IEEE MAGNETICS SOCIETY NEWSLETTER

VOLUME 21, NO. 4 DECEMBER 1985

EDWARD DELLA TORRE, EDITOR

HENRY L. BACHMAN IS CHOSEN IEEE PRESIDENT-ELECT EMERSON PUGH IS ELECTED EXECUTIVE VICE-PRESIDENT

Henry L. Bachman, Vice President of Engineering, Hazeltine Corporation, Greenlawn, NY has been elected 1986 President-Elect of the Institute of Electrical and Electronics Engineers, Inc. (IEEE). Mr. Bachman will serve as IEEE President-Elect during 1986, and will assume the office of Institute President on January 1, 1987. Emerson W. Pugh, Research Staff Member, IBM T.J. Watson Research Center, Yorktown Heights, NY, was elected IEEE 1986 Executive Vice President. IEEE members also elected Directors for Regions 1, 3, 5, 7 and 9 as well as for Divisions I, III, V, VII, and IX. The Institute, with transnational headquarters in New York City, is the world's largest technical professional organization, with some 260,000 members in more than 130 countries.

The current IEEE President is Charles A. Eldon, Corporate Manager of Capital Equipment at Hewlett-Packard Company, Palo Alto, CA. The Institute's Executive Vice President is Merlin G. Smith, Manager of Systems Technology, IBM T.J. Watson Research Center, Yorktown Heights, NY. Bruno O. Weinschel, President, Weinschel Engineering Company, Gaithersburg, MD, will succeed Mr. Eldon as President on January 1, 1986.

In the election, Mr. Bachman received 22,909 votes, his opponent, Jose B. Cruz, Jr., 19,698. Dr. Pugh received 25,757 votes; his opponent, Merrill W. Buckley, Jr., 16,201. All four candidates were nominated by the IEEE Board of Directors.

A total of 197,020 IEEE members was eligible to vote. Of this number, 43,494 voted, or 22.1 percent. This compares with 23.6 percent in 1984, 21.7 percent in 1983, and 23.9 percent in 1982. Recently voter turnout has been slightly lower in odd-numbered years when Directors are chosen from odd-numbered Regions and Divisions. Currently,the odd-numbered Regions 1, 3, 5, 7, and 9 have approximately 20,000 fewer eligible voters than the even-numbered Regions 2,4,6,8 and 10.

Commenting on his election, Mr. Bachman stressed that a key responsibility for IEEE is to emphasize "life-long learning through continuing education." The 1986 President-Elect added that he will seek to improve ways in which the Institute delivers technical information to its members. According to Mr. Bachman, "Delivery of the IEEE's technical products could be broadened to include all of the members, rather than just the approximately 60 percent who are Society members. Every member should receive some tutorial or application-type articles that match his or her technical interests."

The 1986 President-Elect has been a member of IEEE since 1951. Mr. Bachman received the B.E.E. and M.E.E. Degrees from Polytechnic Institute of New York in 1951 and 1954, respectively. Prior to joining Hazeltine, he was employed by Wheeler Laboratories holding positions as Development Engineer, Assistant Chief Engineer, Vice President, and President.

Mr. Bachman has been a member of the IEEE Executive Committee (1984-85) and Board of Directors (1981-82, 1984-85). He is currently IEEE Treasurer and has served as Executive Vice President (1984), as well as Division VI Director (1981-82). He has also participated on the Conference Board as well as the Regional, Technical, and United States Activities Boards.

Emerson Pugh, who becomes Executive Vice President on January 1, 1986, was elected an IEEE fellow in 1972. As a member of the Magnetics Society, he has served as a Transactions Editor, Society President, member of the Board of Directors, and Director of Division IV as well as on the Conference, Publications, Technical Activities, and United States Activities Boards.

Dr. Pugh has held a number of senior technical management positions at IBM, including Director of Operational Memory, Manager of Research Technical Planning, and Research Manager of Exploratory Magnetics. On leave from IBM, in 1974 he served as Executive Director of the National Academy of Science's study of automobile emissions and fuel economy. He holds a B.Sc. and Ph.D. in Physics from Carnegie-Mellon University.

MAGNETICS SOCIETY ELECTS NEW OFFICERS AND ADCOM MEMBERS

J.J. Suozzi, Chairman of the 1985 Magnetics Society Nominating Committee, reports that the election of officers for the Magnetics Society has been completed. The officers have all been reelected for the calendar year 1986 as follows:

Alan B. Smith	-President
William D. Doyle	-Vice President
Richard M. Josephs	-Secretary/Treasurer

Congratulations to all the officers. We look forward to another successful year for the Magnetics Society.

