IEEE MAGNETICS SOCIETY NEWSLETTER

VOLUME 22, NO. 4 DECEMBER 1986

EDWARD DELLA TORRE, EDITOR

MAGNETICS SOCIETY OFFICERS ELECTED

The election of officers for the Magnetics Society has been completed. The following have been elected for calendar year 1987:

President:	William D. Doyle
Vice President:	Richard M. Josephs
Secretary/Treasurer:	Stanley Charap

The following have been elected as members of SMAG Administrative Committee for a three year term.

Term Expires - December 31, 1989

J.D. Adam	B.J. (Langland) Shula
R.E. Fayling	J.E. Opfer
F.B. Hagedorn	R.W. Patterson
J.H. Judy	C.E. Patton

The S-Mag Administrative Committee consists in addition of the following formerly elected members.

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

Ex-Officio Members (with vote)

F.B. Hagedorn, Chairman, Conference Executive Committee
A.B. Smith, Past President

The Nominating Committee extends its best wishes to all of the officers and looks forward to another successful year for the Magnetics Society. J.J. Suozzi, Chairman of the Nominating Committee, also wishes to thank each member of the Nominating Committee for their help during the year.

25th INTERNATIONAL MAGNETICS CONFERENCE INTERMAG '87

The 25th International Magnetics Conference (Intermag'87) will be held April 13-17, 1987 at the Keio Plaza Inter-continental Hotel in Tokyo, Japan. The conference is a forum for engineers and scientists to discuss the field of magnetics from basic research to applications.

The conference will include not only contributed papers, but a large number of outstanding invited papers by internationally known leaders in magnetics research and technology, sessions wherein competing technologies are assessed, and workshops for less formal discussion of timely and/or controversial topics. A one-day tutorial convering five areas of current research in magnetic recording, magneto-optical recording and magnetic bubbles will be held on April 13. The purpose of these lectures is not only to give an introduction to the fields above, but also to provide the listeners with the concepts and

terminology to enable them to follow readily the presentations during the conference. Technical visits to industrial, university and government research laboratories are being specially arranged for INTERMAG participants.

The conference is sponsored by the MAGNETICS SOCIETY OF JAPAN and the MAGNETICS SOCIETY OF THE IEEE. Advanced (reduced cost) registration must be completed by March 15, 1987. Registration forms and further information can be obtained by writing to either:

Secretariat of INTERMAG'87
c/o International Congress Service, Inc.
2-14-9, Nihombashi, Chuo-ku
Tokyo 103
Japan

or to:

INTERMAG'87
c/o Courtesy Associtates, Inc.
655 15th St. N.W., Suite 300
Washington, DC 20005
USA

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. Ed Della Torre, Editor, Magnetics Society Newsletter, Dept. of EE & CS, The George Washington University, Washington, DC 20052 by the following deadlines, September 1, December 1, March 1 and June 1.

TRAVEL FELLOWSHIPS FOR GRADUATE STUDENTS

The Magnetics Society of IEEE is offering travel fellowships to graduate students engaged in research in all related areas of magnetics to attend the INTERMAG'87 conference to be held on April 14-17, 1987 in Tokyo, Japan.

Nominations for these fellowships must be made by the graduate student's research supervisor giving an estimate of expenses. The nominator must be a member of the Magnetic Society.

Letters of nomination and supporting material should be addressed to the Dr. A.H. Qureshi, Chairman, Education Committee, c/o Elec. Eng. Dept., Cleveland State Univ., Cleveland, Ohio, to be received no later than February 15, 1987.

IBM GRANT AWARDED TO MAGNETICS SOCIETY

The Magnetics Society has received a grant from IBM for the next ten years to underwrite an IEEE Award for Outstanding Contributions to Information Storage. The proposed recipient should be an individual. The award will be made annually at INTERMAG. A Magnetics Society committee of Society past Presidents will examine nominations for individuals to receive this $2000 award.

Anyone can submit a nomination. Nominations should be received by no later than February 15, 1987, and should include a description of the accomplishments that support granting the award to this individual. Testimonials are also acceptable supporting material. IBM membership is not required to receive this award or make a nomination.

Nominations should be sent to:

Fritz Friedlaender
Elec. Eng. Department
Purdue University
Lafayette, Ind.

Anyone is eligible for this award, including employees of IBM.

MAGNETICS SOCIETY SCHOLARSHIP PROGRAM

The Magnetics Society is pleased to announce the 1988 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 1988 to a student who will complete high school requirements and who will enter a regionally accredited U.S. college in 1988 to pursue a course 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 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 $4,000.00 per year; the minimum will be $1,000.00 per year.

Descriptive material 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, 1987.

Dr. Richmond B. Clover
Magnetics Society Scholarship
Program Director
c/o INTEL Corporation
3065 Bowers Avenue, M/S Sc9-44
Santa Clara, CA 95051

MAGNETICS SOCIETY AWARDS GRANTS

The Magnetics Society is pleased to announce that two grants in the amount of $10,000 have recently been awarded. The first was awarded to The Materials Science and Engineering Department of the University of Pennsylvania to be used towards the purchase/development of a High-Sensitivity, Variable-Temperature, Hall Effect Vibrating-Sample Magnetometer.

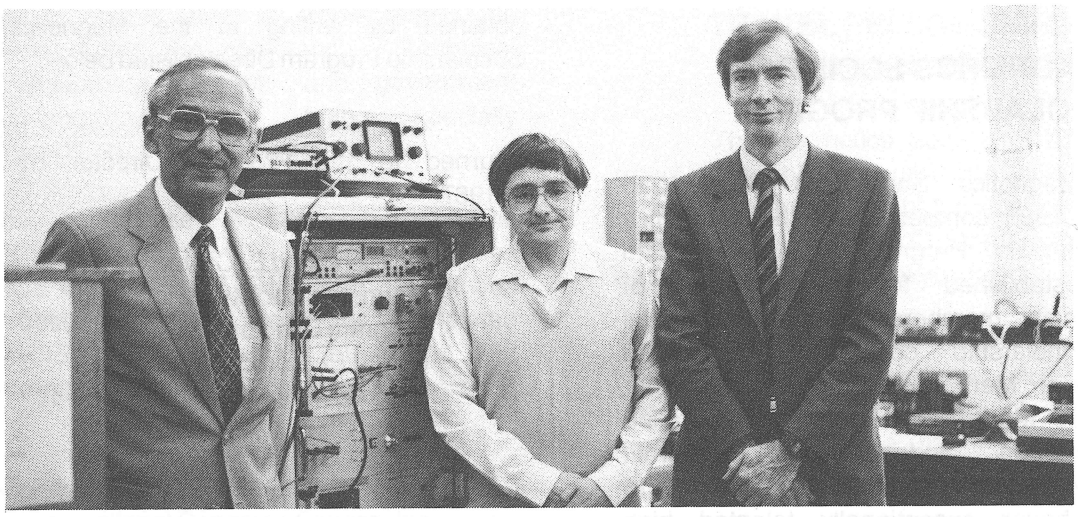
The second grant was awarded to the Center for Magnetics and Information Technologies of the Department of Electrical Engineering of the University of Minnesota. This grant will be used towards the purchase of Electronic Equipment for the Measurement and Analysis of Magnetic Recording Processes.

Congratulations to both recipients of this honor!

NEW MAGNETICS SOCIETY CHAPTER FORMED

The Institute of Electrical and Electronic Engineers, Inc. is pleased to announce the recent formation of a Magnetics Chapter in the United Kingdom and Republic of Ireland Section. This section was formed on September 17, 1986.

Our best wishes to all the members of this new Magnetics Chapter!



