

MRS BULLETIN

MATERIALS RESEARCH SOCIETY, VOL. VII NO. 2, MARCH/APRIL 1982

1982 ANNUAL MEETING

The 1982 Annual Meeting of the Materials Research Society will be held in the Boston, Massachusetts, Park Plaza Hotel November 1-4. This year's meeting, organized by a committee consisting of Lynn A. Boatner, Oak Ridge National Laboratory, Leroy L. Chang, IBM Thomas J. Watson Research Center, and Elton N. Kaufman, Lawrence Livermore National Laboratory, will consist of 15 interdisciplinary, topical symposia, a plenary session, business meetings and award ceremonies. Non-members (as well as members of the Society) are welcome to attend and participate, and will be enrolled as members automatically as part of their registration.

The Plenary Session on Nov. 1 is entitled "Materials R&D in the U.S. - Are We Still Competitive?" Chaired by A. R. C. Westwood of Martin Marietta Laboratory, the session will feature distinguished invited speakers who will present their views on this subject and identify the crucial issues that must be addressed if materials research and development is to improve.

The Society's greatest honor, the Von Hippel Award, will be bestowed at a special ceremony Nov. 2, on a scientist who, in the judgment of the MRS leadership, best exemplifies the vigorous scientific approach and interdisciplinary spirit required to advance materials science. At past annual meetings remarks by the Von

Hippel winner have proved especially memorable and popular gatherings.

At the Von Hippel ceremony the Graduate Student Awards also will be presented. Articles about the student and Von Hippel awards appear elsewhere in this issue of the Bulletin.

Fifteen symposia will be available this year, one more than last. The newest symposium is called **Frontiers of Materials Research**, and will consist of 40-minute authoritative lectures by leaders in a field to give non-specialists a survey of the most recent developments in that field. Two lectures will be given daily Nov. 1-3 during the luncheon period, for a total of six.

These lectures will later be published in the *Journal of Educational Modules for Materials Science and Engineering*, part of the National Science Foundation's educational venture for the worldwide materials science community. The symposium is chaired by *Rustum Roy*, Director, Materials Research Laboratory, The Pennsylvania State University, University Park, PA 16802, (814) 865-3421.

The other symposia and their chairmen are:

Laser/Solid Interactions and Transient Thermal Processing of Materials, chaired by **J. Narayan**,

Solid State Division, Oak Ridge National Lab., Oak Ridge, TN 37820, (615) 574-5508, FTS 624-5508; **R. A. Lemons**, Bell Laboratories, Holmdel, NJ 07733, (201) 949-3176; and **W. L. Brown**, Bell Laboratories, Murray Hill, NJ 07974, (201) 582-3941.

Defects in Semiconductors, chaired by **S. Mahajan**, Bell Laboratories, Murray Hill, NJ 07974, (582-2137), and **J. W. Corbett**, Department of Physics, SUNY, Albany, NY 12222, (518) 457-8315.

Interfaces and Contacts, chaired by **R. Ludeke**, IBM Watson Research Laboratory, P.O. Box 218, Yorktown Heights, NY 10598, (914) 945-2591; and **K. Rose**, Rensselaer Polytechnic Institute, ESCE Department, Troy, NY 12181, (518) 270-6313.

Scientific Basis for Nuclear Waste Management, chaired by **Douglas G. Brookins**, Department of Geology, University of New Mexico, Albuquerque, NM 87131, (505) 277-2310 or (505) 277-4204.

Alloy Phase Metals, chaired by **L. H. Bennett**, National Bureau of Standards, Metallurgy Division, Washington, DC 20234, (301) 921-2981; **B. C. Giessen**, Chemistry Department, Northeastern University, Huntington Ave., Boston, MA 02115, (617) 437-2827; and **T.**

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FROM THE SOCIETY'S PRESIDENT

Greetings!

At the Boston Meeting last fall, many of us discussed ways the Society could improve communications between materials scientists. You have begun to see some of the fruits of these discussions in the MRS Bulletin, and other exciting developments will follow soon. The rapid growth of our Society results, in part, from its serving to enhance our ability to discuss state-of-the-art problems and advances in technology. I urge you to share your ideas with us on how to do this even more efficiently.

