



IEEE MAGNETICS SOCIETY NEWSLETTER



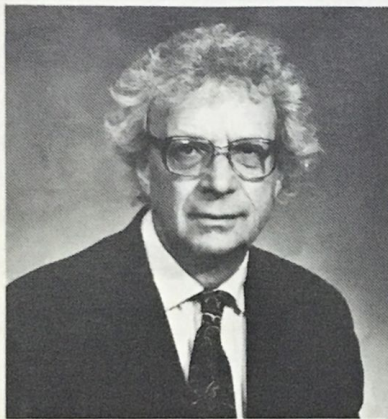
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May 1991

CRAIG PERLOV, EDITOR

DIVISION IV DIRECTOR REPORT

Martin V. Schneider



Martin V. Schneider

At the beginning of this year I took over the responsibilities of Leonard Carlson as your new director and representative to the IEEE Board. Len was very helpful in introducing me to the dedicated and zealous people on the Board who care a great deal about the financial health of the IEEE and the quality of services offered to members. He has gone on to bigger and better things and is now chairperson of the new RAB/TAB Chapters Committee which will focus its efforts on meeting the needs of our chapters. Because of his experience he was also put in charge of the new TAB ad hoc Committee on Education. We wish Len good success in his new endeavours and hope to hear from him through his continued contributions to the IEEE Magnetism Society Newsletter.

Membership Growth/New Chapters

The Magnetism Society showed a healthy growth rate of 3.4% in membership last year; 3,719

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SUMMARY OF TALK GIVEN

BY DR. ALDEN RAY

Bryen E. Lorenz

SPS Technologies of Jenkintown, Pennsylvania, and the Magnetism Chapter of the Philadelphia Section of the IEEE cosponsored "Rare Earth-Transition Metal Permanent Magnets," a talk given by Dr. Alden Ray on November 20 last year. Dr. Ray, currently the senior research metallurgist at the Research Institute of the University of Dayton, is a noted expert in this area of permanent magnets.

To begin his talk, Dr. Ray gave an historic perspective of the impressive gains made in the field of rare earth permanent magnets (REPMs) since their discovery in 1965. The first generation of REPMs that were placed into commercial use by the early seventies were of the SmCo_5 kind which replace the older AlNiCo permanent magnets. These new materials had a maximum energy product, for samples developed in the laboratory, of about 25 MGOe. This was a twofold increase over the AlNiCo types. Later in that decade, a second generation of REPMs appeared commercially, composed of $\text{Sm}_2(\text{Co,Fe})_{17}$. This family of permanent magnets pushed the maximum energy product, obtained in the laboratory, into the 30 MGOe range. Recently, the energy product has been increased still further with the introduction of a third generation of REPMs; the $\text{Nd}_2\text{Fe}_{14}\text{B}$ -based magnets. These unique materials have approached 50 MGOe in the laboratory.

As for future candidates in rare earth permanent magnet development, Dr. Ray pointed out that there are three basic criteria that govern their selection:

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DIVISION IV DIRECTOR REPORT (continued)

in December 1989 to 3,844 at the end of 1990. The increase of 125 members was the combined result of a good growth rate in Europe (11.4% for IEEE Region 8) and a modest increase of 1% in the United States. With a relatively small effort it should be possible to enhance both the technical activities and membership growth of the Society in the Common Market countries which have a total population of 300 million. The formation of new chapters looks promising in France and Germany, where membership is increasing rapidly. While working in Paris last December, I met with Ferdy Mayer, an active member of the Magnetics Society. Ferdy is in the process of forming a joint chapter of the Magnetics Society and the Electromagnetic Compatibility Society. Since both Societies are in our Division, this will increase communications and interactions between two Societies in Division IV.

New Faces at the Top

At the beginning of this year, Eric E. Sumner became President of the IEEE. As Vice President of Operations Planning at AT&T Bell Laboratories until the end of 1990, and recipient of the Alexander Graham Bell Medal in 1978, he brings a number of talents to his new job which will benefit the IEEE. I have worked with Eric previously on IEEE projects and have found him to be receptive and supportive of new projects that help the working engineer to achieve his or her professional objectives.

