

**MRS**

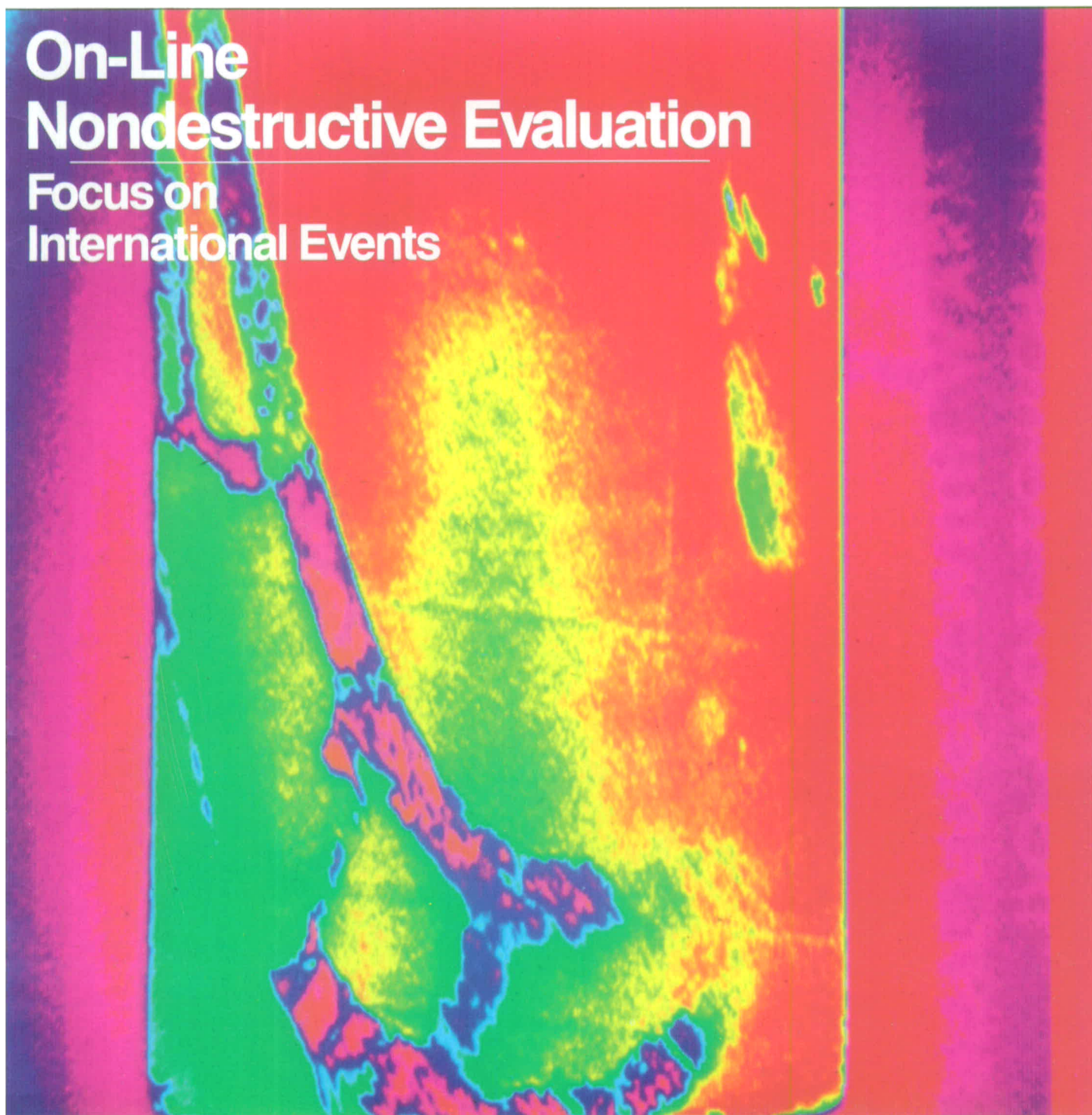
# BULLETIN

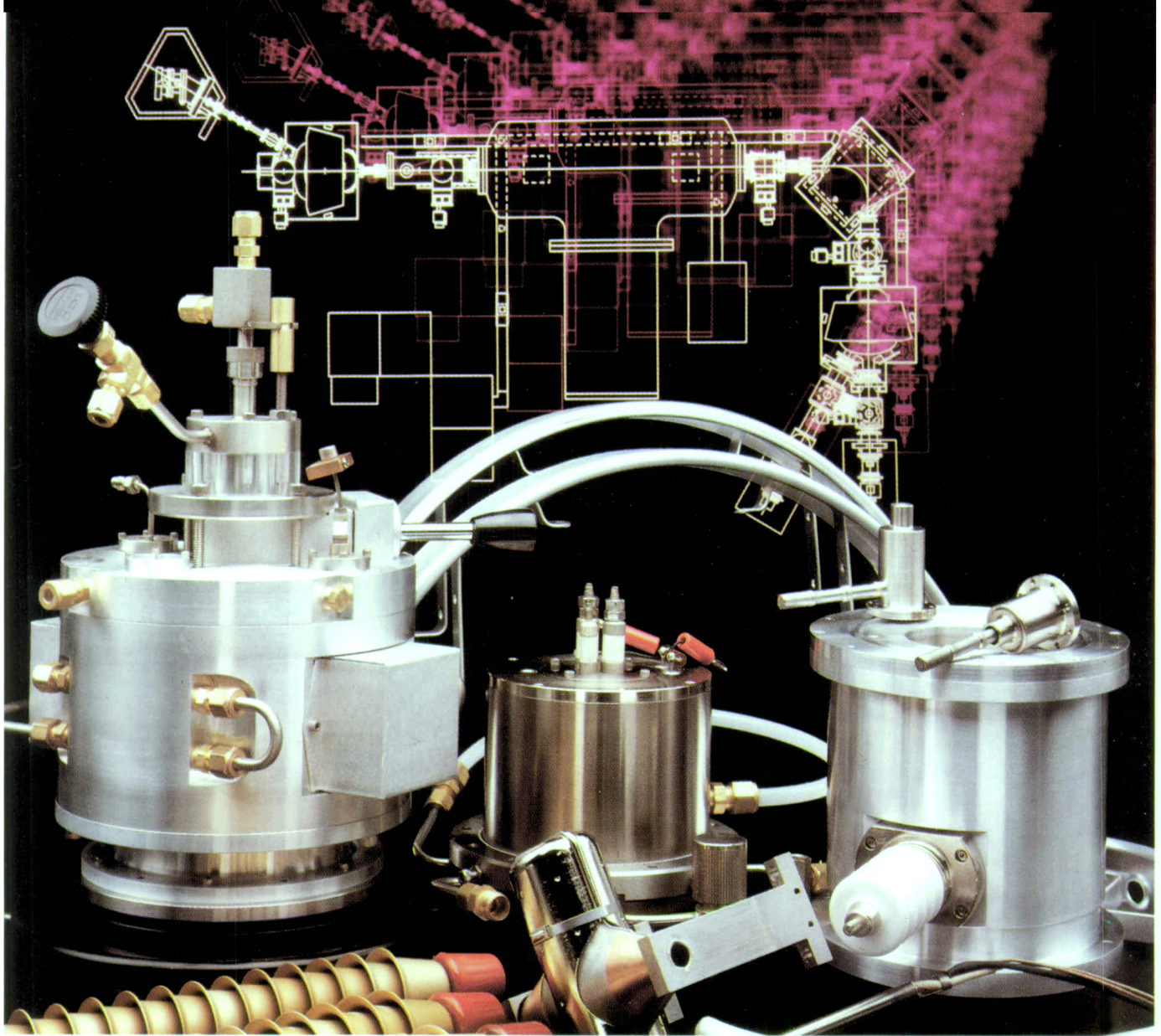
April 1988

Volume XIII, Number 4

Serving the International Materials Research Community

**On-Line  
Nondestructive Evaluation**  
Focus on  
International Events





# ionX $\equiv$ ION BEAM PRODUCTS

General Ionex Corporation, the world leader in advanced ion beam technology, continues to offer the most up-to-date components and systems for the production of ion beams. With energies from the keV to MeV range, GIC ion beam products provide versatility, ease of operation and reliability. From basic ion sources to MeV analysis and materials modification systems, IONEX can cover the spectrum of your needs.

Our product line includes:

- Positive, negative ion sources
- Ion beam lenses, steerers, scanners
- Air insulated accelerator systems
- MeV Tandatron™ ion accelerators

- RBS Surface Analyzer
- MeV implantation systems
- Target chambers and manipulators

You can customize your system with a choice of manual or computer control, metal sealed flanges, vacuum systems, etc.

