 1430  
Eirich Machines Inc, 929  
Erico Products Inc, 1314, 1316  
Exploranium, 1042  
Eyelet Products & Engr and Thaa AG, 735  
FCB, 900  
FOSECO, Inc., 722 (8 sp)

Gautschi Electro Fours SA, 921  
Glama Maschinenbau GmbH, 808  
Graphite Eng. & Sales, 935  
A.P. Green Industries Inc, 831, 833  
Hencon B.V., 1428  
Heraeus Electro-Nite Co, 702, 800  
High Temperature Systems Inc., 604  
Höganäs Eldfast AS, 1228  
Holcan Constructions Pty, Ltd., 1423  
Holton Conform, 703  
Horiba Instruments Inc., 842  
Hotwork Corp., 1416  
Industrial Products Intl (IPI), 502  
Innovative Concepts, 1211  
Jayne Industries Inc., 1421  
Jervis B Webb Co., 1328, 1427  
Kabert Industries, 1016  
Kaiser Aluminum, 1122 (4 sp)  
KB Alloys Inc, 509, 511, 513  
KHD Humboldt Wedag AG, 923  
Larox Inc, 1415  
Leco Corporation, 1038  
Lem Dynamp Inc., 1101  
Light Metal Age, 930  
Loma Machine Mfg. Co., 641, 642  
London & Scandinavian Metallurgical Ltd, 632  
Maerz Ofenbau GmbH, 1032, 1034  
Master Alloys Co., 803  
McAllister Mills, Inc., 721, 723  
Mechatherm International Ltd, 933  
Megaquip Industries Ltd, 1103  
Metal Bulletin, 1106  
Metallurgical Society Of CIM, 903  
Metaullics Systems Co. L.P., 612 (6 sp)  
Milward Alloys Inc, 1127  
MTO Wilhelm Steinhoff Nachf. GmbH, 1422  
Murlin Chemical Inc, 1222  
N.V. Gouda Vurvast, 905  
Nalco Chemical Co, 622, 624  
National Refractories & Minerals, 828, 830  
Neco Inc., 937  
Norsk Hydro , 908 (10 sp)

North American Manufacturing, 1000, 1001  
North American Refractories Co., 1028, 1030  
Pechiney Corporation, 714, 716  
Permtech Inc., 532 (6 sp)  
Carl Aug Picard GmbH & Co. KG , 931  
Plibrico, 904  
Premelt Systems, 1235, 1237  
Premier Refractories Inc, 1006, 1008, 1010  
Princeton Gamma Tech Inc, 1327  
Procedair Industries, 901  
Pryor Giggey Co., 737  
Pyrotek Inc., 506 (12 sp)  
R&D Carbon Ltd., 922  
Refractory Technology Inc, 600, 601  
Research-Cottrell, 736, 738  
Rex Roto Corp, 731, 733  
Rigaku/USA Inc, 1041  
Saint Gobain Industrial Ceramics High Performance Refractories, 1021, 1023  
Scharf-Westfalia GmbH, 1215  
Seco/Warwick, 1335, 1337  
Selcom, Selective Electronics, Inc., 1136, 1138  
Selee Corporation, 626 (4 sp)  
Sentech Corporation, 1022 (4 sp)  
Sermas AS, 700  
Shieldalloy Metallurgical Corp, 634  
Silver Needle Inc, 1210, 1212  
Skamol A/S, 1105, 1107  
STAS, 1113, 1115  
Techmo Car & Engineering, 927, 928, 1027  
Texsem Labs, 741  
Thermal Ceramics & Thermic Refractories, 812 (6 sp)  
Thermal Systems America, 1242  
Thermcon Ovens BV, 1104  
33 Metal Producing, 638  
Thorpe Technologies Inc., 732, 734  
U S Department of Energy, 1213  
Unifrax-Fibers Division, 743, 841  
VanDeMark Metals & Alloys, 835, 837  
Vesuvius Neomelt/Hi Tech Ceramics, 804, 806  
Wagstaff, 522 (8 sp)

*Don't miss the*

# 1998 TMS Foundation Golf Classic

at Pecan Valley Golf Club, San Antonio, Texas

Sunday, February 15, 1998

All attendees of the 1998 TMS Annual Meeting & Exhibition are invited to participate in the 1998 TMS Foundation Golf Classic to be held Sunday, February 14 just prior to the start of the meeting.

The tournament will be held at the beautiful and challenging Pecan Valley Golf Club, site of the 50<sup>th</sup> PGA Championship. Designed by renowned course architect J. Press Maxwell, Pecan Valley has been listed in *Golf Digest's* top 50 courses every year since 1984.

Tournament play will be a Florida Scramble format with teams of foursomes. We will get under way with a shotgun start



at 8:00 a.m. There will be prizes for Longest Drive and Closest to Pin contests, as well as many door prizes. A Hole-in-One Contest with a grand prize of \$10,000 is also planned.

Fees: All fees include green fees, carts, unlimited use of the driving range, 2-4-1 practice rounds coupon, Pecan Valley bag tag, continental breakfast, refreshments, barbecue buffet reception.

**\$120 per individual golfer  
\$400 per foursome**

The registration deadline is December 31, 1997, however, the field is limited to 120 players, so register today!

\* Sponsorship opportunities are available. Please contact Cindy Wilson at (412) 776-9000, ext. 231 or Dan Steighner, ext. 210. You may also contact us via e-mail at wilson@tms.org.

***The tournament is being held to benefit the TMS Foundation***

Note: Written cancellations must be received prior to January 16, 1998. No refunds will be issued after January 16, 1998.  
A \$30 processing fee will be charged on all cancellations.

## 1998 TMS Foundation Golf Tournament Registration Form

Check one:  Individual Golfer (*Individuals will be assigned to a foursome*)  Foursome

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 \_\_\_\_\_

**Payment must accompany registration.**

Method of Payment  Check or money order

Charge my:  VISA  MasterCard  American Express  Diner's Club

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

Cardholder's Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Send to: TMS Foundation  
420 Commonwealth Drive  
Warrendale, PA 15086-7514  
Fax: (412) 776-3770