E.P. Wohlfarth, David Melville and Roy Chantrell of Lancashire Polytechnic with equipment purchased in part from the Magnetics Society Equipment Grant which received in 1985 for low temperature magnetic measurements of fine particle systems

PUBLICATIONS DEPARTMENT REPORT

by Stanley H. Charap, Chairman

The Magnetics Society publishes the Transactions on Magnetics (TMAG) which appears six (6) times a year, the Translation Journal on Magnetics in Japan (TJMJ), which has a monthly schedule, and the Newsletter. It has been suggested that the authors' biographies, which we have published as a group at the back of each issue of the Transactions, should be placed at the end of each article. One advantage is that the biographies will then be part of the article and then the reprint of the article. The IEEE has been instructed to begin this practice with the January 1987 issue. The expectation is that the total number of pages in the issue will be reduced slightly by this practice. The second ten-year cumulative index of the Transactions appeared as Part 2 of the January 1986 issue. It covers the period 1975-1984.

Present plans for publication in the Transactions on Magnetics of the conferences beyond 1986 are as follows:

Magnetic Recording Media (1986)
January 1987
Applied Superconductivity (1986)
March 1987
INTERMAG (1987)
September 1987
COMPUMAG (1987)
January 1988
Magnet Technology - 10 (1987)
March 1988
EMMA '87
March 1988
INTERMAG (1988)
November 1988

We have completed the publication of the 1985 volume of the TJMJ. The plan to catch up on a 12 issue schedule for 1986 is being reconsidered in favor of a conversion to a bimonthly publication. John Mallinson has asked to be relieved of his duties as Editor of the TJMJ. Jim Opfer has agreed to assume that position, relinquishing his job as reviews editor of TMAG. Dan Bloomberg has joined Carl Patton as a reviews editor.

The current personnel (1986) associated with the Publication Department are:

TMAG Editor-in-Chief:
Stanley H. Charap - last year
TMAG Reviews Editors:
Carl Patton, Dan Bloomberg
TJMJ Editor: James Opfer
TJMJ Assoc. Editors:
Bob Johnson, Don Krahn, Dan Phelps
Newsletter Editor: Ed Della Torre

31st ANNUAL 3M CONFERENCE SESSION SUMMARIES

The following are session summaries for the 31st Annual 3M Conference which was recently held in Baltimore, MD., Nov. 17-20, 1986.

Session AC - Techniques and Measurements
Chairperson: S. Foner

R.J. Celotta presented a paper describing the use of scanning electron microscopy with spin polarization analysis to examine microstructures of amorphous alloys. The approach uses an electron beam in the range of 50-100 Adiameter so that one can see microscopic features. Spin polarized analyzers permit determination of the vector magnetization. The method can be applied to analysis near the surface of a magnetic material (to a depth of about 50 A) and yields magnetic information including magnetic topography. A more extensive invited paper was given in Session HA. W.P. Wolff described a high sensitivity ultrasonic interferometer for studies of magnetic phase transitions in the classic dysprosium garnet (DAG) in the range of 0.5 to 2.54 K. The method uses ZnO ultrasonic transducers which are sputtered onto the surfaces of the sample and operate in the range of 1 to 3 GHz. R. Ranjan described 3 non-destructive methods for observations of dislocations in magnetic materials including acoustic Barkhousen noise (ABN), magnetic Barkhousen noise (MB), and hysteresis curves to study the influence on domain walls by dislocations. In the following paper he also described ways of using the ABN and MB effects to study the grain size distributions in ferromagnetic materials. He found that in Ni there is a monotonic decrease in MB and ABN with increasing grain size, whereas the results for steel show exactly the oppostie trend. R. Palanisamy discussed theoretical predictions for eddy current response using non-destructive evaluation of metallic tubes. He found that finite element numerical analysis could be used to model the remote field eddy currents. In the following paper Palanisamy examined the effects of the remanant magnetization on eddy current non-destructive testing. The interesting feature here is that many standards require that the residual magnetic field intensity be 0.5 gauss or less for automotive and manufacturing industries. He found that the eddy current tests were independent (or not critically dependent) on the demagnetization limits, and that the specified residual magnetic fieds are much too stringent. Fields up to 10 gauss can easily be tolerated. A.J. Pointon described an automated vibrating sample magnetometer which covered the range 300-1200 K for measurements of applied magnetic field concurrently with measurements of the ferromagnetic Hall effect in conducting materials. The system uses a series of 12 coils in order to minimize image effects and uses a very large horizontal sample displacement (approximately 2 cm.) at 4.3 Hz. J. Augenstine discussed the effects of various parameters on x-ray fluorescence (XRF). General algorithms were developed for single and multilayer metal films which allowed precision of analysis of composition and thickness approaching 0.1%. M. Abe discussed three approaches to high speed deposition of high quality ferrite films of high quality in aqueous solutions at temperatures below 90°C. Increased deposition rate and means for removing the reacted materials in the region of the film were developed. The methods included spraying, spin coating, and thin liquid film deposition. To date the areas covered are a few cm^2, but larger area fabrication appear feasible. Thin films with two or more solutions, superlattices, and modulated films are being developed for the future. J.J.M. Janssen described a method of determining the particle size distribution in a suspension of magnetic particles in a tube in an applied magnetic field. Other methods use measurements of the equilibrium concentration allows determination of the particle size distribution in the fluid. R.J. Willey discussed the magnetic orientation of respirable asbestos fibers in a magnetic field. He found that the different mineral types of asbestos fibers have different responses as a function of magnetic field. He showed that the non-asbestos fibers did not orient in the magnetic field, so that a magnetic field can be used to differentiate between fine asbestos fibers which are in a serious hazard versus other fibers which are not readily distinguished in an optical microscope without magnetic field (such as lint, etc.). This has direct interest to environmental safety.

Session AP - Magnetic Insulators
Chairperson: Dr. Sheldon Schultz

A. Aharoni adds a crystallographic surface anisotropy term to a sphere and examines nucleating by the magnetization curling mode. He suggests this as a mechanism to explain the effect of chemisorbed surfactants on the coercivity of ferrite particles as reported by Berkowitz, et al.

N. Ayoub et al. report experiments in which they freeze a ferrofluid containing Fe_3O_4 particles in field to 5000 Oe. They measure the initial susceptibility at zero field as a function of T and find a peak which moves to lower T as the cooling field increases.

G. Xiao and C.L. Chien fabricated Fe particles 25-50Å embedded in amorphous $Si-O_2$. They measure the temperature dependence of the initial susceptibility, x, and identify $\sqrt{x}T$ with the undisturbed spontaneous magnetization, M_s. They find $M_s = M_0(1-BT^{3/2})$, with the spin wave constant B larger than that for Fe.

Chien et al. fabricate granular magnetic $Fe-SiO_2$ solids via high rate sputtering. Above a percolation threshold H_c is 20 Oe at 2K, while below H_c is greatly enhanced.

Du Yon-wei et al. prepare oxide stabilized α-Fe fine particles by evaporation in a nitrogen atmosphere. From H_c vs T data they infer the magnetic reversal process is a chain of spheres mechanism, with an increase in He at lower T associated with magnetic anisotropy.

Cowen et al. produce Er single crystals between 1 and 50 mm. They report changes in the magnetic phase transition temperatures compared the three known for the bulk below 100K.

Using cosputtering, Edelstein et al. prepare 10-300Å α-Fe and Co particles in an insulating BN matrix. The material undergoes a metal-nonmetal transformation at .50% Fe and above this concentration the room temperature H_c is large, i.e., 50-100 Oe.

Bridges et al. prepared 0.05 μm α-Fe particles. Magnetic measurements on epoxide and polyurethane films containing these particles with various mass fractions gave Hparticles. Magnetic measurements on epoxide and polyurethane films containing these particles with various mass fractions gave H_c as high as 900 Oe with correspondingly high remanence.

Session AP - Magetic Insulators
Chairperson: Israel S. Jacobs

The dramatic possibility of organic ferromagnets was addressed in the poster paper by Torrence et al (IBM). A conceptual theoretical model was proposed and an experimental example was presented (with no transition metal component). Spontaneous magnetization an hysteresis persist up to about 400° C. Chemical reproducibility is an admitted problem. In view of the very small magnetic moment, this reporter is reminded of the possibility of moment-bearing antiferromagnetic domain walls or similar defects. Notwithstanding, the presence of any magnetic order in such a material above room temperature is striking. The paper will appear in the journal "Synthetic Metals."