Suozzi also announces the 1986 Magnetics Society Administrative Committee members:

Term Expires - December 31, 1986

A.I. Braginski	B.J. Langland
C.E. Johnson, Jr.	R.O. McCary
J.H. Judy	R.W. Patterson
M.H. Kryder	A.B. Smith

Term Expires - December 31, 1987

I.A. Beardsley	R. Hasegawa
E. Della Torre	J.M. Lommel
W.D. Doyle	J.C. Mallinson
F.J. Friedlaender	D.A. Thompson

Term Expires - December 31, 1988

G. Bate	F.E. Luborsky
S.H. Charap	J.W. Shilling
R.M. Josephs	E.J. Torok
K. Lee	D. Wilson

The Nominating Committee of the Magnetics Society for 1985 has now completed its work - thanks to each member of the Committee for his help during the year.

INTERMAG '86 to be held in Phoenix, Arizona

The 24th INTERMAG conference will be held from Monday, April 14, to Thursday, April 17, 1986 at the Hyatt-Regency Hotel in Phoenix, Arizonoa, USA. The program will consist of invited and contributed talks on new developments in applied magnetics, related magnetic phenomena, and information storage techniques. A one day tutorial on magnetic recording will be held on the Sunday preceding the conference. Social events include a reception at the Heard Museum of Anthropology and Primitive Art and a steak cook-out at the Old West Town.

For advance registration (prior to March 15), the fee is $115 for IEEE members and $145 for non-members. The Student/Retiree registration is $10. The registration for the magnetic recording tutorial is $50.

Individuals not on the conference mailing list may obtain information by contacting either the Conference Chairman, J.U. Lemke, 2400 6th Avenue #1103, San Diego, CA 92101, (619)-755-1393, the Publicity Chairman, J.A. Nyenhuis, Purdue University, School of Electrical Engineering, West Lafayette, IN 47907, (317)494-3524, or Diane S. Suiters at Courtesy Associates, Inc., 655 15th St. NW, Suite 300, Washington, DC 20005, (202)639-5088.

IEEE MAGNETICS SOCIETY ANNOUNCES GRADUATE STUDENT SPONSORSHIP

The Education Committee of Magnetics Society of the IEEE is continuing its program to sponsor several graduate students interested or working in magnetics to attend the International Magnetics Conference to be held April 14-17, 1986 in Phoenix, Arizona, U.S.A.

Nominations will be accepted up to January 15, 1986 from faculty advisors of the interested students. The nominator must be a member of the Magnetics Society.

Please send nominations and pertinent support material to:

Dr. A.H. Qureshi
Electrical and Computer Engineering
Wayne State University
Detroit, MI 48202
USA

Please include your budget requirements along with the nomination. The awards will be announced February 1, 1986.

MAGNETICS SOCIETY ANNOUNCES 1987 SCHOLARSHIP PROGRAM

The Magnetics Society is pleased to announce the 1987 competition of the Magnetics Society Scholarship Program. This program has been established for the children of Magnetics Society members through the annual nationwide scholarship competition conducted by the National Merit Scholarship Corporation. The National Merit Scholarship Corporation (NMSC) is an independent,

non-profit organization whose major purposes are (1) to identify and honor exceptionally talented high school students and to aid as many as possible in obtaining a college education, and (2) to enable business enterprises and other organizations to contribute more readily and effectively to the support of higher education through scholarship grants.

One Magnetics Society Scholarship will be awarded in the Spring of 1987 to a student who will complete high school requirements and who will enter a regionally accredited U.S. college in 1987 to pursue courses of study leading to one of the traditional baccalaureate degrees.

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

The Magnetics 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 individuals winner's finanacial situation and the costs of attending the college of the winner's choice. The maximum amount that may be awarded to a winner is $4,000.00 per year; the minimum will be $1,000,00. per year.

Descriptive materials and entry blanks for the Magnetics Society Scholarship may be obtained by writing to the Magnetics Society Scholarship Program Director listed below.

Completed entry blanks must be returned to the Program Director by January 1, 1986.

Dr. Richmond B. Clover
Magnetics Society Scholarship
Program Director
c/o INTEL CORPORATION
3065 Bowers Avenue, M.S. SC9-39
Santa Clara, CA 95051

MAGNETICS SOCIETY ACHIEVEMENT AWARD

Once every year the Magnetics Society honours one of its most deserving members for his scientific, technical contribution and for his service to the Society.

Nominations are invited for the year 1986. The award consists of a prize of $2000. and a diploma to be presented at the intermag Conference at Phoenix, Arizona.

