

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

School of Engineering Faculty Personnel Record

Markus Zahn

Thomas and Gerd Perkins Professor of Electrical Engineering
Director, VI-A Internship Program

Date: April 2004

1. Date of Birth: December 3, 1946
2. Citizenship: US
3. Education:

<u>School</u>	<u>Degree</u>	<u>Date</u>
MIT	SB	June 1968
MIT	SM	June 1968
MIT	EE	June 1969
MIT	ScD	Sept. 1970

4. Title of Thesis for Most Advanced Degree:

Space Charge Dynamics of Liquids

5. Principal Fields of Interest:

Electrodynamics; electromagnetic fields and energy; continuum electromechanics; dielectrometry and magnetometry sensors for measuring dielectric, conduction, and magnetic properties of media; dielectric physics; high voltage breakdown in gases, liquids, and solids; high voltage engineering; electrohydrodynamics and ferrohydrodynamics; electro-optic field and charge mapping measurements; spark discharges in automotive systems; micro/nano-electromechanical systems (MEMS/NEMS); web based demonstrations and animations for the enriched teaching of electromagnetism.

6. Name and Rank of Other Department Faculty in the Same Field:

Alan J. Grodzinsky, Professor
Jin A. Kong, Professor
Jeffrey H. Lang, Professor

7. Name and Rank of Faculty in Other Departments in the Same Field:

Howard Brenner, Professor (Chemical Engineering)
Ain A. Sonin, Professor (Mechanical Engineering)
David L. Trumper, Associate Professor (Mechanical Engineering)

8. Non- M. I. T. Experience:

<u>Employer</u>	<u>Position</u>	<u>Beginning</u>	<u>Ending</u>
University of Florida	Assistant Professor	Sept. 1970	Aug. 1975
National Bureau of Standards	Guest Worker	June 1972	Sept. 1972
University of Florida (with tenure)	Associate Professor	Sept. 1975	June 1978
University of Florida	Professor	June 1978	Aug. 1980
Centre National de la Recherche Scientifique, Grenoble, France	Visiting Researcher	Sept. 1992	May 1993
Joseph Fourier University, Grenoble, France	Visiting Professor of Physics	Sept. 1992	May 1993

Technion-Israel Institute of Technology	Visiting Professor	July 1993	
Poitiers University, Poitiers, France			
Laboratoire D'Etudes Aerodynamiques	Visiting Professor	Jul. 1996;Jan. 2001;Jul. 2001	
Institute of Technology, Kitakyushu, Japan	Visiting Professor	July 1999	
Department of Electrical Engineering, Kyushu			
Ecole Centrale de Lyon	Visiting Researcher	Nov. 1999	Jan. 2000
Centre National de la Recherche Scientifique, Lyon, France (CEGELY)			
Ecole Supérieure de Physique et Chimie	Visiting Researcher,	March 2000	June 2000
Industrielle, Paris, France	Paris Sciences Scholar 2000		

9. History of M.I.T. Appointments:

<u>Rank</u>	<u>Beginning</u>	<u>Ending</u>
Instructor	July 1969	Aug. 1970
Visiting Associate Professor	Sept. 1976	Aug. 1977
Associate Professor (without tenure)	July 1980	June 1986
Associate Professor (with tenure)	July 1986	June 1992
Professor	June 1992	Present
Thomas and Gerd Perkins Professorship in Electrical Engineering	Sept. 2000	Aug. 2005

10. Consulting Record:

<u>Firm</u>	<u>Beginning</u>	<u>Ending</u>
National Bureau of Standards	Jun. 1972	Jul. 1975
Exxon Research and Engineering Co.	Dec. 1973	Dec. 1983
Lipe-Rollway Corp.	Sep. 1977	Oct. 1977
Dow Chemical Co.	Jan. 1981	Dec. 1983
Teleco Oilfield Services	Mar. 1983	Dec. 1989
Barry Blesser, Consultant	Oct. 1983	Dec. 1983
Philips Laboratories	Dec. 1983	Dec. 1984
International Paper Co.	Jan. 1984	Dec. 1991
Optical Diagnostic Services	Oct. 1984	Dec. 1985
Ferrofluidics Corp.	Nov. 1984	Present
Polaroid Corp.	Feb. 1985	Dec. 1985
CREARE	Aug. 1985	Dec. 1988
Centronics		Dec. 1986
Electric Power Research Institute	Jan. 1987	Dec. 1999
Pennwalt Corp.	Jan. 1987	Aug. 1990
AMAX Coal Enterprises		Nov. 1987
Foster-Miller	Dec. 1986	Jul. 1990
Union Mines	Feb. 1988	Jun. 1988
Pencept	Nov. 1988	Mar. 1989
Presstek		Sep. 1989
Dupont	Jan. 1989	Dec. 1991
Cooper Industries Power Systems	Jan. 1990	Dec. 1991
Energy 4	Jul. 1990	Sep. 1990
Breakthrough Medical Corp.	Apr. 1990	Jun. 1990
Ascension Technology Corp.	Apr. 1990	Dec. 1990
Haverfield	Apr. 1991	Dec. 1991
General Electric	May 1991	Dec. 1991
General Motors Corp.	Jun. 1991	Dec. 1991
Olin Research Center	Jun. 1991	Dec. 1991
International Separation Systems, Inc.	Jun. 1992	Dec. 1992
LSR Technologies	July 1992	Dec. 1992
Actron	June 1993	Aug. 1993