Many of those who attended the last meeting said they felt a sense of excitement they rarely saw at technical gatherings. The heated, interdisciplinary discussions were refreshing and are a source of strength for our Society. This year the Society is sponsoring two meetings, one in Europe (Berlin) and the second in Boston, and all indications are these meetings will be as important technically as those we have had in the past. Many of the Proceedings of the Society are becoming essential references and this year many of the symposia will

again document these contributions.

Effective communication between technical people from many backgrounds is one of the most important purposes our Society serves. I encourage you to participate in the committees and functions of the Society. Help us discover ways to improve, and to communicate the understanding of materials behavior in creative and meaningful ways.

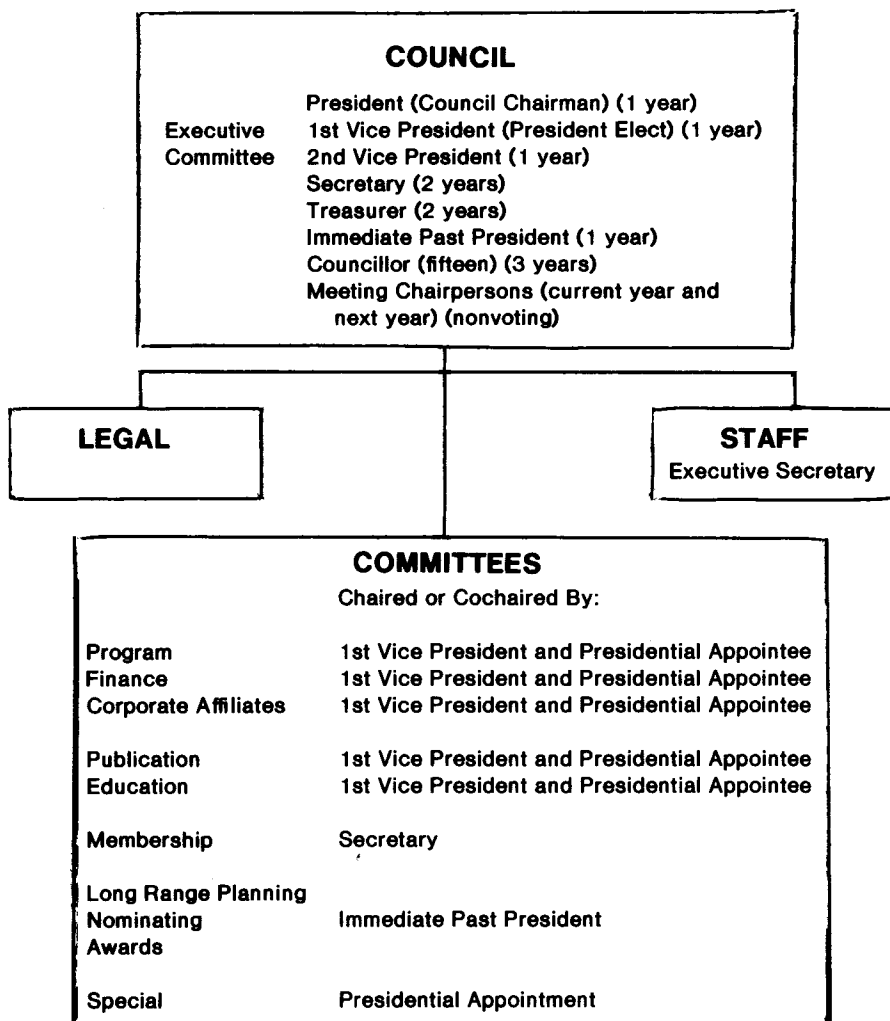
Best regards,
Clyde J. M. Northrup, Jr.
 President

MRS FORMALIZES ORGANIZATIONAL STRUCTURE

At its meeting in Atlanta last January, the council of the MRS adopted a new set of bylaws that formalize the organizational structure of the society. Recently, the membership received for approval, a constitution that has been amended to reflect this new structure. Essentially, the society chose to recognize working relationships that had been proven during the past few years. Tasks that had been carried out without specific mandate were recognized, and their scopes were defined.