Any member of the Society may nominate a candidate with curriculum vitae and statement of technical and other contributions. Nominations should be sent before February 15th, 1986 to:

Prof. P.P. Biringer
Chairman, Awards Committee
c/o Dept. of Elec. Engineering
University of Toronto
Toronto, Ontario M5S 1A4

MILWAUKEE CHAPTER MEETING DATES

The Milwaukee Chapter of the Magnetics Society plans six meetings for its 1985-1986 season. Three meetings have been held in 1985 and three more will be held in 1986.

On September 24th Frank Klein of Eaton Corporation spoke on "Brushless Motors". On October 22nd Dr. John Brauer of A.O. Smith Data Systems spoke on "3D Magnetic Finite Element Modeling." On November 13 Dr. P.K. Rastogi of Inland Steel spoke on "Magnetic Properties of Steels."

Meeting dates for 1986 are February 10, March 18, and April 22. If you are interested in speaking at or attending these meetings, please contact the Chairman:

Ken Vollbrecht
Briggs & Stratton Corp.
414/259-5567

NEW MAGNETICS SOCIETY CHAPTER BEING ESTABLISHED IN ROCHESTER, NEW YORK

Several members of the IEEE Magnetics Society living in the Rochester, New York, area have petitioned for the establishment of a local chapter. The petition has been acknowledged by the IEEE and the signatures verified. We are now anxiously awaiting word that we are officially a chapter. The following IEEE members have agreed to serve as officers for the new chapter:

Chairman	- Daniel J. Phelps
Vice-Chairman	- George J.S. Gau
Secretary/Treasurer	- Jerry Chung

In addition to organizing our chapter this fall, we have sponsored two excellent technical meetings. Mario Acuna, one of the IEEE Magnetics Society Distinguished Lecturers, presented his "Magnetometry in Space" at our kick-off meeting in September. The presentation was well received and helped generate interest in our chapter. At our November meeting, Eric Daniel presented the lecture "Understanding Magnetic Recording - An Historical Overview." Eric Daniel is a Senior Member of the IEEE and is well-known for his work in the area of magnetic recording.

Future plans include a January 23, 1986 meeting at which Professor Karl Strnat from the University of Dayton will talk about "The Modern Permanent Magnet." Dr. Robert Bryant from the University of Rochester will be our speaker on March 26. He will present the lecture "Magnetic

Resonance in Medicine." A joint meeting with the Rochester Section of the American Vacuum Society will be held in June.

Anyone interested in membership or additional information regarding our activities should contact:

Dr. Daniel J. Phelps
Bldg. 82A, Kodak Park
Rochester, NY 14650
(716) 477-6361

COMMUNICATIONS HELP AVAILABLE

The Professional Communication Society (PCS), one of the 33 specialized technial organizations within the IEEE, is chartered to serve members of the IEEE and of the Engineering profession in general, sponsoring activities involving the disciplines of writing, editing, speaking, graphic arts and other forms of professional communication. The PCS publishes Transactions on Communication and the "Professional Communication Newsletter," as well as Proceedings of their annual conference.

PCS membership includes authorities in almost every field of communication. For assistance in locating appropriate sources, please contact Lois Moore or Jim Hall:

Lois K.Moore
President, IEEE PCS
The John Hopkins University
Applied Physics Laboratory
Laurel, MD 20270
(301) 953-5000, ext. 8313

James Hill
Vice-Pres., IEEE PCS
HRB-Singer, Inc.
Box 60, Science Park
State College,Pa 16804
(814) 238-4311

ADDITIONAL ICM SESSION CHAIRMAN SUMMARIES

In order to keep the magnetics community informed, the Newsletter is presenting summaries of the sessions held at ICM'85, held in San Francisco, CA from August 26 to August 30, 1985. These summaries, prepared by the session chairman, are not designed to be comprehensive, but merely to present some of the highlights. It is not possible, due to the size of some of the sessions to list all the papers presented, let alone discuss them. The following summaries missed the deadline of our last edition and are being given here in order to give a complete picture of the conference.

Session 1E - Heavy Fermions & Valence Fluctuations I
Chairman: John Wilkins

The order of the papers served to obscure the subject from the audience and this brief summary takes up the ideas in a more coherent order. The dilute problem, especially of Ce impurities, is well understood. All properties can be related to the presence of a strong and narrow resonance in the f-density of states sitting at the Kondo energy above the Fermi level; the resonance position shifting up and broadening with increasing temperature. The striking simularity between the dilute systems and the concentrated systems (heavy fermions) which made up the rest of the session is that on a per impurity basis the effective density of states corresponds to an effective degeneracy temperature of order 10K. The striking difference is that, while the dilute systems have a resistivity that saturates at low temperatures, the resistivity of the heavy-fermion systems starts at a low value, then rising as T^2. Nonetheless there is still a strong tendency to make analogies with other more conventional systems.