Our new Vice President of Technical Activities is Fernando Aldana, Vice President at the Universidad Politecnica de Madrid in Spain. Fernando is a dynamic, down-to-earth person who knows how to motivate his team. He and Eric Sumner visited industry leaders in Central Europe last December to gain their support in encouraging engineers to join and become active in the IEEE. Fernando currently spends one week a month at the IEEE Service Center in Piscataway, New Jersey to work with the staff on all TAB related issues ranging from publications to sound financing.

1991 Board Meeting Highlights

The IEEE Board of Directors and Executive Committee met in New York City January 30 to February 1, 1991. The highlights of the meeting were as follows:

- IEEE General Fund reserves continue to decline; liquid funds were \$1.7M in 1991;
- Liquid fund reserves of the Societies are \$22M;
- IEEE membership showed a modest increase of 2.1%;
- Broadcast Technology and Consumer Electronics Societies will join Division IV in 1992;
- The direct mail campaign for gaining new members was successful. The requirement of obtaining reference signatures had been waived.

In order to improve the financial health of the IEEE, the Board endorsed targets for upcoming budgets and will hold the lid on spending. Future budgets will not only be balanced but will provide steadily growing surpluses beginning with \$1M in 1992.

1991 Division IV TAB Representatives

In order to be represented and participate in the Councils and Committees of the Technical Activities Board the following members from Division IV have been appointed to various TAB and other IEEE entities:

Ronald J. Pogorzelski

TAB Periodicals Council

Chester L. Smith

TAB Publications Products Council

Charles Buntschuh

TAB Technical Meetings

Peter N. Clout

TAB Awards and Recognition Committee

Robert H. Brook

Social Implications of Technology Committee

Alton L. Estes

Membership Development Committee

The IEEE Magnetics Society Newsletter is published quarterly by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017. The objective of the Newsletter is to publicize activities, conferences, workshops, and other information of interest to the membership of the Society and technical people in the general area of applied magnetics. Copy is solicited from the S-Mag membership, organizers of conferences, officers of the Society and local chapters, and other individuals or organizations with potentially relevant material. Copy should be sent to Dr. C. M. Perlov, Hewlett-Packard Labs, MS-2U, P.O. Box 10490, Palo Alto, CA 94303.

I have contacted each representative and encouraged them to submit contributions for publication in the IEEE Magnetics Society Newsletter. This will ensure that our members remain informed about new developments and services that will benefit their professional careers.

TALK (continued from page 1)

1. The Curie temperature must be well above room temperature ($T_c > 300^\circ\text{C}$).
2. the room temperature saturation magnetization, $4\pi M_s$, must be high.
3. the material must have large uniaxial crystal anisotropy, H_A , to enhance the maximum intrinsic coercive force.

The talk went on to touch upon the technical improvements in the operating characteristics of the REPMs, for instance in the area of temperature compensation. Changes in ambient temperature can have a marked effect on the saturation magnetization of these materials. The temperature coefficient, a measure of this effect relating change in magnetization to change in temperature, can be quite pronounced. However, researchers have found that heavy rare earth compounds (such as GdCo_5), in contrast to the lighter rare earth compounds used in REPMs (such as in SmCo_5) possess a temperature coefficient that can, when mixed in the proper amounts with the original REPM material, offset to a certain degree the degradative effects of changing temperature. This compensation technique makes it possible to attain a relatively constant magnetization over a larger temperature range. However, the introduction of the heavy rare earth elements into the REPMs has the adverse effect of diminishing the maximum energy product. For example, in comparing the uncompensated and compensated versions of the SmCo_5 -based REPMs at 100°C , a fourteenfold reduction in the temperature coefficient is observed while, at the same time, the energy product is approximately halved.