Elf-Ato Chem	Apr. 1994	1995
Raychem Corp.	May 1994	1998
Jentek Sensors, Inc.	Sep. 1996	Present
Apex Medical, Inc.	Dec. 1996	1998
NASS Food Equipment	Jun. 1998	Present
Amtrak High Speed Rail Group	Aug. 1998	Sep. 1998
TND Service, Inc.	Sep. 1998	Mar. 2000
Avo-Multi-Amp Corp.	Oct. 1998	Present
Woods Industries	Dec. 1998	Aug. 2001
Draper Laboratory	Aug. 1999	Aug. 2000
Profiles Technology	Dec. 2001	Present
Sionex Corp.	Jan. 2002	Present
General Electric Global Research	Jul. 2002	Present
Calgon Carbon Co.	Feb. 2002	Present

11. Department and Institute Committees, Other Assigned Duties:

<u>Activity</u>	<u>Beginning</u>	<u>Ending</u>
Undergraduate Counselor (Dept.)	Sep. 1980	Present
Graduate Committee on Admissions and Fellowships (Dept.)	Jan. 1984	Present
Edgerton Award Committee (Inst.)	Sep. 1984	Jun. 1985
Preliminary Written Examination Committee (Dept.)	Sep. 1987	Dec. 1998
Committee for Faculty Resolution on Prof. Melcher (Inst.)	Jan. 1991	
Graduate Counselor (Dept.)	Feb. 1991	June 1992
Freshman Advisor/Freshman Seminar	Sep. 1991	Present
Catalogue Subcommittee, Committee on the Five-Year Plan (Dept.)	Oct. 1991	June 1992
Director, VI-A Internship Program	Jul. 1994	Present
Professional Engineers Policy Committee (PEPC)	Jul. 1994	Jul. 1999
EECS Graduate Committee	Jul. 1994	Present
MIT Faculty Committee on the Library System	Sep. 1999	Aug. 2002
Chairman of the MIT Faculty Committee on the Library System	Sep. 2001	Aug. 2004
Member, Lemelson-MIT Screening Committee	Oct. 2002	Apr. 2004

12. Professional Service:

<u>Activity</u>	<u>Beginning</u>	<u>Ending</u>
Lecturer, IEEE Professional Engineers Refresher Courses	1973	1974
Member, Scholar-Diplomat Seminar on Scientific and Technological Affairs, Department of State	Jun. 1974	
Assistant Editor, IEEE <u>Transactions on Electrical Insulation</u>	1977	1980
Member, Conference on Electrical Insulation and Dielectric Phenomena Board of the Committee on Dielectrics, National Research Council Assembly Program Committee,	Jan. 1978	Jan. 1980
IEEE Symposium on Electrical Insulation	1978	
U.S. Organizer IEEE U.S./Japan Seminar on Electrical Conduction and Breakdown in Dielectrics	Oct. 1979	
Associate Editor, IEEE <u>Transactions on Electrical Insulation</u>	1980	Present
General Chairman, IEEE Second International Conference on Magnetic Fluids	Mar. 1980	
Guest Editor, IEEE <u>Transactions on Magnetism</u>	Mar. 1980	
Guest Editor, IEEE <u>Transactions on Electrical Insulation</u>	Jun. 1980	
Vice-Chairman, Program Committee, IEEE Conference on Electrical Insulation and Dielectric Phenomena	1980	1981