Batra et al (OSU) discussed the magnetic properties of charge-compensated CaGE:YIG. It is proposed that an electron hole can localize at low temperature, allowing creation of an unusual Fe^{4+} ion. This results in a third magnetic sublattice and accounts for the observed magnetic compensation point. In their paper, Bush et al (Ga Tech) used X-band FMR spectra to investigate anisotropy effects from imlantation of various ions into YIG. The method, based on Wilts' mathematical model, is particularly sensitive and provides a spatial resolution. Implantation generates an amorphous layer. For argon this anneals out with no residual effects, but not so for iron or manganese.

Plumier and co-workers at Saclay reported continued studies on the garnet $Ga_3Mn_2Ge_3O_{12}$. Evidence was presented for a biquadratic interaction explaining a quqadrupolar ordering below the Neel point, and

associated moment canting. The Parma group (Paoluzi et al) reported on single crystals of $(Co,Zn)_2$ W-type hexaferrite. Magnetization curves, including first order processes, provided data for discussing a magnetic phase diagram based on unusual anisotropies and intersublattice competition. Belesis and coworkers at CMU presented two papers on rare-earth ethyl sulfate nonahydrates. Magnetic behavior was analyzed for fully substituted Tb, Dy, and Ce single crystals, and spin resonance behavior for dped Y:Dy and Y:Er crystals.

Willett's group from Washington State presented three magneto-chemistry reports. The first discussed magneto-structural correlations in Cu(II) bromide salsts and could be subtitled "Why are bromides better antiferromagnets than chlorides?" Such studies are an effective reminder that first-principle calculations of exchange are not at hand, so that partial theoretical concepts must be tested against systematic experimental data. The second paper reported on anomalous magnetic properties of trinuclear Cu(II) halide compounds where inter-trimer interactions promote a sort of frustrated spin system. In the third paper, Willett asnd Landee of Clark U. examined powder and single crystal susceptibilities and EPR linewidths of a CU(II) layer peroskite. It behaves like a two-dimensional ferromagnet with its easy axis perpendicular to the layer and does not order down to 1.8K.

Lastly, another copper (II) chloride compound, with widely-spaced layers was studied by DeFotis et al (College of William and Mary et al). Single crystal susceptibility, magnetization, and EPR were reported. Low dimensional (2D?) character is observed. Below a Neel point of 9K, a metamagnetic transition is found, whose low temperature H_t of 31 G suggests dipole-dipole anisotropy.

Session BC, Magnetism and Superconductivity
Chairperson: A.S. Edelstein

This session consisted entirely of contributed papers. Approximately half of the papers dealt at least partially with materials that were superconductors. Tkaczyk and Tedrow used electron tunneling to study the magnetic proximity effect at superconductor-rare earth oxide interfaces. The effects they have observed can be completely described by an enhanced internal field. There is no additional pair breaking. Hou et al. did not observe any effects due to spin-fluctuations near the Neel temperatures in their study of $NdRh_4$ and $SmRh_4B_4$. Heidel et al. studied the magnetic order and structure in Ce deuteride single crystals. They found that the ordered moment was less than expected for the G_8 ground state and interpreted this as due to a crystalline distortion with causes an additional crystal field splitting. Stanley et al. performed neutron scattering measurments on the cubic superconductor $ErPd_2Sn$. They reported that there are spin wave contributions which are maximized at reciprocal lattice points. DiMarzio et al. observed an increase in the magnetic ordering temperature with pressure in EuO and $Eu(Au_XPd_{1-x})_2Si_{-2}$ for x close to 1. Zhou et al. reported that the system $U(Ga_{1-x}Ge_x)_3$ is a low moment, antiferromagnetic in a narrow concentration range near x=0. Below the Neel temperature there is a low temperature susceptibility increase. Franse et al. reported that superconductivity is destroyed by alloying 0.5 at. % of Pd to the heavy-fermion superconductor UPt_3. Antiferromagnetism occurs for 1 to 10 at. % Pd. Franse et al. observed that URu_2Si_2 is both a superconductor and a low moment antiferromagnet. They observe several sharp, nonhysteric jumps in the magnetization near 30 T. Hu et al. discussed how adding new channels wo their theory treating resonant band-f scattering improved the agreement with experiments on actinide systems. Cyrot discussed the effect of coherence and impurities on heavy-fermion systems.

Session BD - Neutron Scattering
Chairperson: Charles F. Majkrzak

A total of twelve contributed papers were presented in this Session. The first seven papers dealt with inelastic neutron scattering investigations of magnetic excitations in various systems. Beginning the Session was a presentation by P. Boni et al. on critical magnetic scattering from the Heisenberg

ferromagnet EuS in which the measured line widths were compared with predictions based on dynamical scaling. The second paper by K. Yamada et al. reported the first observation of anisotropic paramagnetic scattering in a metallic ferromagnet. The third paper by W.H. Li et al. reported measurements which suggest that "forbidden" and allowed magnons exist as underdamped excitations both below and above T_c in Pt_3Mn. E.R. Crowley et al. then presented the results of a recent neutron scattering study of the magnetic excitations in Fe-doped Mn_3Si. The fifth paper by J.A. Fernandez-Baca et al. discussed results of research on the spin dynamics of amorphous $Fe_{(90-x)}Ni_xZr_{10}$. The next paper by B.D. Gaulin et al. described the determination of the spin wave dispersion relations in the triangular antiferromagnet $CsMnBr_3$. The seventh paper by K.M. Hughes et al. reported that there is apparently no measurable difference between the transverse and longitudinal spin response in single domain uranium selenide.

The next three papers dealt with magnetic structures. J.A. Gotaas et al. reported on their study of the magnetic field-induced transition in $Y_{1-x}Gd_x$ alloys for dilute Gd concentrations. The following talk by R. Plumier et al. discussed the results of a reinvestigation of the magnetic properties of $MnSe_2$. S. Simizer et al. then described the structure of $FeC_2O_4 \cdot 2D_2O$ determined by analysis of neutron diffraction data on powdered samples.

The last two talks of the session were concerned with the measurement of crystall field levels by inelastic neutron scattering. The first of these presentations,by R.R. Arons, et al., showed how polarized neutrons could be used to separate, unambiguously, crystal field excitations from phonons in $PrD_{1.95}$. The final paper, by B. Schmid et al., described inelastic scattering measurements on $PrCl_3$ and $PrBr_3$ and the crystal field level schemes which could be inferred from the data.

Session CA
Symposium on Technologically Interesting Thin Film Properties
Chairperson: J. Kent Howard

A session of all invited papers was developed to discuss in detail the application of thin film properties to mass storage devices. The applications ranged from longitudinal and perpendicular media, soft magnetic alloy films for heads to optical storage technology. W.G. Haines (CDC) presented a paper on "Anisotropy in Thin Film Media - Origins and Applications" which described the effect of deposition processes on the origins of magnetic anisotropy in thin films. The effects of anisotropy on improved magnetic recording performance was related to the understanding and control of microstructural properties of the thin film structure. A review of the "Physical and Magnetic Characteristics of Rigid Single Layer Perpendicular Recording Media" was presented by N. Heiman of Lanx. The important aspects of deposition technology, structure, and media performance (density, SNR, etc.) were described for a production system. Hayashi, Hayakawa, Ishikawa, Ochiai, Matsuda, Iwasaki, and Aso of Sony presented an interesting study of some new ternany alloys (similar to Sendust) with improved magnetic properties. The FeGaSi and FeAlGe alloys were reported to exhibit higher saturation magnetization values than Sendust.

Lo, Huang, Cambell (IBM) and Allee (Stanford University) described the deposition of thick NiFe films for inductive heads in a paper entitled "Magnetic and Structural Properties of High Rate Dual Ion-Beam Sputtered NiFe Films." The relationship between deposition conditions, structure, and magnetic properties (Nc, Hk was emphasized). Suits, Geiss, Lin, Rugar, and Bell (IBM) reported on "Lorentz Microscopy of Laser-Written Domains in Tb-Fe". The domain structure was investigated with Lorentz Microscopy and the results were related to the media SNR.