Dr. Ray's talk concluded with a discussion on future prospects for new or improved varieties of high energy product permanent magnets. His feeling is that although entirely new materials are always possible, there are none on the horizon at present and even if there were, full commercialization would require at least five years. More probable, would be the introduction of an enhanced commercial grade, $\text{Sm}_2(\text{Transition-Metal})_{17}$ with a maximum energy product reaching to 32 MGOe or perhaps $(\text{Sm, light rare earth})_2(\text{Transition Metal})_{17}$ going to 31 MGOe. Temperature

compensation techniques should improve to 300 C with the maximum energy product in the range of 15 to 20 MGOe. Other improvements to look for would be: nickel coatings from Shin-Etsu and TDK, hot rolled Pr-Fe-B-Cu magnets from Seiko-Epson, Nd-Fe-B-V magnets from Ugimag/Recoma/IGT and 41 MGOe Nd-Fe-B magnets from TDK.

NEW CHAPTER IN DENVER

Effective November 7, 1990, a Magnetic Society Chapter was established within the Denver section under the chairmanship of Dr. Subrata Dey. The first meeting in January, 1991, was held at the Storage Technology Corporation's Louisville, Colorado campus. Mr. Clark E. Johnson, past president of the Magnetic Society, spoke on "HDTV—America's Last Chance to Regain Technological Supremacy?" In attendance were some twenty-five people.

Our February speaker, Dr. William B. Phillips, Vice President of Information Technology, Storage Technology Corporation presented "DASD Technology Future"; in March, Professor Frank S. Barnes presented "The Effect of Time Varying Magnetic Fields on Biological Materials—Are Power Lines Dangerous?" and in April, Carl E. Patton, Colorado State University Physics professor, talked about magnetic research opportunities at CSU.

For information about our group please contact Dr. Subrata Dey at (303) 673-6494.

NEW NEWSLETTER EDITOR

I'm happy to announce that Dr. Jodie Christner has agreed to take over as editor of the Magnetics Society Newsletter. Jodie received her Ph.D. in physics from the University of Minnesota after which she worked for Control Data—Imprimis on advanced thin film magnetic recording media. She now works for IBM in Rochester, Minnesota investigating recording physics of advanced head, disk and channel combinations, including magneto-resistive heads. I am particularly pleased that Jodie has agreed to edit the Newsletter because I'm certain she will do a great job and make the Newsletter better than ever. If you wish to correspond, her address is:

DR. JODIE A. CHRISTNER
DEPT 2H2
IBM CORPORATION
3605 HIGHWAY 52N
ROCHESTER, MN 55901-7829

SCHOLARSHIP PROGRAM ANNOUNCEMENT

Although the deadline has passed to apply for the 1992 Magnetism Society Scholarship Program, we will accept late applications if these reach the director listed below promptly. To be eligible for consideration, a child of a Magnetism Society member must have taken the October, 1990 PSAT.

This program has been established for the children of Magnetism Society members through the annual nationwide scholarship competition conducted by the National Merit Scholarship Corporation. The NMSC is an independent, nonprofit organization whose major purposes are: to identify and honor exceptionally talented high school students and to aid as many as possible in obtaining a college education and to enable business enterprises and other organizations to contribute more readily and effectively to the support of higher education through scholarship grants.

One Magnetism Society Scholarship will be awarded in the Spring of 1992 to a student who will complete high school requirements and who will enter a regionally accredited U.S. College in 1992 to pursue courses of study leading to one of the traditional baccalaureate degrees.

The Magnetism Society winner will be chosen through the facilities of NMSC from among children of Magnetism Society members who meet the competition requirements established by NMSC. The winner will be chosen on the basis of test scores, academic records, leadership, and significant extracurricular accomplishments.

The Magnetism Society Scholarship will be a renewable award covering up to four years of full-time study or until baccalaureate degree requirements are completed, whichever occurs first. The amount of the stipend accompanying the scholarship will be related to the individual winner's financial situation and the costs of attending the college of the winner's choice. The maximum amount that may be awarded to a winner is \$4,000 per year; the minimum will be \$1,000 per year.

Descriptive material and entry blanks for the Magnetism Society Scholarship may be obtained by writing to the Magnetism Society Scholarship Program Director *immediately*.