The aim in all of this activity was to preserve those attributes for which the society is well known: program flexibility and innovativeness, interdisciplinary approaches to well focussed topics, and the allowance of maximum organizational freedom to society members. The future vitality of the society was looked after by formation of committees on finance, long range planning and education.

The functional relationship of the various working groups are outlined in the block diagrams, and the next issue of the bulletin will include a description of each committee and its membership.



M R S: THE CORPORATE ROLE

As all those familiar with MRS meetings are aware, the Society enjoys the participation of researchers from industry, government and university laboratories as attendees and authors as well as in the program planning effort. The support of MRS activities by individuals and their institutions in this way has been an invaluable asset and insures the continuing vitality of our interdisciplinary forum. Perhaps less well known is the means by which the MRS is financially supported.

Each topical symposium offered by the Society operates as a quasi-autonomous conference in its own right and incurs most of the usual expenses. The single meeting registration fee and members' dues do not cover the cost of some fourteen symposia each year and provide for year-round Society operations. Major governmental grants directed toward specific symposium topics of interest to various Federal agencies have contributed to closing this gap. Past meetings have been supported by the Office of Naval Research, the Army Research Office, the Air Force Office for Scientific Research, the Defense Advanced Research Projects Agency, the Department of Energy, the Nuclear Regulatory Commission, the National Aeronautics and Space Administration, and the U.S. Bureau of Mines. We trust that, to the extent our topical coverage overlaps the missions of these agencies, continued support will be forthcoming.

As the Society's programs continue to expand in size and scope, additional support will be required. This need becomes particularly acute in times of reduced governmental spending. The technological relevance of MRS symposia accounts for the strong representation of industrial laboratories at our meetings. This is reinforced by the

interdisciplinary format of the meetings, which so closely parallels the way materials research is actually pursued. An increasing number of industrial research and commercial organizations have recognized the Society's need for support beyond that accrued from meeting registration fees and have sponsored some MRS activities. To aid in developing a close liaison with our corporate sponsors and to help enlist the support of additional sponsors, the Council of the MRS formed the Corporate Participation Committee, which first met in November 1980.

Over the past fifteen months the Committee has worked toward expanding corporate sponsorship through a variety of means, not the least of which has been through individual researchers from the industrial community. Of course, the primary benefit to sponsoring corporations is, and will continue to be, the opportunity for technical and personal interactions and information exchange which MRS meetings provide. Beyond this, our corporate sponsors are given advance notice of Society activities and their advice is directly solicited in the planning stage of topical programs. They are also given the option of providing literature displays for participants at MRS meetings.

It is also well recognized that the interaction between university and industry at our meetings is mutually beneficial. Not only does each segment of the research community learn of the interests and activities of the other, but personal contacts are an effective means by which industry can identify talented researchers as prospective staff members for industrial research labs. The MRS will facilitate this process by providing the appropriate liaison and interview mechanisms at the request of a sponsoring corporation.

Corporations that affiliate with the

Society through sponsorship of particular topical symposia or through general grants-in-aid are encouraged to send representatives to MRS meetings. The Corporate Participation Committee schedules Corporate Affiliate functions where matters of mutual concern are discussed among our affiliates and with Society officers. Listed below are companies presently supporting the MRS.

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Inquires regarding sponsorship may be directed to the MRS Secretariat.

SOLID STATE TRANSDUCERS

The Solid State Transducers symposium exceeded our expectations. The presentations provided an excellent mix of high quality technical papers and review papers dealing with the fundamental physics and chemistry of sensors. Some of the interesting topics included the magnetic sensor, the dielectric measurement technique, gas sensors, MIS gas diode detector, special diaphragm pressure transducer and sodium potassium micro ISFET's.

Attendance was 40 to 50 percent higher than expected. Although the room seated 120 people, ten were

standing during the first day. Attendance continued throughout the symposium at about 70-100, indicating a strong interest in the program. The evening panel discussion was attended by about 70 people and although it was formally ended at 10 p.m., many participants held informal discussions until a later hour.