For example, the large entropy of the heavy fermion systems suggest a connection with strongly localized systems (such as the half-filled Hubbard model). On the other hand, the magnetic properties of the antiferromagnetic U_2Zn_{17} has many similarities with the itinerant chromium. This dichotomy is a major theoretical problem.

At the same time the theorists need to keep in mind the extreme richness of the experimental situation. (Not just the forest but also the trees are interesting.) For example there are large anisotropies seen in the temperature-dependent susceptibility and field-dependence resistivity of UPt_3 and $CeRu_2Si_2$. How important are such anisotropies for superconductivity.

A prime emphasis in the studies of heavy-fermion superconductors is to deduce the nature of the superconducting pairing: its parity and the symmetry classification of the order parameter. There have been several low-temperature measurements of ultrasonic attenuation and specific heat. To date, the best one can say is that UBe_{13} might be odd parity; this is based on the theoretical observation that some odd-parity superconductors may have energy gap going to zero at points on the Fermi surface which fact gives a temperature dependence possibly consistent with the data. Other observations, such as a possible collective mode in UBe_{13} (seen by ultrasonic attenuation) await interpretation.

Finally one theorist (PWA) made a number of specific statements, arguments, and speculations some of which are recorded here since no paper will appear. (i) While the f level moves above the Fermi level and narrows (as in the dilute case) it is the free electrons which are renormalized to be heavy electrons (a point where most arguments go wrong). The band structure calculations are off by orders of magnitude since they cannot include the strong energy-dependence of the self-energy (its k-dependence is weak) that renormalizes the mass and wave function. (ii) The main component of the attractive interaction for superconductivity is spin fluctuations, the same as in ^3He. The fluctuation is quite localized on to the actinide, and hence the energy gap parameter is (spatially) localized on the actinide site. (iii) The most "interesting" symmetry case is the odd parity order parameter; in any case (I think he said) the spin fluctuations are repulsive for the even parity case. (iv) To get an odd-parity case it is necessary that the center of symmetry be elsewhere than on the actinide - i.e., there needs to be two actinides per basis in order to ever obtain odd

symmetry. Perhaps this is a guide for what systems should be explored for superconductivity.

Session 1Pd - Low-D Magnetism in Insulators
Chairperson: Jill Bonner

This session contained both theoretical and experimental studies of 1D and 2D magnetic systems. The 1D papers covered most topics of current interest. The novel Haldane conjecture implies that Heisenberg antiferromagnetic chains with integer-spin, e.g. S = 1, will show a gap in their excitation spectrum in the thermodynamic limit. Numerical investigation was carried out using finite chain calculations supplemented by quantum Monte Carlo calculations. Complementary experimental spin dynamical studies on the spin-1 magnetic system $CsNiCl_3$ did indeed indicate the presence of a rather large gap. The same magnetic chains studies revealed a novel and unanticipated crossover phenomenon, which explains how the distinctive excitations for spin-1/2 in a field are superseded by excitations of a classical type as $S \to \infty$. A detailed exact analytic discussion was presented of the low-T dynamical correlation function of spin chains of XYZ-type. The calculations manifested rich structure unanticipated in the context of spin-wave theory.

A question of continuing interest in the study of spin-Peierls systems, with bearing on the nature of the high-field phase, is the competition between spin-Peierls and regular antiferromagnetic ordering. This was the topic of an extensive theoretical investigation. Also featured were two theoretical investigation of Ising spin chains, one involving arbitrary further-neighbor interactions, and the other an extension of the RG treatment of Nelson and Fisher. Two papers featured theoretical and experimental investigations of bicritical behaviour in two quasi-1D compounds, CoTac and $[NH_3CH_3][MnCl_3] \cdot 2H_2O$, [MMC].

In higher-D interest lay in experimental investigations of the Ising like quasi-1D antiferromagnet $CsCoCl_3$, where spin frustration occurs when the Ising-like spin chains order into a triangular lattice configuration. Spin frustration was also featured in the quasi-1D ferromagnet $RbFeCl_3$ with residual antiferromagnetic interactions. In particular, the effect of impurity doping in relieving the frustration was observed. A theoretical study was presented of the phase diagrams of 2D and 3D anisotropic Heisenberg mixed-spin systems. Graphite iontercalated with transition-metal chlorides, such as $MnCl_2$ and $CoCl_2$, offers a unique experimental testing ground for theories of 2D and quasi-2D magnetic behavior, since the coupling between magnetic layers can be controlled by the number of intervening graphite planes. Usual phase behavior was reported, involving two transitions. Interesting low-D magnetic multicritical behavior was observed experimentally in solid oxygen. Finally experimental results were presented on temperature and magnetic field dependence of exciton and hot magnon bands in the quasi-1D system $CsNiF_3$.