Dr. Bernard R. Cooper
Scholarship Program Director
c/o Department of Physics
West Virginia University
Morgantown, WV 26506

APPLIED SUPERCONDUCTIVITY

The inaugural issue of *IEEE Transactions on Applied Superconductivity*, the IEEE's first journal in this field and the only one centered on applications, has just been published by The Institute of Electrical and Electronics Engineers.

The publication's editorial board is drawn from diverse IEEE Societies: Communications; Components, Hybrids, and Manufacturing Technology; Dielectrics and Electrical Insulation; Electron Devices; Instrumentation and Measurement; Magnetics; Microwave Theory and Techniques; Power Electronics; Power Engineering; and Ultrasonics, Ferroelectrics, and Frequency Control.

The journal will publish technical papers on the science and technology of superconductors and their applications. A "Technical Notes" section will publish short correspondence, to keep readers abreast of developments in this dynamic field.

Both electronics and power applications will be covered in the publication. Electronics applications will include analog and digital circuits and systems. Power applications will encompass magnet design for energy storage or magnetic levitation, new developments in superconductive motors and generators, and power transmission lines. Papers on materials will focus on such subjects as limiting current densities, microwave surface resistance, noise properties and magnetic-field dependencies.

The annual subscription rate is \$80 (or \$10/year for members of any of the ten sponsoring societies). More information can be obtained by calling 1-800-678-IEEE or, 908-981-0600 outside of the United States, 8 a.m. to 4 p.m., U.S. eastern standard time.

TRANSACTIONS ON MAGNETICS

The July 1992 issue of *Transactions* is to feature Non-Linear Effects in Magnetic Materials. Guest editors will be:

Professor A. D. Boardman
Department of Physics
University of Salford, Salford
M5 4WT, UK

and

Dr. S. Nikitov
Institute of Radio engineering and Electronics
USSR Academy of Sciences
Marx Avenue 18, 103907
Moscow, Centre, USSR

Papers are requested. Please submit written work in the agreed format of IEEE Transaction Magazine. Papers will be refereed in the normal way.

BOOK REVIEW

B. K. Middleton

Coding Techniques for Digital Recorders
by Kees A. Schouhamer Immink

Coding is an essential aspect of modern digital recording technology be it magnetic or optical. The variety of systems available in the areas of digital audio, digital video, digital data and instrumentation is vast and there is an equally wide range of codes which have been developed for these applications. Coding theory and practice for recording systems are now well developed but until recently there has been a shortage of books which treat this subject in the detail it deserves. This book represents a major development in this respect and is to be welcomed.

The book gives a structured introduction to the theory of line codes (channel codes or modulation codes as they may be variously called) and ranges widely within the subject to introduce many of the basic concepts, treat and classify many codes, and discuss many of their most important properties. The treatment is rooted in mathematics although a detailed mathematical exposition of coding theory is mercifully avoided. The subjects covered are Compact Disc: A design Case, Entropy and Capacity, Spectral Analysis, Runlength-limited Sequences, Ideal Dc-free Sequences, Performance of Dc-balanced Codes, Higher Order Spectral Zeros, Spectral Nulls at Frequencies other than Zero, Generation of Pilot Tracking Tones and Dc-free Runlength-limited Codes. The treatment carries the stamp of authority as should be expected from someone who has contributed widely to the technical literature on the subject.

This is not a beginners book on coding; the reader needs relevant background and interests to be able to read it to fullest advantage. It is nevertheless a valuable contribution to the available literature in this area.

NEW JOURNAL

The *International Journal of Applied Electromagnetics in Materials* publishes original research papers pertaining to the electromagnetic engineering phenomena of materials. Emphasis is placed on contributions concerning: physics and mechanics of electromagnetic materials; computational electromagnetics in materials and applications of electromagnetic forces and phenomena.

Subscription information: ISSN 0925-2096

1990, Vol. 1 (in 4 issues) Dfl.303.00/Us\$151.50

1991, Vol. 2 (in 4 issues) Dfl.310.00/Us\$184.50

Sample copies are available upon request.