The half-hour time allotment per speaker worked out well and most speakers limited their talks to 20-25 minutes, leaving time for discussion which increased audience participation.

During the evening meeting, it was

suggested that there should be a fixed schedule for similar future solid state transducer symposia. An ad hoc committee was formed to consider this and to discuss ways to implement the idea. Several industrial companies indicated their willingness to provide additional funds beyond existing government support to make such meetings possible.

Wen H. Ko
Case Western University

S. C. Chang
GM Research Laboratories
Chairmen

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT

The 4th International Symposium on the Scientific Basis for Nuclear Waste Management was highlighted by a maturing of the process of characterizing alternative forms for immobilization of the waste. It was generally shown that when a total waste disposal system is taken into account, several waste forms are more than adequate. The decision regarding which waste form will be used, particularly for the low heat

generating defense wastes, therefore seem to revolve most around cost and ease and safety of processing.

It is anticipated that future symposia will reflect a growing interest in the science underlying low level waste disposal and in analyses of total system performance, including geologic phenomena.

Another highlight of this

symposium was the enthusiastic response to the poster sessions. Since these sessions offer so much potential for one-to-one information exchange and discussion, there will probably be a higher proportion of poster session papers in future years.

Steven V. Topp
DuPont Savannah River Laboratory
Chairman

NOMINATIONS FOR THE VON HIPPEL AWARD

The membership is invited to nominate distinguished materials scientists for the Society's most prestigious honor, the Von Hippel Award. Nominations must be received by May 15, so do not delay.

The Award recognizes scientists of the first order, whose research has contributed significantly to a greater understanding of materials from the atomic to the microstructural level. The Award recognizes a body of work rather than an isolated achievement.

Even more importantly, the Award recognizes the interdisciplinary nature of materials science, the cooperative spirit in which various disciplines work in concert to solve problems common to the several fields.

Nominations should include a description of the career achievements of the nominee, and should be sent to K.N.Tu, Awards Committee Chairman, Thomas J. Watson Research Center, International Business Machines Corp., Yorktown Heights, New York 10598, (914) 945-1602.

THIN FILMS AND INTERFACES

The theory on Schottky barriers, electronic states and structures were separately addressed with the conclusion emerging that understanding of the interfaces requires correlation of electronic states and structures to electrical properties.

The session on TEM studies was a significant development in that this concerns the first observations on atomic scale of the structure of the interfaces. Since the pioneering work of H. Foell about two years ago, several groups have explored the

problem, and their results are pushing to the limit the resolution of the best TEM. These results clearly lay the foundation for theoretical work that will ultimately lead to the understanding of the Schottky barrier problem.

To balance the basic science areas, the symposium on the third day took up applications to microelectronics, and solar cells, silicides and metallization in VLSI were addressed. Those reviews helped to focus attention on problems that can lead to

new and exciting areas of research, and certainly brought into focus the importance of material properties for device interface and the need for lateral as well as vertical properties of the interfaces. Again, we were over crowded and this brought the meeting to an exciting end.

P. S. Ho
K. N. Tu
IBM Thomas J. Watson
Research Center
Chairmen

RAPIDLY SOLIDIFIED AMORPHOUS AND CRYSTALLINE ALLOYS

While earlier symposia in this series mostly dealt with amorphous metals, the present session also included rapidly quenched crystalline materials, microcrystalline alloys prepared by devitrification, alloy surface layers produced by laser and electron beam processing, as well as catalysis, magnetism, etc., suggesting the widening scope of materials produced by rapid solidification processing that are considered for technological applications.

The symposium, which was sponsored by AFOSR, ARO, DARPA and ONR, was very well attended, especially by industry

representatives. Synergistic interactions existed with other symposia, such as those on ion implantation, laser and electron interactions with solids, and space processing of materials, which in part treated related topics.

About 80 papers in six sessions and

a large poster session dealt with fundamentals, processing, and structure-property relationships in amorphous and crystalline alloys. It is intended that this series of symposia on rapid solidification processing be continued at future Society meetings.