LET OUR TWENTY YEARS OF EXPERIENCE WORK FOR YOU. CONTACT US WITH YOUR SPECIFIC NEEDS.

GENERAL IONEX CORPORATION

19 Graf Road

Newburyport, MA 01950

Telephone (617) 462-7147

FAX 617 462 3543, TWX 710 347 6919

General Ionex Corporation



A Publication of the Materials Research Society

Volume XIII, Number 4 ISSN: 0883-7694

**ON-LINE  
NONDESTRUCTIVE  
EVALUATION**

- 17 Intelligent Processing of Materials**  
H. T. Yolken, Guest Editor
- 21 Advanced Processing of Composites**  
B. Tittmann
- 28 Physics of Thermal Wave NDE of Semiconductor Materials and Devices**  
J. Opsal and A. Rosencwaig
- 34 On-Line NDE for Control and Modeling of Ceramic Processing**  
R. W. McClung and D. R. Johnson
- 40 Ultrasonic Characterization of Texture and Formability**  
A. V. Clark, Jr.
- 44 Real-Time X-Ray Diffraction for Materials Process Control**  
R. E. Green, Jr.
- 49 Ultrasonic NDE for Surface Roughness**  
D. G. Eitzen and G. V. Blessing

**SPECIAL FEATURE**

- 54 Up Close: The National Center for Electron Microscopy at Lawrence Berkeley Laboratory**  
K. H. Westmacott

**INTERNATIONAL**

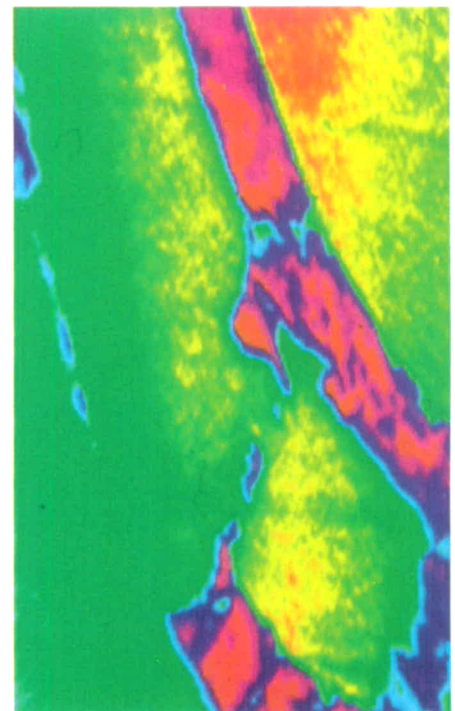
- 56 E-MRS Holds 1988 Spring Meeting in Strasbourg**
- 57 Materials Research Activities in Europe**
- 57 E-MRS Seeks Nominations for Board of Delegates**
- 59 Indo-U.S. Workshop on Advanced Techniques for Microstructural Characterization Promotes Collaboration**
- 60 Tokyo Hosts First MRS International Meeting on Advanced Materials**

**DEPARTMENTS**

- 4 Material Matters**
- 8 Research/Researchers**
- 12 Editor's Choice**
- 14 Research Resources**
- 16 From Washington**
- 53 Historical Note**
- 64 Book Reviews**
- 68 Calendar**
- 71 Classified**

**MRS NEWS**

- 62 JMR Accepting Papers for Feature Section on Laser and Particle Beam Processing of Materials**
- 62 1988 Von Hippel Award Nominations Sought**
- 66 Call for Papers—1988 MRS Fall Meeting**



**ON THE COVER:** False-color reflection ACT (asymmetric crystal topographic) image taken in real-time of a portion of a single-crystal nickel-based alloy turbine blade. The image does not show all of the blade portion exposed by the x-ray beam because the entire blade is not a single crystal. Examination of the image shows that the single-crystal portion contains a substructure, indicating the presence of fairly large subgrains. See "Real-Time X-Ray Diffraction For Materials Process Control" by R. E. Green, Jr. on p. 44.