RARE-EARTH MAGNETS AND THEIR APPLICATIONS

July 16, 1992, Canberra, Australia

The Twelfth International Workshop on Rare-Earth Magnets and their Applications is to be held at the Lakeside Hotel in Canberra in 1992. This will be a continuation of the series of workshops and symposia which have provided opportunities for effective exchange of current information and ideas on the development and utilization of rare-earth magnets. The workshop will cover a wide spectrum of topics of scientific, technical and commercial interest, including applications of rare-earth magnets (such as circuit design, device and system engineering, manufacturing), evaluation and standardization of test methods and instrumentation. The workshop will consist of three days of plenary and poster sessions and opportunities will be available for exhibits of industrial products, devices, materials and test equipment. The symposium will be held on July 16. Copies of the workshop and symposium proceedings will be available to participants on registration.

The nominated International Carrier for the conference is Qantas Airways. The conference is to be organized in collaboration with Australian Convention and Travel Services Pty Lid. (ACTS) and is sponsored through the Department of Industry, Technology and Commerce by the New Materials Technology Committee of the Industry Research and Development Board.

For further information contact:

Robert Street

Dept. of Physics, U of Western Australia
Nedlands WA 6009 Australia

Phone: (09) 380-2751 FAX: (09) 380-1014

**SECOND INTERNATIONAL SYMPOSIUM
ON MAGNETIC MATERIALS,
PROCESSES AND DEVICES**

The Second International Symposium on Magnetic Materials, Processes and Devices will be held during the fall meeting of the Electrochemical Society (ECS), October 13-18, 1991 in Phoenix, Arizona. This symposium is a forum at which materials and processing people, together with the device engineering colleagues, have an opportunity to present and discuss work on magnetic materials, fabrication processes, and requirements for future magnetic devices and storage systems. As in the previous symposium which was held in 1989, leaders in the respective fields have been invited to

(continued page 6)

review trends in the storage business and key aspects of technology. The detailed program will appear in the August issue of the Journal of the Electrochemical Society.

The 1989 Symposium was very successful, with a peak attendance near 250 people. Nearly every company and institution involved in micromagnetics was represented not only in the audience but also as speakers and panel discussion participants. The papers presented in the Fall of 1989 were refereed and edited as a Symposium Proceedings Volume (copies may be obtained from The Electrochemical Society, Inc., Pennington, NJ 08534-2896). A Proceedings volume is again planned for this year's Symposium.

Although the deadline for full length submissions has now passed, 100 word abstracts for Recent News Papers to be given as ten minute presentations will be accepted until August 10, 1991. Any inquiries should be directed to:

L. T. Romankiw (914) 945-1208 or D. A. Herman, Jr. (914) 945-1452.

Abstracts should be mailed or faxed to either of the above at:

IBM T. J. Watson Research Center
P.O. Box 218
Yorktown Heights, NY 10598; FAX (914) 945-4520.

Recent News authors will be expected to submit camera-ready full papers at the time of presentation for inclusion in the Proceedings.

1992 INT'L MAGNETICS CONFERENCE April 13-16, 1992

The International Magnetics Conference (INTERMAG), sponsored by the Magnetics Society of the IEEE will be held at the Adam's Mark Hotel in St. Louis, Missouri from April 13-16, 1992. The purpose of INTERMAG '92 is to provide a forum for presentation of new developments in applied magnetics, related magnetic phenomena, and information storage techniques. In addition to the contributed papers, there will be invited papers, sessions wherein competing technologies can be assessed, tutorial sessions, and workshops for less formal discussion of timely and/or controversial topics. Special emphasis will be placed on applications oriented topics. Contributed papers are solicited in all areas of applied magnetics, magneto-optics, related magnetic phenomena and information storage technologies. Topics of wide interest in recent years have included all aspects of magnetic recording, various magnetic and other memory technologies, microwave magnetics, permanent magnet materials and technologies,

control and power conversion and conditioning, magnetometry and transducers, magnetic separation, magnetic levitation and drives, applied superconductivity, field calculations, and magnetic materials-properties and processing. This list is intended to be suggestive rather than restrictive.