Session DA - Symposium on Dynamics of Random Systems
Chairperson: David L. Huber

The five papers on the Symposium on the Dynamics of Random Systems fell into two categories: low-frequency dynamics in spin glasses and excitations in dilute antiferromagnets. D.S. Fisher (AT&T Bell Labs) outlined a theory of the long time dynamics of random systems with applications to spin glasses and random field Ising magnets. The theory is based on an activated dynamic scaling hypothesis involving distributions of barriers which grow as a power of the length scale. R.H. Koch, W. Reim, A.P. Malozemoff, and M.B. Ketchen (IBM Watson Research Center) reported on their studies of the temperature dependence of 1/f noise in the insulating spin glass $Eu_{0.4}Sr_{0.6}S$. They used a novel integrated squid technique to measure the magnetic noise and susceptibility. They confirm the fluctuation-dissipation theorem and present evidence against H. Bouchiat, J. Hammann, M. Ocio, and P. Refregier (Saclay) reported a variety of dynamical studies on the spin glass $CdIn_{0.3}Cr_{1.7}S_4$. They compared the results of noise, relaxation, and susceptibility measurements. Along with Koch et al., they verify the fluctuation-dissipation theorem.

R. Orbach (UCLA) and K.W. Yu (Hong Kong Polytechnic) discussed an effective medium calculation of the dynamic susceptibility of a dilute Heisenberg antiferromagnet. The susceptibility shows a two-peak structure for certain parameter ranges, which they attribute to the simultaneous presence of magnon and fraction excitations. R.J. Birgeneau (MIT) and Y.J. Uemura (Brookhaven) reported inelastic scattering measurements of the spin dynamics in $Mn_xZn_{1-x}F_2$. Preliminary results indicate qualitative agreement with the magnon/fracton model outlined by Orbach and Yu.

Session EA - Particulate Recording Media
Chairperson: M.P. Sharrock

As in previous major conferences, the strong interest in barium ferrite particles was evident. This material accounted for four of the twelve presented papers. Y.K. Hong, et al. presented studies of barium ferite syntesis using dopants other than the commonly-used cobalt and titanium and described the use of X-ray and Mossbauer spectroscopy to characterize site occupancy. Cou Fucheng et al. described the dependence of the magnetic moment and anisotropy, and also the site occupancy of cobalt and barium ferrite synthesis. M. Kishimoto et al. discussed measurements of magnetic anisotropy in barium ferrite and the correlation with magnetic squareness in recording media. D.E. Speliotis reported on recording performance in rigid disks, where perpendicularly oriented barium ferrite was found to be superior to random and longitudinally oriented barium ferrite and to acicular oxide.

Three papers dealt with the use of cobalt to enhance the anisotropy of spinel oxides. R.L. Meng et al. discussed the use of sputtered oxide films with diffused cobalt as a model for cobalt-doped particles. Huan Tang et al. and Du You-Wei et al. presented two related papers on spherical zinc ferrite particles with a cobalt-containing surface layer. The first was concerned with the Mossbauer spectra of these materials and the second with magnetic properties, especially anisotropy.

One paper, by Wei Yu-Nian and Ling Qi-Fen, described a coercivity increase with aging in nonstoichiometric iron oxide. This was explained as being due to ordering of vacancies and divalent iron.

Two papers dealt with orientation of acicular particles in media. A theoretical treatment, by C.M. Perlov and S. Middleman, considered the effects of interparticle interaction and predicted that particles under the influence of a field in a fluid coating will orient faster as particle loading is increased. An experimental study, by H.J. Lee, et al., described the relationship between the measured magnetic orientation ratio and the

angular distribution of individual particles.

A.M. Homola et al. discussed the technology of ultra-thin particulate coatings, where thicknesses down to a particle monolayer are produced through control of particle-particle and particle-substrate interactions.

Ching-Ray Chang and D.R. Fredkin presented a theoretical study using a vectorial model of a particualate medium. Coercivity and squareness were modeled as a function of magnetic field direction, with the result that coercivity shows a peak at about 60° out of the plane.

Session EC - Numerical Methods
Chairperson: Dan S. Bloomberg

A wide range of topics was covered in the Numerical Methods Session (EC).

Most people agree that acoustic investigations of one clapping hand are best left to practitioners of Eastern philosophy. I. Mayergoyz and G. Friedman did not study this problem, but they did derive, within the classical Preisach model, the hysteretic energy loss expected for non-periodic field variations. In general, energy loss is known only for closed loops. However, energy loss is a continuous process, and it was shown that within this model the losses in each half of a closed loop are equal!

People have for years been tearing their hair over the problem of accurately assigning boundary conditions for open geometry finite element problems. An arsenal of approaches, including guessing on a finite boundary, coupling to integral equations, and "infinite" elements have been used. Now J. Lee and Z. Cendes have proposed an elegantly simple approach for coupling a two-dimensional finite element problem to a boundary at infinity. They chose a homogeneous circular exterior region, for which the solution to Laplace's equation is given as a multipole expansion. Only a few coefficients were necessary to generate an accurate coupling to the exterior region. The extension to three dimensions is straightforward.

Can you always find a non-intersecting set of cuts that will allow, for an arbitrary 3-dimensional current configuration, a magnetic scalar potential solution in the space outside the current? P. Kotiuga used formal methods of algebraic topology to answer this question in the affirmative. Neither the result nor the proof were intuitive.

Do conventional 3-dimensional vector potential finite element methods that require continuity of A overconstrain the vector potential? M. Barton and Z. Cendes showed that only continuity of the tangential component is satisfied "naturally" in the variational approach. They then formulated the problem with edge nodes instead of vertex nodes on tetrahedral elements. Although the number of edges far exceeds that of vertices, the bandwidth for edges is smaller (less edge-to-edge connectivity), and some reduction in computation is achieved.

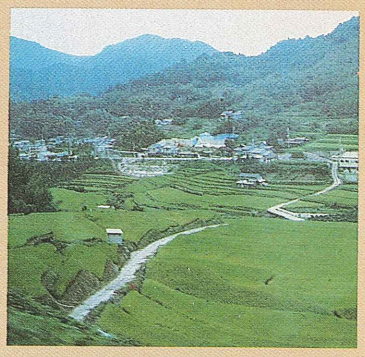
If you enjoy entering mesh coordinates in finite element programs, skip this paragraph. Adaptive mesh refinement is greatly needed in two (and especially three) dimensional field solvers. Unlike some previous methods based on minimizing energy functionals, S. Yoganathan, M. Chari and S. Hoole proposed a refinement criterion, which they applied to axisymmetric fields, based on an easily calculable error in the bending angle of B at an interface between two elements.

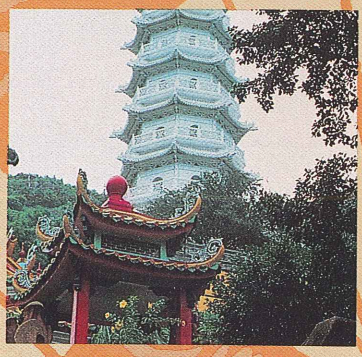
Do you think it's possible to solve eddy current problems in non-linear magnetic materials, using an integral formulation in the exterior region only? K. Ali, M. Ahmed and P. Burke have found an iterative surface impedence method that does it at high frequency where the skin depth is relatively small.