Session 1Pk - Domains and Micromagnetics
Chairperson: Philip Wigen

The papers in this session include a wide variety of macaroscopic as well as microscopic studies of domain walls.

The macroscopic studies included a remanent effect due to domain wall pinning on non-interacting particles and another considered the calculation of the influence of inhomogeneities such as grain boundaries on the magnetizations response. A third paper discussed the preparation of grain oriented Terfernol-D in single crystal or rod form.

A second grouping of papers included the theme of "thermal memory" where the materials, MnF_2, Fe, Ni and "bubble" garnet were heated above the ordering temperature. A significant memory of the domain structure was observed when the material was heated significantly above its ordering temperature and then cooled or that the magnetic structure was noticeably more stable to the influence of external fields after heating then when once saturated below the ordering temperature.

Microscopic properties of domains in thin films were investigated using STEM. The domain structures were investigated as a function of the preparation conditions employed in producing the samples.

Finally, two unusual papers were given in the session, one included the use of a thin film recording head as a sensitive sensor to investigate domain wall properties and pinning imperfections of a soft magnetic material. The other described a "Maggot" capable of moving in steps as small as 70 Anstroms in any direction. The device operates in a wide range of environmental condition of temperatures and pressures.

Session 3B - Magnetic Multilayers
Chairperson: P. Gruenberg

After an introduction into the field, the first paper dealt with results on Fe-V and Fe-Mg multilayers. From Mössbauer experiments it was concluded that by going to very thin layers (2A), Fe loses its moment when sandwiched between V whereas moment reduction is much weaker for Fe between Mg. The question of the size of the moments was also addressed theoretically in the fifth paper and experimentally in the sixth. For example, large moments are predicted for Cr single layers sandwiched between Au but experimentally so far only much smaller moments could be identified. For Gd-Y-superlattices it was reported in the second paper that the Gd layers adjacent to the Y do not order ferromagnetically even at low temperatures. Gd-Y-superlattices were also used to demonstrate how the magnetic structure of a superlattice can be analyzed using the flipping ratio in X-ray scattering in the fourth paper. Replacing now the Gd by Dy with its much stronger spin-orbit coupling leads to interesting spiral structures and field induced magnetic orientational effects at low temperatures as shown in the third

paper. Interesting microstructures also occur in the Gd-Co and $GdCo_2$-Co system where e.g. a compensation point due to antiferromagnetic alignment of layers can be achieved. This was discussed in the seventh paper. For all the R.E. systems the possibility of RKKY interaction across nonmagnetic interlayers was considered but the interlayer exchange was in particular addressed in the eigth paper for Fe layers separated by very thin films of carbon. Diffusion at interfaces in most contributions was considered as undesireable but as was shown in the ninth by means of NMR it can also lead to new compositions and alloys which are not possible otherwise. NMR was also used in the tenth paper to identify a new magnetic phase at the interface between Co and Mn. Finally, in the eleventh paper, measurements of H_c, H_K and 4π Ms on Fe-Cr multilayers were presented suggesting with increasing Cr thickness but decreases with increasing temperature.

Session 3C - Heavy Fermions and Valence Fluctuations II
Chairperson: M.B. Maple

In Nuclear Relaxation in the Normal State of UBe_{13}, measurements of the ^9Be nuclear spin-lattice relaxation rate ($1/T_1$) in the normal state of UBe_{13} were made in the temperature range 0.9 -300 K. the T_1T data can be described phenomenologically with a model of nuclear relaxation by conduction electrons in a narrow band of width 10 K.

In uSR study of the Heavy Fermion Systems $CeAl_3$ and U_2Zn_{17} S. Barth et al. presented uSR data on polycrystalline samples of the heavy fermion compounds $CeAl_3$ and U_2Zn_{17} in the temperature range 1.3 - 300 K were presented. The discussion was concentrated on the U_2Zn_{17} compound where the uSR data indicated that the magnetic order that occurs in this material at 9.7 K is complicated in nature.

In Heavy Fermions in Point Contact Spectroscopy (PCS) M. Moser et al. reported point contact spectroscopy data for the compounds $CeAl_3$, UPt_3, U_6Co and U_2PtC_2. It was suggested that the width, which ranged from 2 meV to 35 me V for the four compounds, of the symmetric part of the point contact spectrum represents the width of the narrow feature in the density of states at the Fermi level in these materials.

In Magnetic Response of Intermediate Valence Systems and Heavy Fermion Superconductors an investigation of the wavevector and energy dependence of the magnetic response in the intermediate valence compound $CeSn_3$ and the heavy fermion superconductors $CeCu_2Si_2$ and UPt_3 by means of polarized neutrons and polarization analysis was discussed.