# MRS BULLETIN

Materials Research Society • 9800 McKnight Road, Suite 327 • Pittsburgh, PA 15237

## MRS BULLETIN

### Editorial Board Chairman

E. N. Kaufmann  
Lawrence Livermore  
National Laboratory

### Associate Editor—Europe

I. W. Boyd  
University College London  
Dept. of Electronic and  
Electrical Engineering  
Tarrington Place  
London WC1 E7JE  
United Kingdom  
01-387-7050  
ext. 3956 or 7340

### Guest Editor

H. T. Yolken

### Contributors:

K. J. Anderson, T. L. Aselage, K. D. Keefer, J. C. Soares,  
L. Zanotti

## 1988 MRS EXECUTIVE COMMITTEE

### President

J. E. E. Baglin  
IBM Almaden Research  
Center

### First Vice President and President-Elect

R. P. H. Chang  
Northwestern University

### Second Vice President

P. S. Peercy  
Sandia National Laboratories

### Executive Director

Materials Research Society  
John B. Ballance

## EUROPEAN MRS

### P. Siffert

Centre de Recherches  
Nucléaires  
Laboratoire PHASE  
67037 Strasbourg Cedex,  
France  
(88) 28 65 43

## ABOUT THE MATERIALS RESEARCH SOCIETY

The Materials Research Society (MRS) is a nonprofit scientific association founded in 1973 to promote interdisciplinary goal-oriented basic research on materials of technological importance. Membership in the Society includes more than 5,900 scientists from industrial, government, and university research laboratories in the United States and more than 25 countries.

The Society's interdisciplinary approach to the exchange of technical information is qualitatively different from that provided by single-disciplinary professional societies because it promotes technical exchange across the various fields of science affecting materials development. MRS sponsors two major international annual meetings encompassing approximately 30 topical symposia, as well as numerous single-topic scientific meetings each year. It recognizes professional and technical excellence, conducts short

## MRS BULLETIN EDITORIAL BOARD

MINKO BALKANSKI  
University of Pierre and Marie Curie  
Laboratoire de Physique des Solides  
4 Place Jussieu, Tour 13  
75230 Paris Cedex 05, France  
telephone: 336-25-25

RICHARD B. FAIR  
Vice President  
Research Program Management  
Microelectronics Center  
of North Carolina  
P.O. Box 12889  
Research Triangle Park, NC 27709  
telephone: (919) 248-1800

FRANK Y. FRADIN  
Associate Laboratory Director for  
Physical Research  
Bldg. 221  
Argonne National Laboratory  
9700 South Cass Avenue  
Argonne, IL 60439-4844  
telephone: (312) 972-4925

SHU-EN HSU  
Director  
Materials R&D Center  
Chung Shan Institute of  
Science and Technology  
P.O. Box 1-26  
Lung-Tan, Taiwan, China  
Cable: CHUNSHANINST SHIMEN,  
TAIWAN

RALPH J. JACCODINE  
Sherman Fairchild Professor  
of Solid State Studies  
Sherman Fairchild Laboratory 161  
Lehigh University  
Bethlehem, PA 18015  
telephone: (215) 862-3950

HIROSHI KAMIMURA  
Department of Physics  
Faculty of Science  
University of Tokyo  
7-3-1 Hongo, Bunkyo-ku  
Tokyo 113 Japan  
telephone: 03-812-2111  
telex: UTPHYSIC J23472

ELTON N. KAUFMANN (Chairman)  
Lawrence Livermore National  
Laboratory  
P.O. Box 808 L-350  
Livermore, CA 94550  
telephone: (415) 423-2640

R. KRISHNAN  
Naval Chemical & Metallurgical  
Laboratory  
Naval Dockyard  
Bombay 400 023, India  
telex: 011-3192 NCML IN

HENG DE LI  
Professor  
Department of Engineering Physics  
Tsinghua University  
Beijing, China  
telephone: 28-2451, ext. 2770

JAMES L. MERZ  
Associate Dean  
for Research Development  
College of Engineering  
University of California  
Santa Barbara, CA 93106  
telephone: (805) 961-4446

SUSUMU NAMBA  
Professor of Electrical Engineering  
Faculty of Engineering Science  
Osaka University, Toyonaka  
Osaka, Japan 560

JULIA M. PHILLIPS  
AT&T Bell Laboratories  
Room 1E-431  
600 Mountain Avenue  
Murray Hill, NJ 07974  
telephone: (201) 582-4428

EMANUELE RIMINI  
University of Catania  
Department of Physics  
57 Corso Italia  
I 95129 Catania, Italy  
telephone: 37-70-61  
telex: 911554 INFNCT I

RUSTUM ROY  
Materials Research Laboratory  
Pennsylvania State University  
University Park, PA 16802  
telephone: (814) 865-3424

RICHARD L. SCHWOEBEL  
Directorate 1800  
Sandia National Laboratories  
P.O. Box 5800  
Albuquerque, NM 87185  
telephone: (505) 844-9273