B. H. Kear
Exxon Research &
Engineering Co.

B. C. Giessen
Northeastern University
Chairmen

On these pages appear brief reports by chairmen of some of the 1981 Annual Meeting symposia, which for reasons of space could not appear in the January/February issue of the Bulletin.

GRADUATE STUDENT AWARD NOMINATIONS

Ten awards are available for graduate students conducting research on a topic to be addressed at one of the symposia planned for the Annual Meeting. The award consists of a cash grant of \$50, waiver of meeting registration fee, and a travel grant of one-half the round-trip economy fare between Boston and the applicant's community.

Criteria are graduate standing in a materials-related academic program, participation in one of the symposia, outstanding performance and promise as judged by the faculty advisor and significant research as judged by the symposium chairman.

Application materials - available from the Secretariat, 110 Materials Research Laboratory, University

Park, PA 16802 - must be completed and returned by Sept. 1. The application package must include an abstract of the relevant thesis or publication and a letter of support from the research supervisor.

Results of the competition will be announced Oct. 1, and the winners will be recognized at the Von Hippel Award ceremony.

A CALENDAR OF THE SOCIETY'S ACTIVITIES

MAY

- 1 - Mail Membership Directory (includes MRS Constitution, By Laws, Officers and Committees)
- 15 - Nominations for the Von Hippel Award must be in the hands of K. N. Tu, Awards Committee President.

JUNE

- 7-10 - Berlin Meeting, "Scientific Basis for Nuclear Waste Management"
- 15 - Deadline for submission of abstracts to Symposia Chairpersons
- 15 - Nominating Committee submits candidates for 1st and 2nd Vice Presidents, Secretary, Treasurer and five Councillors on ballots to Council (return deadline July 15).
- 15 - Secretariat tallies ballots for the Von Hippel Award and reports results to Council

JULY

- 1 - Deadline for submission of final programs for symposia to Program Committee
- 15 - Program Committee submits final Program and Registration booklet copy to Secretariat
- 15 - Secretariat tallies ballots of Council and using this slate of candidates for officers and councillors prepares ballot for distribution to general membership in August

AUGUST

- 15 - Deadline for Submission of Final Abstracts by the Symposia Chairpersons to the

Secretariat

- 15 - Secretariat mails ballots for election of officers and councillors to general membership (return deadline Sept. 15)
- 31 - MRS mails Preliminary Program with hotel and meeting registration forms

SEPTEMBER

- 15 - Final Program and Abstracts submitted to printer
- 15 - Secretariat reports results of balloting for officers and councillors to Council and notifies candidates of results
- 23 - Program Committee Meeting with 1982 Symposia Chairpersons at Park Plaza Hotel, Boston

OCTOBER

- 1 - Awards Committee announces Student Awards - Prints inserts with these announcements and those for Von Hippel Award for inclusion in the registration folder (deadline Oct. 29 at hotel)
- 8 - Announcement by President of 1983 Committee Chairpersons to Council and committees of Society ('83 Committee Chairpersons will provide nominations for their respective committees to President before Oct. 25)
- 25 - Deadline for initial submission to President of nominations for committee members by '83 Committee Chairpersons
- 31 - Society Publications (Proceedings, etc.) with order forms are displayed

- 31 - (5:30 p.m.) Boston Meeting registration opens
- 31 - (8:30 p.m.) Committee meetings (open to membership)
 1. Publications (C. White)
 2. Education (R. Roy)
 3. Membership (B. Giessen)
 4. Long Range Planning (K. Tu)
- 31 - (late) Poster boards set up at The Castle

NOVEMBER

- 1-4 - Boston Meeting - Boston Park Plaza Hotel
- 1 - Plenary Session (5:30 - 7:00 p.m.)
- 2 - Von Hippel Award/Wine and Cheese Reception

MRS BULLETIN

VOLUME VII NUMBER 2

The Materials Research Society Bulletin is published bi-monthly by the Materials Research Society for its members and others interested in materials science. Correspondence and submissions are invited. They should be brief and typewritten (double spaced), and the author's affiliation must be indicated. Address technical materials to the Managing Editor and all other materials to the Editor.