W.J.L. Buyers et al. presented neutron diffraction measurements on a UPt_3 single crystal in Evidence for a Gap in the Heavy-Fermion Superconductor UPt_3. The data yielded evidence for antiferromagnetic spin fluctuations which diminish drastically upon cooling before the specimen becomes superconducting at 0.5K.

The specific heat of $U(Pt_{1-x}Pd_x)_3$ compounds with small values of x was measured at low temperatures in Enhancement of Spin Fluctuations by Alloying Heavy Fermion UPt_3 with Pd by A. de Visser et al. From the measurements, the spin fluctuations in the compounds were found to be greatly enhanced by alloying with Pd.

In Hall Effect in the Heavy Fermion Systems UBe_{13} and $CeCu_6$ T. Penney showed that the Hall effect in both $UBed_{13}$ and $CeCu_6$ becomes very large at low temperatures, reflecting the transition in the heavy fermion state. The Hall constant of $CeCu_6$ changes sign oncooling into the coherently scattering regime.

The presence dependance of the Neel temperature T_N in the Kondo lattice systems $CeAu_2Si_2$, $CeAg_2Si_2$, $CePd_2Si_2$, and $CeRh_2Si_2$ was measured in Effect of Pressure on the Neel Temperature of Kondo Lattice systems by J.D. Thompson et al. The systems $CePd_2Si_2$ and $CeRh_2Si_2$, for which $T_K > T_N$, exhibit strong, nonmonotonic dependences of T_N on pressure.

C. Lin et al. presented a paper entitled $CePd_3$: A Heavy Fermion Antiferromagnet that becomes Superconducting in a High Magnetic Field?. Specific heat, electrical resistivity and magnetic susceptibility data suggest that $CePb_3$ may be a system precariously perched at the border between antiferromagnetism, superconductivity and heavy fermion behavior. The system appears to be induced into the superconducting state by a magnetic field of the order of 15 tesla at low temperatures.

A uniaxially anisotropic p-wave interaction was shown to lead to either a polar or an axial state in the paper by R.A. Klemm and K. Scharnberg. Weak interaction anisotropy leads to a kink in the upper critical magnetic field perpendicular to the anisotropy axis.

Session 3D - Amorphous Magnets
Chairpersons: T. Egami & K.H.J. Buschow

This session consisted of 12 orally presented papers concerning various aspects of the amorphous magnetism. In particular a number of papers were on unusual and unconventional subjects and materials, making this session stimulating and enjoyable. For instance, Ota et al. reported that oxide glasses obtained by rapid quenching of the mixture $BiFeO_3$ and $ZnFe_2O_4$ showed ferromagnetism. This is rather surprising since the crystalline $BiFeO_3$ and $ZnFe_2O_4$ are both antiferromagnetic.1 It is quite possible that a large variety of such presumable ferrimagnetic oxide glasses exist, and some of them may turn out to be useful for magnetic application such as recording. The effect of ion-implantation was discussed by Collins et al. and by Gondo et al., while the effect of hydrogen on the Invar-like Fe-Zr was discussed by Gonser et al. Several papers dealt with the question of the local structure in glasses, and in particular

McHenry et al. suggestedd that the icosahedral cluster would not be stable in liquid cobalt, based upon the electronic structure calculation. On the other hand, Watson and Bennett discussed the Voronoi polyhedra incomplex crystalline phases and suggested that such topological features may be transferred to the corresponding amorphous phase, which may explain the polymorphism reported in some glasses. From the experimental side, Eibschutz and Lines discussed the usefulness of a detailed analysis of the Mossbauer data to obtain the information regarding the local fluctuations in the magnetic environment of atoms. Two papers described the neutron studies of the random anisotropy magnets and Invar Fe-Ni-Zr. The formation of hard magnetic phases by the crystallization of Fe-RE-B glasses was discussed by Aly et al., and the strikingly different effects of alloying Mo into Fe in the crystalline and amorphous phases were discussed by Chien et al.