Is it possible to present a paper MMM conference that has nothing directly to do with magnetism? The answer is yes! In a tour de force that demonstrated the power of the integral equation approach, M. Lean and G. Domoto computed the flow of ions trapped in a viscous vortex flow (in the low Reynold's number regime) and subject to electric fields. They made simplifying assumptions that the flow is decoupled from the electrostatics and that inertial effects in the flow are negligible

THE MAGNETICS SOCIETY SPECIAL TRAVEL OPPORTUNITY TO THE TOKYO INTERMAG CONFERENCE

APRIL 13 - 17, 1987





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Kansas City	$1,197.00
Los Angeles	$ 969.00
Miami	$1,220.00
Minneapolis	$1,197.00
New Orleans	$1,197.00
New York	$1,197.00
Philadelphia	$1,197.00
Phoenix	$ 969.00
Pittsburgh	$1,197.00
San Francisco	$ 969.00
San Antonio	$1,168.00
Seattle	$ 969.00
St. Louis	$1,197.00
Washington	$1,197.00

Rates. All above rates are as of October 20, 1986, and are subject to adjustments upward or downward prior to ticket purchase.

Reservations. Reservations are subject to availability. It is recommended that reservations be made as soon as possible, but no reservations can be accepted after March 12, 1987.

Cancellations and Refunds. A cancellation fee will be assessed by United Airlines according to their rules and regulations plus a $25.00 clerical fee to Tabor Travel.

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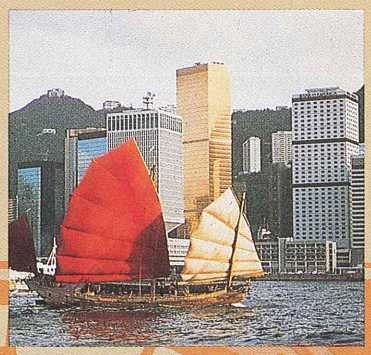

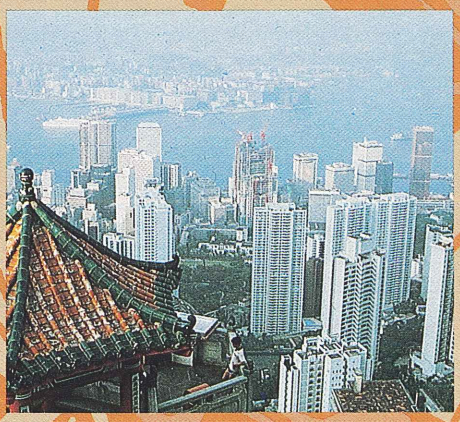

(so that vorticity satisfies Laplace's equation). Both the charge transport and viscous flow were formulated as boundary integral equations, and the method of characteristics was used to enforce the continuity equation. A problem involving ion flow through a complex channel was solved for illustration.

I believe the participants in this eclectic session would agree that it was highly enjoyable and productive of new ideas.

Session FB: Metallic Multilayers
Chairperson: J. Raynien Kwo

The advances in thin film preparation techniques have led to significant progress in the studies of metallic magnetic mutilayers. The first half of the session focused on the long range magnetic order in the rare earth superlattices prepared by molecular beam epitaxy. In the first invited paper, J.J. Rhyne discussed the occurrence of long range helimagnetic order in rare earth Dy-Y multilayers based on neutron diffractions. The spiral spin structure of the Dy layer maintains its coherency through the Y layer with a coherency length decreasing with increasing Y layer thickness. The results are interpreted on the basis of stabization of a spin density wave in the conduction bands of Dy and Y. Julie Borchers et al reported magnetic measurements on the same superlattices and suggested the Dy spiral structure appeared to be more stable with increasing Y layer thickness. An independent study on Dy-Y superlattices was carried out by M. Hong et al. They showed that in the superlattices the Dy helical order exhibits markedly different variation with temperature because of a strongly modified magnetostriction in the presence of coherency strain. New behavior of "lock-in" to a constant wavector at low temperature was observed. C. F. Majkrzak et al reported polarized neutron diffraction on Gd-Y superlattices to investigate the interlayer exchange coupling effect between successive Gd arrays across Y, and observed an oscillatory occurrence of ferromagnetic and antiferromagnetic order. The magnetic behavior of the interfacial Gd planes was also analyzed. Y. Yafet calculated the RKKY exchange couplings for (1) two monoatomic Gd planes separated by a Y layer, and (2) two Dy arrays, each of 2 atomic planes thick, and separated by a Y layer. He showed that the RKKY coupling across Y is of sufficient strength to produce long range coherency in both Gd-Y and Dy-Y superlattices. In the second invited paper, I.K. Schuller gave a tutorial talk reviewing preparation and structure of magnetic superlattices produced by both sputtering and MBE techniques. A newly developed microcleavage technique was applied to directly image the transverse crossection of the multilayers. Gang Xiao et al reported the synthesis of Cu-Ni superlattices with exclusively [100] texture, and found an enhanced surface anisotropy effect in thin Ni layers than those of [111] texture. The dimensionality of Ni-Cr multilayer system was studied by M.B. Stearns et al. The M vs T behavior of the multilayers with decreasing Ni layer thickness is compared with the theory assuming a small surface anisotropy.

Session GA - Recording Heads
Chairperson: W.D. Doyle

This session described some evolution but no revolution. Several papers were presented on both inductive and magnetoresistive thin film head technology.

Two invited papers by Hanazono et al. and Kawakami et al., and a contributed paper by Ohura et al., all from Hitachi, documented, in excellent fashion, the design, fabrication and testing of a flying thin film inductive head. The authors reported advantages to sputtering rather than electroplating Permalloy because of the decreased sensitivity of the film composition to substrate topography. It was required to control the composition to 82 $\pm$ 0.2% Ni. A new ion etching method using CF_4 to etch Al_2O_3 on NiFe and argon to etch NiFe and Al_2O_3 prevented redeposition and provided practical etch stops. Throat height was controlled to $\pm$ 0.6 μm using inductive lapping guides. A unified set of performance data documented the trade-offs between resolution, overwrite and head dimensions.

Cain et al. reexamined the possibility of providing a bias for magnetoresistive heads

using exchange anisotropy and extended earlier work by others on FeMn to include films of αFe_2O_3 and TbCo. The Curie temperature of these materials is higher than FeMn which significantly reduced the temperature sensitivity of the exchange field.

The various bias schemes for magnetoresistive heads were compared by Bhattacharyya et al. Pohm et al. described sensitivity measurements on magnetoresistive Permalloy stripes and speculated on the performance of these heads in very narrow track (~4 μm) applications. In a related paper from the same group, Comstock et al. showed that the thermal limit of these stripes is comparable to the melting point of Permalloy.

In a paper presented by Suran for the authors, Krishnan et al., showed that films of $Co_{87}Fe_2Nb_{11}$ have attractive soft magnetic properties. Spin wave spectra were observed which gave a value of the exchange constant of 300 mev/A.

Finally, Elsbrock et al. evaluated the fields outside the gap of a thin film head using a SEM.

Session GB - Domain Walls and Magnetization Processes
Chairperson: F.B. Humphrey

The session started with three invited papers aimed at a better basic understanding of domains in materials. Portesil concluded that domain topology could lead to an intrinsic energy loss even in perfect materials. His model was illustrated with a comprehensive study of domains in bubble garnet material. Then Van den Berg presented his domain theory and the rules for predicting domain shape and size. He had interesting domain structures in permalloy, displayed by the bitter technique as examples. Finally Herman showed the results that could be obtained by extensive instrumentation utilizing the Kerr effect. Interesting domains were shown in a 50 μu square of permalloy highlighted by a movie to give a better feel for the dynamic effects.

Two contributed papers were given on wall resonance in garnet films. Batra presented an analysis to match the experimentally observed data. The motion of flat Lozenger shaped domains was presented by Puchalska. By using a combination of image processing and careful Kerr observation of domains in permalloy, the process of domain motion could be followed.

Chaotic motion in a one dimensional rf driven domain wall was predicted. No experimental confirmation was suggested by Suhl. The approximate calculation of the magnetization curve for a polycrystalline material was discussed by Arrott. The dependence of the result on the specific assumptions that are made was emphasized. A model for the magnetization behavior in amorphous ribbon samples was presented by Valenzuela. The predicted magnetization curve exhibited two linear regions in good agreement with measurements made on a long torroidly wound amorphous ribbon. The reproducibility of domain wall motion in metghass was investigated by Wadekar.