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Summit, New Jersey 07901

1981 VON HIPPEL AWARD ADDRESS

Highlights from the Von Hippel Award remarks of Prof. James W. Mayer, Cornell University.

I am honored to be the recipient of the Von Hippel Award. Prof. Von Hippel's long-standing, interdisciplinary approach to the science and engineering of materials exemplifies the spirit of the Materials Research Society today. The award has a special significance to me because of my research associated with a previous award recipient, David Turnbull, and two MRS presidents, John Poate and King Nung Tu. Prof. Turnbull and his group at Harvard have been a source of inspiration to my colleagues and to me over the past ten years in our investigation of epitaxial growth - both in the solid phase and in the transient liquid-phase. David Turnbull has a delightful touch with his pocket slide-rule. King Tu has developed my awareness of the materials science aspects of thin-film reactions in our long association in studies of silicides. John Poate provided the impetus for ion-beam mixing through our work on preferential sputtering of silicides and implantation in copper single crystals. My years at Caltech are linked with Marc Nicolet, my associate in many ventures, and with students and colleagues such as S. S. Lau, who provided the excitement in our studies. The Von Hippel Award is also recognition of the contributions of all these associates and colleagues.

This is an exciting time to be involved in materials research, as witnessed by the attendance at this meeting of the Materials Research Society. From the viewpoint of Prof. Von Hippel, it has always been an exciting time. I draw from his book *The Molecular Designing of Materials and Devices* (M.I.T. Press, 1965) that comprises publications from lecturers

at his 1963 summer session course at the MIT Laboratory for Insulation Research. It is a provocative book, as provocative as C. Escher's "Thinker", which appears as the first illustration in the book, and

reflects Von Hippel's view that the "isolation of specialists is ending" and that they are drawn into "mutual alliance" to "create any kind of material and device". In my research the present thrust of materials science follows the same course as outlined nearly twenty years ago but with emphasis on tailoring the outer microns of material and on understanding surfaces and interfaces. This focus arises naturally because of the development of high-vacuum techniques and analytical tools such as auger electron spectroscopy, secondary-ion-mass spectrometry and Rutherford backscattering, which measure composition depth profiles. One has the tools, now, to study surfaces, interfaces and thin-film reactions. Ion implantation, ion-beam mixing, and pulsed beams - lasers, electrons and ions - allow tailoring of the composition and structure of the near surface region.

We are truly at the forefront of a field that will establish the technology for future devices and structures. In spite of this, we face difficult times. Funds for the basic research that is at the heart of materials science are being cut. The atmosphere is reflected in headlines ... "Cuts in U.S. Research Support Batter National Laboratories"... "Scientists Warn White House About Dangers of Cuts in Basic Research"... "Budget Cuts"... "Frank Press to American Science: 'Tell People What You're Doing and Why It Is Important'"... "Reduction in Funds for Research and Development".

These cuts are not a new phenomenon; I experienced them twice before in the early 60's and 70's. Now, however, research in the

modification and analysis of surfaces and interfaces is even more expensive. Research systems cost between \$100,000 to \$500,000. At universities, even burdened costs of graduate students are about \$20,000/year.

I believe that we cannot rely on government funds to carry out our research programs and I suggest direct collaboration of University with Industry. In this approach, industrial laboratories would give a grant or contract directly to a university department for work in a fairly specific area of research. This would have the advantage that industrial groups would have back-up research underway in areas of direct interest; this support would also have an altruistic flavor as it would provide for the training of graduate students. From the standpoint of the university department or professor it would provide clearly identified support.

At present, there is industrial support of universities as well as fellowship programs and research contracts. My proposal is to strengthen the ties between university and industrial researchers on a direct basis. There are problems with this approach involving both the time scale and patents. University research is not geared to "fire-fights" on the production line and the research must be open and publishable. The patent situation has both University and Industry claiming their rights. One solution is to have the research cover broad areas that do not involve proprietary processes and to share the patents by assigning the licensing rights to the corporation and by splitting the royalties on a mutually agreed basis.