Session 4G - High Anisotropy $R_2Fe_{14}B$ Magnets I
Chairperson: W.B. Yelon

With the technology of $Nd_2Fe_{14}B$ magnets already well launched, the question dominating this session was the mechanisms leading to magnetic hardness. A general introduction to Nd-Fe-B ternaries was given by D. Givord, in which he observed the presence of the $Nd_{1+\varepsilon}Fe_4B_4$ phase along with the $Nd_2Fe_{14}B$ phase and suggested this as an important contributor to the coercivity. R. Mishra, however, reported that in optimally melt spun material, only an amorphous thin film between grains of the $Nd_2Fe_{14}B$ phase is seen, althoughthe $NdFe_4B_4$ phase is seen in underquenched samples. The Japanese reported (in non-stoichiometric samples) both Nd rich and cubic material and showed some unusual wall pinning sites, while the Chinese reported similar properties in Pr-based systems. The anisotropy was studied experimentally by the NRL group by partial substitution of Y for magnetically active rare earths, and theoretically by Sankar (Penn State) and Narasimhan through simple crystal field calculations. Particularly exciting were the first detailed electronic structure calculations from UMKC for $Y_2Fe_{14}B$. While these are preliminary, they hold great promise for detailed understanding. Properties of Co substituted material were also reported by G.M. which appear to be useful at higher temperatures than pure $Nd_2Fe_{14}B$. Finally, reports on Ru substituted material and of sputtered $Nd_2Fe_{14}B$ were given. Also reported was a (metastable?) $FeTi_5$(Sm) phase prepared by sputtering which appeared to have a very high energy product.

While the technology of the $Nd_2Fe_{14}B$ magnets did not receive a great deal of specific emphasis, it is clear that there is a great excitement about the potential use of magnets of this phase, and that an understanding of the physics of these systems will leads to wider applications.

CALL FOR PAPERS ON SYMPOSIUM ON MAGNETISM AND LOCAL ATOMIC IN ALLOYS

Sponsored by the TMS-AIME
Committee on Alloy Phases

to be held at the TMS-AIME Fall Meeting, Orlando,FL
October 5-9, 1986

This symposium will address both experimental and theoretical approaches to the understanding of the effects of the local atomic environment on basic magnetic and superconducting properties of crystalline or amorphous alloys. Topics to be considered may include: effects of short-range order and local coordination and topology on magnetic moments and Curie temperatures; superconducting and ferromagnetic properties in layer superlattices, strained epitaxial films, clean and chemisorbed surfaces, etc.; moment variations among different sites in intermetallic compounds, including the new "super"-magnet $R_2Fe_{14}B$; "giant moment" effects, etc. The goal of the symposium is to summarize and document the current state of the art.

Please submit abstracts on the TMS-AIME Abstract Form by April 15, 1986 to Dr. L.H. Bennett, Metallurgy Division, National Bureau of Standards, Gaithersburg, MD 20899 [Telephone (301) 921-2914]; or to Dr. James D. Livingston, General Electric Company, Corporate Research and Development, P.O. Box 8, Schenectady, NY 12301 [Telephone (518) 387-6465]. Abstract forms may be obtained from TMS-AIME Headquarters, 420 Commonwealth Drive, Warrendale, PA 15086 [Telephone (412) 776-9050].

1986 INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM (IGARSS '86)

8-11 September 1986

University of Zurich-Irchel
Zurich, Switzerland

For further information please contact:

Prof. Dr. H. Haefner
General Chairman
Department of Geography
University of Zurich-Irchel
CH-8057 Zurich/SWITZERLAND
Telephone: 01/257 51 31
Telex: 55575 unizi ch

RECORDING SEMINARS

Danvik is presenting a course on Magnetics Recording Engineering in Santa Barbara, California, February 4-7, 1986. For further information contact Danvik, 1201 Bel Air Drive, Santa Barbara, CA 93105, or call (805) 682-2102.

The George Washington University Continuing Engineering Education Program is sponsoring a Seminar: Magnetic Recording Materials, to be presented in San Diego, California, February 5-7, 1986. Magnetic Recording Engineering is in Washington, DC, April 7-10, 1986.

For further information, please contact the Course Coordinator, Cliff Hopkins, at the George Washington University Continuing Engineering Education Office, toll-free at 1-800-424-9773, or 1-202-676-6106.

CONFERENCE CALENDAR

INTERMAG Conference, April 15-18, 1986, Phoenix, Arizona

31st Conference on Magnetism and Magnetic Materials, November 17-20, 1986, Baltimore, Maryland

INTERMAG Conference, April 1987, Tokyo, Japan

32nd Conference on Magnetism and Magnetic Materials, November 9-12, 1987, Chicago, Illinois

Joint INTERMAG/Magnetism and Magnetic Materials Conference, July 11-15, 1988, Vancouver, British Columbia

International Conference on Physics of Magnetic Materials (ICPMM), September 14-20, 1986, Spala, Poland

IEEE International Symposium on the Applications of Ferroelectrics, June 8-11, 1986, Lehigh University, Bethlehem, Pennsylvania

IQEC'86-International Conference on Quantum Electronics, June 9-13, 1986, Moscone Center, San Francisco, California

CLE'86-Conference on Lasers and Electro-Optis, June 9-13, 1986, Moscone Center, San Francisco, California

ICM 88, July 25-29, 1988, Paris France.