Session GC - Spin Glass Panel
Chairperson: M.B. Salamon

The concensus of this panel was that there is, indeed, a phase transition in the three dimensional Ising spin glass (and in anisotropic Heisenberg spin glasses) but that the nature of the low-temperature phase is not yet understood. J. Mydosh began the discussion by citing experimental evidence, mainly singularities in the non-linear suceptibioity, supporting the assertion that there is a thermodynamic phase transition, though not of the usual sort. Contrasting spin-glass transitons (sg) with those in random-field Ising magnets (rfim), Mydosh focussed on the frequency dependent aspects of the sg transition and the absence of specific heat anomalies. He urged that future work focus on a few ideal systems in order to push comparision with theory and Monte Carlo simulation.

A similar view was expressed by J. Souletie, who stressed the importance of scaling relations using H^2 as the relevant field. He

argued that the extreme difficulty in characterizing this transition is attributable to the very large value of the dynamical exponent which causes processes to slow to laboratory time scales even quite far from the freezing temperature. The latter point was endorsed by A. Ogielski, who argued that such extreme slowing down invalidates all simulation efforts carried out before 1984. The exponents obtained from simulation abot T_g and those recently obtained by high temperature series expansion now are close to agreement but do not agree with present experimental values. The need for carefully controlled experiments on a few ideal systems was emphasized.

A. Zippelius analyzed the failures of theoretical approaches to the transition, pointing out that the inability to treat fluctuations reliably probably means that expansions around a mean-field solution are not possible in three dimensions. She described a high-temperature series method which includes dynamics and yields power-law exponents for dynamical quantities.

Focussing on the low temperature phase, which all participants agreed was not understood, A.J. Bray described scaling methods based on zero temperature domain-wall-energy scaling. This combination of analytical and numerical analysis uses the energy differences between states prepared with periodic and with antiperiodic boundary conditions to determine whether the energy required to create domain walls (excitations) decreases (no ordered phase) or increases (ordered phase) with system size. He concludes that the three dimensional Ising model is ordered, and the lower critical dimension is between 2 and 3. He suggested that replica-symmetry breaking does not occur.

Active discussion accompanied each presentation and a general discussion focussed on the nature of the order parameter in a spin glass, contrasts with the ordinary glass transiton, and questions of "university" in the spin glass problem.

Session GD - Alloys and Intermetallic Compounds
Chairperson: D.J. Sellmyer

This session consisted of one invited and eight contributed papers focussing mainly on the relationship between structure and properties of rare-earth (R) and transition metal (TM) compounds and disordered phases. In the invited paper, McHenry and coworkers reported on their initial theoretical and experimental studies of icosahedral (I) order and its relationship to magnetism. Theoretical ideas centered on the expected electronic structure of TM atoms at I sites, and the implications for anisotropy of I-site symmetry. Reference was made to metastable Co-Er and Co-Er-Si alloys which have properties different from either crystalline or amorphous phases. Gyorgy et al. characterized the reentrant ferromagnetism exhibited by $SmMn_2Ge_2$ by determining its pressure-temperature phase diagram; the sensitivity to interatomic spacing was shown. Orehotsky discussed kinetic effects in the magnetization of the Pt_1Co_1 order-disorder alloy. A rapid transient response and a sluggish ordering kinetics were characterized. Saleh and coworkers presented results on the local-environment effects seen in ordered CoAl compounds in which 0-40% of the Al atoms are replaced by Mn. Large moment clusters and eventually ferromagnetism is seen. Malamud et al. reported on a Wigner-Seitz analysis of the location of the Fe atoms and their magnetic moments in RFe_nAl_{12-n} alloys. Neutron diffraction results on the atomic and magnetic structures of $ER(Fe_{1-x}Ni_x)_3$ intermetallic compounds were reported by James and coworkers. Ni site occupancies and various magnetic structures were discussed in terms of competitive local anisotropies and differences between Er-Fe and Er-Ni exchange interactions. Ramesh discussed the high-voltage Lorentz electron microscopy of FeNdB magnets. By tilting the foil, the interaction of the domain walls with microstructural features was studied. Finally, Jen reported on a study of the critical behavior of FeNdB alloys near T_c by means of heat capacity and electrical resistivity measurements.

Session GP - Thin Films and Multilayers
Chairperson: Peter F. Carcia

Z.Q. Han and P.E. Wigen presented FMR evidence that shows reduction in a 11μm thick $Y_{2.0}Ca_{1.0}Ge_{.9}Fe_{4.1}O_{12}$ film occurs in a surface layer whose magnetic properties are altered significantly from the interior of the film, which is only slightly changed from the as-grown film.

K. uematsu et al. studied by FMR the effect of light irradication on the relaxation of surface spin wave modes in H_2+ implanted YIG films with (111) orientation.

Tang Sing-ye showed that RF power coupled between two perpendicularly oriented rectangular YIG thin film rings exhibits a frequency independent maximum with change in magnetic bias applied to one ring.

G.T. Rado defined the conditions for substitution, in FMR analyses, of surface anisotropy energy by an effective bulk value and concludes that such a substitution in both amorphous and crystalline films, tens of angstroms thick, is not usually justified.

SQUID magnetometry measurements of M for FeB films by L. Zhang and G.T. Rado confirmed values obtained from a new FMR method proposed for deducting magnetic surface anisotropy, and thus support the reliability of that technique.

Shi Longpei used a Green's function method to derive a relationship between surface anisotropy and spin wave modes excited by a uniform microwave field. The same technique was alos used to study the spatial dependence of calculated Curie temperature and spontaneous magnetization at a film's surface and interior.

R.F. Wiegert and M. Levy reported on the correlation of changes in surface acoustic wave attenuation and magneto-resistance with applied magnetic bias field in thin Ni films.

El Sayed A. Mehanna et al. presented new electrical resistance data for thin films (50-1500A) of Cr.

Optical refectance measurements of $Co_{1-x}Cr_x$(x=0.12-.2) films were used by J. Leng and C.Y. Fong to probe electron energies by comparison to the individual metal spectra. Cr only appears to affect Co energy states well above E_F.

J. Zasadzinski et al. synthesized polycrystalline $Er_2Fe_{14}B$ and $Nd_2Fe_{14}B$ films by DC triode sputtering on to heated substrates (600-700C). $Er_2Fe_{14}B$ films have an easy axis of magnetization in the film plane and $Nd_2Fe_{14}B$ films perpendicular. Both films have preferred c-axis orientation perpendicular to the film plane.

A. Morisako et al. used magnetron sputtering to synthesize the τ-phase of $Mn_{56}Al_{44}$ with hard properties.

T. Ishiguro et al. correlated the magnetic properties of Co-Si composite thin films, made by RF sputtering, with microstructural properties studied with high resolution election microscopy.

The magnetic anisotropy and structural properties of Gd-Fe, Tb-Fe, and Dy-Fe multilayer films, prepared by DC sputtering, were reportedby N. Sato and K. Habu. The highest anisotropies and coercivities were obtained in Tb-Fe multilayers with thin Tb and Fe layers, confirmed the importance of this pair interaction.

B.L. Ramakrishna et al. characterized Co/CR multilayers, prepared by e-beam evaporation, by FMR. Several weak modes with the external magnetic perpendicular to the film were measured and attributed to anisotropy of interfacial Co atoms.

G.F. Strouse and M.J. Pechan showed that anisotropies obtained from 180° torque and FMR measurements in Mo/Ni multilayers are in good agreement, but are at variance wth anisotropies from the 45° torque method.

Session HB - Fe-Based Multilayers
Chairperson: Ross W. Erwin

The session on Fe-Based Multilayers (HB), was opened with the work of Hillebrands, et al., on collective spin waves in Fe/Pd and Fe/W multilayers observed by Brillouin scattering. They showed that existing theories are able to describe the observed spin-wave band. As a result they are able to extract the saturation magnetization, which shows a descrease with decreasing film thickness for Fe/Pd and not for Fe/W. Fe layers were about 16A-94A. A related paper by Draaisma et al. discussed results for Fe and Co layers from 2A to 12A thick. They found an enhanced magnetization, suggested to be result of Pd polarization. These multilayers showed

increasing perpendicular anisotropy with decreasing Fe and Co thicknesses.