Digests, prepared in 2 page format, should be submitted to: INTERMAG '92, c/o Courtesy Associates, 655 15th Street NW, Suite 300, Washington, DC 20005 by November 22, 1991. Instructions for the preparation of digests will be mailed with the first call for papers. Requests to be placed on the conference mailing list should be sent to the above address. The General Chairman of the Conference is Marcel Muller. Conference information may also be obtained from Publicity Chairman:

John Nyenhuis
Purdue University
School of Electrical Engineering
West Lafayette, IN 47907
Tel: (317) 494-3524 FAX: (317) 494-6440

SECOND INT'L SYMPOSIUM ON PHYSICS OF MAGNETIC MATERIALS July 3-8, 1992 in Beijing, China

The 2nd International Symposium on Physics of Magnetic Materials (ISPMM '92) will be held in Beijing, China, July 3-8, 1992. The Symposium is the continuity of Sendai's Symposium in 1987, which was created by Prof. Minorum Takahashi. This Symposium is sponsored by Chinese Institute of Electronics, IEEE Beijing Section and Cooperated with IEEE MAG.

The purpose of this Symposium is to provide a forum and opportunity for researchers, technicians working on the area of magnetism and magnetic materials to meet with each other and to exchange their thoughts and experiences. All who are interested in recent developments in magnetism and associated technologies and applications are invited to attend this Symposium and to contribute to its technical sessions.

Submitted digests must be received by October 31, 1991 and the deadline for submitted manuscripts is February 15, 1992. Please send to:

Prof. Yang LUO
San Huan R/D Center
Academia Sinica
P.O. Box 603, Beijing 100080
P.R. China
Telex: 222592 SHI CN FAX: 2561268

For further information, contact Dr. Karl Strnat, KJS Associates, 1616 Hillrose Pl., Fairborn, OH 45324

CONFERENCE CALENDAR

The Magnetic Recording Conference, June 12-15, 1991, Pittsburgh, PA. For information contact: Prof. Vijaya Kumer, Dept. of EECS, Carnegie Mellon University, Pittsburgh, PA 15213, Telephone: (412) 268-3026.

Joint Magnetism and Magnetic Materials INTERMAG Conference, June 18-21, 1991, Pittsburgh, PA. For further information contact Ms. Diane Suiters, Courtesy Associates, 655 15th St. N.W., Suite 300, Washington, DC 20005, Telephone: (202) 639-5088.

Power Electronics Specialists Conference, June 24-28, 1991, Massachusetts Institute of Technology, Cambridge, MA, USA. Contact Conference Chairman for further information: Professor Martin F. Schlecht, Room 39-553, Department of EE and Computer Science, M.I.T., Cambridge, MA 02139, Tel: 617 253-3407

Magnetic Films and Surfaces, August 26-30, 1991, University of Glasgow, Scotland, UK. For further information contact: J. N. Chapman, Dept. of Physics and Astronomy, University of Glasgow, Glasgow G12 8QQ, UK, Telephone: (44) 339-8855 ext. 4462.

International Conference on Magnetism, Sept. 2-6, 1991, University of Edinburgh, Scotland, UK. For further information contact: David Melville, Vice-Rector, Lancashire Polytechnic, Preston Lanes PR1 2TQ, UK, Telephone: 772 262-186.

Second Int'l Symposium on Magnetic Materials, Processes and Devices, October 13-18, 1991, Phoenix. For further information and contact see pages 5 and 6.

Portland Int'l Conference on Management of Engineering and Technology (PICMET '91), October 27-31, 1991, Portland, OR. For further information contact: PICMET '91, Portland State University, P.O. Box 751, Portland, OR 97207-0751 USA. Telephone (503) 725-4660, FAX: (503) 725-4667

1992 Int'l Magnetics Conference, April 13-16, 1992, St. Louis, Missouri. For further information and name of contact, see page 6.

Second International Symposium on Physics of Magnetic Materials, July 3-8, 1992, Beijing, China. See article on page 6.

Rare-Earth Magnets and Their Applications, Twelfth Int'l Workshop, July 16, Canberra, Australia. For further information see page 5.

IEEE MAGNETICS SOCIETY NEWSLETTER
c/o Craig Perlov
Hewlett-Packard Laboratories
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