Rapidly Quenched Metals 6th Annual Conference, August 3-7, 1987, Montreal, Quebec

MMM-86, November 16-20, Baltimore, Maryland

MMM-87, November 8-12, 1987, Chicago, Illinois

Joint MMM-Intermag '88, July 13-16, Vancouver, Canada

LAST MINUTE NEWS ITEM! FIVE MAGNETIC SOCIETY MEMBERS ELECTED TO FELLOW GRADE

The IEEE recently announced its members that have been elected to fellow grade as of January 1, 1986.

The Magnetics Society wishes to congratulate the four members of the Society who are in this category:

Professor M. Shawky A.A. Hamman
Department of Electrical and Computer Engineering
Clarkson College of Technology
-For contributions to electric power systems engineering and electrical machinery.

Dr. Ryusuke Hasegawa
Nippon Amorphous Metal Company
Tokyo 100, Japan
-For contributions to the physics of amorphous magnetic metals and alloys.

Professor William H. Olendorf
Neurology Department
University of California, Los Angeles
School of Medicine
-For contributions to physiological scanning and the development of computerized axial tomography and magnetic resonance scanners.

Dr. Karl J. Strnat
1616 Hillrose Place
Fairborn, OH 45324
-For contributions to the science and technology of rare-earth permanent magnets and to engineering education in applied magnetics.

Dr. Michio Takaoka
The Fujikura Cable Works Limited
Tokyo 135, Japan
-For contributions to theoretical design and development of high-voltage cable.

The IEEE Magnetics Society Newsletter is published quarterly by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47 Street, New York, New York 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. Ed Della Torre, Editor, Magnetics Society Newsletter, Dept. of EE & CS, The George Washington University, Washington, D.C. 20052 by the following deadlines, March 1, June 1, August 1 and November 1.

JOIN THE IEEE MAGNETICS SOCIETY TODAY

Membership in the IEEE Magnetics Society entitles you to receive, for the low Society fee, the IEEE Transactions on Magnetics, and the quarterly Magnetics developments, meetings, and conferences in your areas of interest, and are entitled to purchase informative conference records and other helpful educational aids at greatly reduced rates for members.

Use the convenient coupon to become a member of the IEEE Magnetics Society. If you are not a member of the IEEE, but would like to join, please check the appropriate box on the coupon. Descriptive materials and an IEEE membership application will be sent to you upon receipt.

Society Fee: $7.00 for IEEE members of all grades except Student.

Student Fee: $5.00.

These rates apply to payments received September 1 through February. On payments received March 1 through August 31, remit one-half of the above rates. (Payments received September 1 through December 31 apply through December 31 of the following year.)

MEMBERSHIP APPLICATION/ IEEE MAGNETICS SOCIETY

_____ I am a _____ (Grade) member of IEEE and hereby apply for membership in the MAGNETICS Society. I enclose a check for the Society Fee* (Made payable to IEEE).

_____ I am not a member of the IEEE but would like to join. Please send information.

_____ I am interested in becoming a MAGNETICS Society affiliate. Please send information.

Name _____ IEEE No. _____

Mailing Address _____

City _____ State/Country _____ ZIP _____

Company _____

Field of Interest _____

Send to: IEEE Service Center
445 Hoes Lane
Piscataway, NJ 08845

(Please show this message to a colleague in magnetics who could benefit from membership in the Magnetics Society.)

JOIN THE MAGNETICS SOCIETY

If you are not yet a member of the IEEE Magnetics Society and are involved in magnetics research, development or engineering, the Society could make a valuable contribution to your professional activities.

You will join over 2000 colleagues in belonging to the only society in this country devoted solely to the interests of those who work in magnetism.

You will have the opportunity of contributing to your profession through membership in its Society and participation in the work of its technical and administrative committees.

You will receive bimonthly the Magnetics Transactions, recognized throughout the world as a leading publication in applied magnetics.

The Society sponsors the INTERMAG Conference and co-sponsors the Conference on Magnetism and Magnetic Materials, which jointly cover the whole subject of magnetism.

Fill out the application blank today. For additional information, you may contact: Barbara Langland, Membership Chairman of the Magnetics Society, HP Labs, Distributed Systems Center, 1501 Page Mill Road, Palo Alto, CA 94304-1181.

IEEE MAGNETICS SOCIETY NEWSLETTER
c/o EDWARD DELLA TORRE, EDITOR
DEPT. OF EE & CS
THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC 20052

Bulk Rate
U.S. Postage
PAID
Permit No. 316
Washington, D.C.