Several papers were presented on Fe/Cu multilayers. Kozono et al. investigated both single layes of Fe and Co as well as multilayers. Their TEM and resistivity measurements suggest that Fe and Co single layers prepared by magnetron sputtering are crystalline when the thickness exceeds about 40A and 80A respectively. This then affects the crystal structure in the multilayers. As the thickness of the Fe layer decreases, flux density and coercivity decrease and the magnetostriction changes sign. Fukizawa and Naoe showed that the saturation magnetization of Fe layers in sputtered Fe/Cu is near the value for bulk Fe for layers as thin as 7A (the multilayer structure was confirmed down to 5A). Saturation magnetization is much smaller for thinner Fe layers. Both papers discussed the dependence of uniaxial anisotropy on layer thickness. An additional paper by Katayama et al. discussed the dependence of the Kerr angle in Fe/Cu multilayers.

Two talks were given on Fe/Ag type multilayers where there is believed to be little or no interfacial diffusion. Xiao and Chien used SQUID to investigate spontaneous M(T) in $Fe_{70}B_{30}$/Ag magnetron sputtered multilayers. They $T^{3/2}$ Block decrease for a-$Fe_{70}B_{30}$ layers thicker than 6A, crossing over to 2D linear T dependence below 6A. Stearn and Walker discuss the importance of islanding in (111) Ag/ (110) Fe multilayers on the magnetization measured by SQUID and Mossbauer. They showed enhanced hyperfine fields in the case of Fe layers separated by 5 atomic planes of Ag.

Shan, Zhao and Sellmyer discussed the dependence of the easy-axis direction on layer thickness in Fe/Ta comiositonally modulated structures.

There were two papers on Fe rare-earth multilayers. Cofield et al. measured anisotropies in the range of -6 to -13kOe in Tb/FeCo evaporated multilayers, increasing in magnitude with increasing modulation wavelength. Zhao et al. explained the magnetic properties of Fe/Nd epitaxial multilayers in terms of zero-net-moment at the interface region.

Session HC - Mossbauer Spectroscopy and Magnetic Resonance Studies
Chairperson: Wayne Federer

Thirteen papers describing assorted spectroscopic applications were presented at this session. Studies were conducted using as primary tools Mossbauer spectroscopy (8 papers), zero-field spin-echo nuclear magnetic spin resonance (3 papers), "conventional" solid state NMR (1 paper), electron spin resonance (1 paper), and muon spin resonance (1 paper). Insofar as materials are concerned, this was a very interdisciplinary session. The only class of materials covered by more than one paper was the rare-earth transition-metal borides. The four papers, presented (two each) by O.A. Pringle and M. Rosenberg, respectively, focused on determining the site occupancies (especially fr the j_2 site) and magnetic hyperfine fields for the six different sublattices in various substituted $RE_2TM_{14}B$ compositions by Mossbauer and spin-echo NMR. The spin-echo NMR signal results primarily from nuclei within the magnetic domain walls, unlike (conventional) Mossbauer spectra which are representative of the entire sample, and thus the two techniques may give different results. A.N. Murty presented another practical and interesting application of zero-field NMR for the mechanistic study of cobalt zeolite catalysts for "syngas" conversion. Y.D. Zhang et al. also used zero-field NMR as a probe of the local atomic environments in boron-rich orthorhombic $Fe_3B_{1-x}C_x$ intermetallic phases. L.H. Bennett discussed the origin of the ^{55}Mn NMR signal in his paper on nonmagnetic icosahedral Al_4Mn and hexagonal Al-Mn alloys. The topics of short-range order in rapidly quenched alloys, magnetic instabilities in the U(Sn,Pb) stystm, magnetic ordering/phase transformation in the alpha- and beta- forms of $FeF_3 \cdot 3H_2o$, and the high-pressure structure of magnetite were addressed by Mossbauer spectroscopyt in presnetations by Sanchez, Vykovetz, Pannaparayil and Evans, respectively. Sachdev showed in a theoretical paper how ESR can be used to study dynamics of metal-insulator transitions. Lastly, A.S. Arrott's muon precession experiments in Japan failed for unknown reasons, but he proudly described how to build a high-temperature furnace "in Japanese!"

Session HP - One Dimensional Systems
Chairperson: K.K. Mon

Five papers on one-dimensional systems were presented in the poster session HP. Bonner and Muller presented results on the "Critical exponents of the 1D Spin 1/2 Heisenberg Ferromagnet: Breakdown of scaling hyperscaling." They argued that both scaling and hyperscaling are violated and attributable to significant first order character of the transition and Pokrovskii-Telapov behavior.

Bonner et al., presented results on "Unusual critical behavior in a bilinear-biquadratic exchange hamiltonian." They have studied the general 1D spin-1 bilinear-biquadratic exchange Hamiltonian by analytic and numerical methods for N up to 12 spins. Rather interesting and unusual results in the gap and exponents are presented and compared to previous results.

Gaulin presented results of "Soliton spin configurations along the classical anisotropic Heisenberg chain." In this paper, the spin configurations of a one-dimensional, weakly anisotropic, Heisenberg antiferromagnet were examined by means of an importance sampling Monte Carlo simulation. One rather interesting result is that a predicted instability of the YZ solution as a function of in-plane anisotropy strength does not manifest itself.

McGurn and Hu presented a paper of "Effects of a magnetic field on the thermodynamics of dilute classical spin chains." They have determined the magnetization, susceptibility, specific heat and elastic neutron scattering for both the isotroic Heisenberg and the classical XY models as functions of temperature, magnetic field and magnetic concentration.

Srivastava et al. presented a paper on "Classical spin clusters: integrability and dynamical properties." They considered a system described by a Hamiltonian of the form

$$H = \sum_{\alpha=x,y,z} -J_\alpha S_1^\alpha S_2^\alpha + 1/2A\alpha[(S_1\alpha)^2 + (S_2\alpha)^2]$$

including exchange anisotropy as well as single-site anistropy. It was shown that an independent integral of motion quadratic in the spin variable exists if and only if the model constants satisfy the equaiton

$$(A_x-A_y)(A_y-A_z)(A_z-A_x)+\sum_{\alpha\beta\gamma = \text{cycl (xyz)}} J^2_\alpha(A_\beta-A_\gamma)=0.$$

Please Note:

Sessions Summaries which were received too late to publish will appear in the next issue of the Magnetics Society Newsletter.

Thank you.

COMPUMAG CALL FOR PAPERS

Graz, Austria
August 25-28, 1987

The sixth COMPUMAG Conference on the Computation of Electrical and Magnetic Fields will be held at the Conference Center in Graz, Austria, from August 25 to August 28, 1987. Its aim will be to review recent developments in the analysis of electrical and magnetic fields for physicists and engineers engaged in the design of electromagnetic devices and permanent magnets.

Deadline for preliminary short version of paper is December 1, 1986 and deadline for full papers is August 25, 1987. Conference bulletins will be issued giving more detailed information about the Conference Program and the general arrangements. Communications and correspondence concerning he Conference should be addressed to:

COMPUMAG-Secretariat
c/o Interconvention
P.O. Box 80
A-1107 Vienna, Austria
Phone 587-62-88, or 587-63-05,
587-64-50 or 52-02-93

SOFT MAGNETIC MATERIALS 8

Announcement of Conference and Call for Papers

A European Physical Society conference entitled SOFT MAGNETIC MATERIALS 8 (SMM8) will be held at the Congress Centre Badgastein (county of Salzburg), Austria, from Tuesday, Sept. 1 to Friday, Sept. 4, 1987.