We must cooperate - University and Corporation - if we are to maintain our technological base at the forefront of materials science. It is too exciting an area to neglect.



MATERIALS RESEARCH SOCIETY
102C Materials Research Laboratory
University Park, PA 16802

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1982 ANNUAL MEETING

[Continued from Page 1]

B. Massalski, Carnegie Mellon Univ., Mellon Institute, Pittsburgh, PA 15213, (412) 578-2708.

Nuclear Radiation Detector Materials, chaired by **E. E. Haller**, Bldg. 70A/4473, Lawrence Berkeley Lab., Berkeley, CA 94720, (415) 486-5294; **W. A. Higinbotham**, Bldg. 197C, Brookhaven National Lab., Upton, NY 11973, (516) 282-2908; and **H. W. Kraner**, Bldg. 535B, Brookhaven National Lab., Upton, NY 11973, (516) 282-4238.

Superconducting Materials, chaired by **T. H. Geballe**, W. W. Hansen Research Laboratory, Dept. of Applied Physics, Stanford University, Stanford, CA 94305, (415) 497-0215; and **J. Bevk**, Bell Laboratories, 6E-32B, 600 Mountain Avenue, Murray Hill, NJ 07974, (201) 582-5913.

Intercalated Graphite, chaired by **M. S. Dresselhaus**, Center for Materials Sci. & Eng., M.I.T., Cambridge, MA 02139, (617) 253-6864; **M. J. Moran**, Chemistry Department, West Chester State College, West Chester, PA 19380, (215) 436-2476; and **J. E. Fischer**, Moore School of EES D2, U. of

Pennsylvania, Philadelphia, PA 19104, (215) 243-6924.

Laser Diagnostics and Photochemical Processing for Semiconductor Devices, chaired by **R. M. Osgood**, Dept. of Electrical Engineering/Columbia Radiation Lab., Columbia University, New York, NY 10027, (212) 280-4462 or 3103; and **S. R. J. Brueck**, MIT - Lincoln Lab., Wood Street, Lexington, MA 02173, (617) 862-5500 x5557.

Solar Energy Photoconversion: Materials and Devices, chaired by **L. L. Kazmerski**, Solar Energy Research Institute, 1617 Cole Boulevard, Golden, CO 80401, (303) 231-1115; and **M. S. Wrighton**, Department of Chemistry, Massachusetts Institute of Technology, Cambridge, MA 02139, (617) 253-1597.

Advanced Methods of Catalyst Characterization, chaired by **K. Klier**, Sinclair Laboratory, Bldg. #7, Lehigh University, Bethlehem, PA 18015, (215) 861-3577.

Heterogeneous and Cluster Catalysts for CO-H₂ Reactions, chaired by **E. L. Kugler**, Exxon Research & Engineering Co., P.O. Box 45, Linden, NJ 07036, (201) 474-3301; and **D. W. Goodman**,

Division 5114, Sandia Laboratories, P.O. Box 5800, Albuquerque, NM 87185, (505) 844-5435.

Effect of Surface and Colloid Phenomena on Properties of Fresh Concrete, chaired by **Jan. P. Skalny**, Martin Marietta Laboratories (301) 247-0700; and **Sidney Diamond**, Purdue University, (317) 494-5016.

Ceramics from Solutions: Sol-gel and Fine Powder Technologies, chaired by **D. E. Harrison**, Manager, Nuclear Materials Department, Westinghouse R & D Center, 1310 Buelah Rd., Pittsburgh, PA 15235, (Tel: (412) 256-7841).

In general, the deadline for abstracts to be in the hands of symposia chairmen is June 15. Abstracts must be in the form specified in the Preliminary Announcement.

The Announcement, which includes more complete information about the meeting and a form for reserving accommodations at the conference hotel, will be mailed to members shortly. Others can request a copy from the Materials Research Society Secretariat, Ernest M. Hawk, Executive Secretary, 110 Materials Research Laboratory, University Park, PA 16802, (814) 865-2424.