G. D. W. SMITH  
University of Oxford  
Department of Metallurgy  
and Science of Materials  
Parks Road  
Oxford OX1 3PH, England

TAKUO SUGANO  
Professor of Engineering  
Department of Electronic Engineering  
University of Tokyo  
7-3-1 Hongo, Bunkyo-ku  
Tokyo 113 Japan  
telephone: 03-812-2111, ext. 6675

C. W. WHITE  
Solid State Division  
Oak Ridge National Laboratory  
Oak Ridge, TN 37831  
telephone: (615) 574-6295

J. S. WILLIAMS  
Royal Melbourne Institute of  
Technology  
Microelectronics Tech. Center  
124 Latrobe Street  
Melbourne, Victoria 3000, Australia  
telephone: 03-660-2459

courses, and fosters technical exchange in various local geographical regions through Section activities and Student Chapters on university campuses.

MRS is an Affiliated Society of the American Institute of Physics and participates in the international arena of materials research through associations with professional organizations such as European MRS.

MRS publishes symposia proceedings, the *MRS BULLETIN*, *Journal of Materials Research*, and other volumes on current scientific developments.

For further information on the Society's activities, contact MRS Headquarters, 9800 McKnight Road, Suite 327, Pittsburgh, Pennsylvania 15237; telephone (412) 367-3003; facsimile (412) 367-4373.

# SUPERCONDUCTIVITY

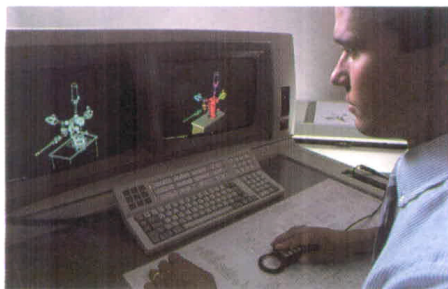


## LET PERKIN-ELMER RESPOND WITH SPEED AND EXPERTISE

### *Match Your Ideas With Our Experience...*

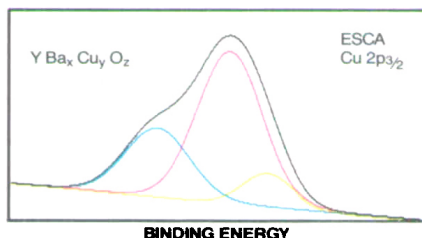
#### **Thin Film Deposition**

Lightning fast developments in superconducting materials require exacting deposition capabilities, and Perkin-Elmer is providing them. Our manufacturing and CAD expertise can quickly turn your plans into a system for your deposition experiments. We offer years of experience designing and manufacturing precision UHV test chambers and custom deposition systems. Our SAVE (Self Assembled Vacuum Experiments) capability allows you to select exactly the components you need to fulfill an experimental application...from a single supplier.



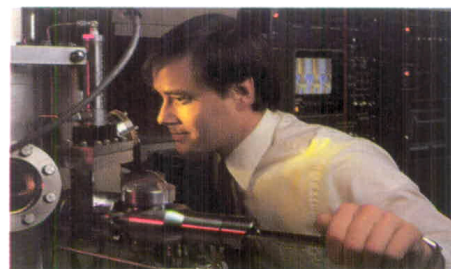
#### **Materials Analysis**

Our Auger, ESCA and SIMS instruments help you analyze surfaces, thin-films, grain boundaries, and interfaces to determine elemental composition, spatial distribution, chemical states and electronic structure. The sensitivity of these techniques allows you to more fully characterize and understand your superconducting materials.



#### **Laboratory Support**

Our Lab Scientists are already engaged in helping others analyze complex, high temperature superconductors. Five laboratories around the world offer a full complement of surface characterization techniques to assist you in your research.



#### **Sample Our Capabilities**

Fast changing developments require immediate answers. Bring us a sample or a complete experiment, then watch us respond to your research needs. Call or write us for a demonstration.

Perkin-Elmer, Physical Electronics  
6509 Flying Cloud Drive  
Eden Prairie, MN 55344  
(612) 828-6300

*From Physical Electronics.  
The Leader in Surface  
and Thin-Film Technology. Ⓞ*

\*Superconducting materials supplied by:  
Dr. R.C. Budhani., Dr. R.F. Bunshah  
U.C.L.A. Department of Materials Sciences.

**PERKIN-ELMER**