The conference is organized by the University of Technology, Vienna, Austria's Division of Bioelectricity & Magnetism and the Institute of Applied and Technical Physics. The conference will consist of invited and contributed papers. Contributed papers will be presented as posters. There will be no parallel sessions. The conference language is English. The sessions of the conference will deal with the following areas of interest:

- Basic Magnetization processes
- Domains (theory and experimental)
- Measuring methods
- Amorphous materials
- Grain oriented Si-Fe
- Other materials
- Applications (magnetic circuitsand others)

Final selection of papers for inclusion in the conference program will be based on a **two page digest** which must be received before March 1, 1987. Owing to the popularity of the conference, early submission of digests is recommended. Detailed instructions for the preparation of camera ready digests can be obtained by writing the Chairman of the Local Organizing Committee:

H. Pfützner
Bioelectricity & Magnetism Division
University of Technology
Gusshausstrasse 27
A-1040 Wien

SYMPOSIUM ON MAGNETIC PROPERTIES OF AMORPHOUS METALS

25 - 29 May 1987
Malaga, Spain

The Symposium on Magnetic Properties of Amorphous Metals will be held in Benalmadena (Malaga), Spain from 25 through 29 May 1987. The Symposium is sponsored by the Universidad Complutense, Madrid and the Fundacion Banco Exterior de Espana. Topics covered by the Symposium are: Preparation and processing, Domains, Magnetization processes and losses, Phases and phase transitions, magnetic and structural relaxations, magnetostriction and magnetoelastic effects, induced anisotropy, after-effects and disaccommodation, experimental methods, applications and thin films.

For further information please contact:

Prof. A. Hernando
Laboratorio de Magnetismo
Facultad C. Fisicias
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Spain

EMMA '87

Following the success of the Magnetic Materials for Applications Conference held in Grenoble in June 1985, it has been decided to inaugurate a series of meetings under the title European Magnetic Materials for Applications **(EMMA)**. It is intended that EMMA will be held on a biennial basis and provide a forum for discussion of all aspects of Applied Magnetics research. Plans for te second in the series are well advanced. This will be held from 14th -

16th September 1987 at the University of Salford, U.K. The principal topics to be covered will be:

- Magnetic recording and data storage, media, heads, processes
- Permanent magnets
- Soft Magnetic materials
- Magnetic separation
- Magnetic fluids and printing
- Thin Films
- Amorphous materials
- Field calculations
- Magneto Optics

Anyone with an interest in these or related fields wanting futher details of EMMA '87 should contact:

Dr. P.J. Grundy
Local Chairman, EMMA'87
Dept.of Pure and Applied Physics
University of Salsford
SALFORD
M5 4WT
United Kingdom

9th INTERNATIONAL WORKSHOP ON RARE-EARTH MAGNETS AND THEIR APPLICATIONS

and

5th INTERNATIONAL SYMPOSIUM ON MAGNETIC ANISOTROPY AND COERCIVITY IN RARE EARTH-TRANSITION METAL ALLOYS

The Ninth International Workshop on Rare-Earth Magnets and their Applications will be held August 31 to September 2, 1987. This conference will be followed by the Fifth International Symposium on Magnetic Anisotropy and Coercivity in Rare Earth-Transition Metal Alloys on September 3. Both meetings will be held at the Taunus Conference Center, Parkhotel and Kurhaus D-6232 Bad Soden near Frankfurt, Federal Republic of Germany.

A Joint Organizing Committee for these two conferences has been constituted from members of German and Swiss Companies, and from the "Arbeitsgemeinschaft Magnetismus", a joint committee of the Deutsche Gesellschaft für Metallkunde" (DGM), "Deutsche Physikalische Gesellschaft" (DPG), "Verband Deutscher Elektrotechniker" (VDE) and "Verein Deutscher Eisenhüttenleute" (VDEh).

Continuing the pattern of the eight earlier Workshops in the series, the ninth will cover, within three days, all aspects of raw materials supply, alloy metallurgy, materials development and properties, magneti manufacturing technology and magnet properties, magnetic circuit design, and applications of the permanent magnets based on alloys of lanthanide elements and 3d-transition metals.

The organizing committee is looking forward to the participation of scientists, engineers, and businessmen representing a broad range of interests from research, product development and manufacture, to magnet application, product marketing, and corporate planning. The international community of rare-earth "magneticians" has come to look at this conference as its major forum to discuss all aspects of the subject. We ask you to put the meetings on your calendar now and to consider attending them. If you have been active doing new things, we invite you to contribute a paper and/or to participate in the industrial exhibition.

Those who plan to attend or just want to keep informed about Workshop or Symposiuym, are asked contact Mr. Rainer Poerschke, Secretary (address below) who will also be happy to answer any futher questions or special requests.

Mr. Rainer Poerschke
Registration, General Organization, Publications
AG Magnetismus der Deutschen Physikalischen Gesellschaft E.V.
Hauptstrasse 5, D-5340 Bad Honnef 1
West Germany
Phone 2224-71061

CONFERENCE CALENDAR

INTERMAG Conference, April 1987, Tokyo, Japan, contact: N. Imamura, Kokusai Denshin Denwa Co. Ltd., 2-1-23, Nakameguro, Meguro, Tokyo 153

IEEE Power Electronics Specialist Conference, June 22 to 27, 1987, Blacksburg, Virginia, contact: Robert E. Corbett, Lockheed Missiles & Space Co., Inc., Dept. 62-16, Bldg. 151, PO Box 3504, Sunnyvale, CA 94088-3504.

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

ICAME 87 International Conference on the Applications of the Mossbauer Effect, August 17-21, 1987, Department of Physics, Monash University, Melbourne, Australia

COMPUMAG Conference on the Computation of Electromagnetic Fields, August 25 - 28, 1987, Graz, Austria (see contact pg. 16)

9th Intl. Wksp on Rare-Earth Magnets and their Applications, August 31 to September 2, 1987, Taunus Conference Ctr., Parkhotel and Kurhaus, Frankfurt, West Germany (see contact pg. 18)

5th Intl. Symposium on Magnetic Anisotropy and Coercivity in Rare Earth-Transition Metal Alloys, September 3, 1987, Frankfurt, West Germany (see contact pg. 18)

Soft Magnetic Materials 8 (SMM8), September 1-4, 1987, Congress Centre Badgastein, County of Salzburg, Austria (see contact name pg. 17)

EMMA '87, 14-16 September 1987, University of Salford, UK (see contact name pg. 18)

32nd Conference on Magnetism and Magnetic Materials, November 9-12, 1987, Chicago, Illinois, contact: R.M. Josephs, Naval Air Devel. Ctr., Code 5023, Warminster, PA 18974

Symposium on Magnetic Properties of Amorphous Metals, 25-29 May, 1987, Malaga, Spain (see contact name pg. 17)

Joint INTERMAG/Magnetism and Magnetic Materials Conference, July 11-15, 1988, Vancouver, British Columbia, contact: R.M. Josephs, Naval Air Devel. Ctr., Code 5023, Warminster, PA 18974

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

INTERMAG 89 , April 4-7, Washington, DC

1989 MMM, Boston MA

INTERMAG 90, Brighton, UK

INTERMAG 92, St. Louis, Mo.

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.

There are Magnetics Society chapters of the IEEE in Central New England (Massachusetts), Los Angeles, Pittsburgh, Princeton, San Diego, Santa Clara Valley, Tokyo, Twin Cities, Rochester (New York), and Washington DC/Northern Virginia. These chapters meet regularly and provide an opportunity to meet other professionals involved in all areas of magnetism. In addition to local speakers, these meetings provide an opportunity to meet with the Magnetics Society Distinguished Lecturers.

The Society sponsors the INTERMAG Conference and co-sponsors the Conference on Magnetism and Magnetic Materials, which jointly cover the whole subject of magnetism. Recently, the Society has funded the IEEE Translation Journal on Magnetics in Japan. Equipment grants to universities, student scholarships to children of Society members, and support of workshops are only a few of the many community contributions made by the Magnetics Society.

For additional information on joining the Magnetics Society contact: Barbara (Langland) Shula, Hewlett-Packard Laboratories, P.O. Box 10490, Palo Alto, CA 94303-0971.

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