Member, Jet Propulsion Laboratory Electric Field Positioning Science Working Group	1980	1981
Program Committee, IEEE Symposium on Electrical Insulation	1982	
Chairman, Program Committee, IEEE Conference on Electrical Insulation and Dielectric Phenomena	1982	1983
Chairman, Nominating Committee, IEEE Conference on Electrical Insulation and Dielectric Phenomena	Jan. 1984	Dec. 1987
Technical Committee Chairman, Liquid Dielectrics Committee, IEEE Electrical Insulation Society	Jan. 1985	Present
Session Organizer, Conference on Electrical Insulation and Dielectric Phenomena	1986	
Guest Editor, <u>IEEE Transactions on Electrical Insulation</u>	1988	
Local Arrangements Chairman, IEEE International Symposium on Electrical Insulation	Jun. 1988	
Administrative Committee, IEEE Electrical Insulation Society	Jan. 1989	Dec. 1994
Steering Committee, Sixth International Conference on Magnetic Fluids, Paris, France	June 1990	Dec. 1992
Chairman, 1991 Meeting of Electrostatics Society of America	Jun. 1990	Jun. 1991
Chairman, Nominating Committee, IEEE Electrical Insulation Society	Jan. 1991	Dec. 1992
Scientific Committee, Interdisciplinary Conference on Dielectrics, Societe Francaise du Vide, France	Mar. 1991	Present
Board Member of the Conference on Electrical Insulation and Dielectric Phenomena	Jan. 1998	Dec. 2000
Scientific Committee, 2nd and 3rd International Conference on Space Charge in Solid Dielectrics, France	Mar. 1995	1998
IEEE-DEIS Technical Committee of Space Charge	Mar. 1995	Present
M.I.T. Humanitarian Demining Group	Sep. 1997	Present
International Scientific Committee of the 4 th International Conference on Electric Charges in Non-Conductive Materials, Tours, France, July 2-6, 2001	Jul. 2000	Jul. 2001
International Advisory Committee of the 14 th International Conference on Dielectric Liquids, July 7-12, 2002, Graz, Austria	Jul. 1999	Jul. 2002
Academic Advisory Board of the W.M. Keck Laboratory for Electro-Hydrodynamics of Suspensions, New Jersey Institute of Technology	Mar. 2000	Present
National Academies Naval Studies Board Committee for Mine Warfare Assessment	Aug. 2000	Sep. 2001

13. Awards Received:

<u>Award</u>	<u>Date</u>	
Sigma Tau - Tau Beta Pi Award for Excellence in Undergraduate Engineering Teaching, University of Florida	May 1971	
IEEE (student branch) Excellence in Teaching Award, University of Florida	Jan. 1972	
Honorable mention, 1972 Awards for Essays on Gravitation, the Gravity Research Foundation	1972	
IEEE (student branch) Excellence in Teaching Award, University of Florida	Jan. 1973	
Special Achievement Award from the National Bureau of Standards for the paper, "Ken Effect Studies of an Insulating Liquid Under Varied High Voltage Conditions"	1974	
National Science Foundation Faculty Fellowship	Sep. 1976	Jun. 1977

University of Florida Faculty Development Grant for Sabbatical Leave	Sep. 1976	Jun. 1977
Honorable mention, 1979 C. Holmes MacDonald Outstanding Teaching Award, Eta Kappa Nu Association	Jan. 1980	
Award for supervision of best master's thesis in 1979 in Dept. Electrical Engineering, University of Florida	May 1980	
Ferrofluidics Advanced Study Fellowship	Jul. 1982	Dec. 1982
Winner, Great MIT Image Making Contest (videotape)	Jan. 1987	
Graduate Student Council Teaching Award	May 1989	
Fellow of the IEEE for "contributions to the understanding of the effects of space charge and flow electrification on the conduction and breakdown of dielectrics."	Jan. 1993	
EECS Adler Scholar (6.720 Integrated Microelectronic Devices)	Fall 1995	
1998 J.B. Whitehead Memorial Lecturer of the Conference on Electrical Insulation and Dielectric Phenomena with lecture "Optical, Electrical, and Electromechanical Measurement Methodologies of Field, Charge, and Polarization in Dielectrics.	Oct. 1998	
1999 Frank E. Perkins Award for Outstanding Advising of Graduate Students	May 1999	
Paris Sciences Scholar 2000, ESPCI Medal	Mar. 2000	Jun. 2000
Certificate of Completion of Deminers Orientation Course at the Night Vision and Electronic Sensors Directorate Countermine Division , Ft. Belvoir, VA	Jan. 1998	
Thomas and Gerd Perkins Professorship of Electrical Engineering	Sep. 2000	Aug. 2005
Winner at the November, 2002 American Physical Society Division of Fluid Dynamics Gallery of Fluid Motion with video entitled "Hele-Shaw Ferrohydrodynamics for Rotating and Axial Magnetic Fields," C. Lorenz and M. Zahn	Nov. 2002	
James R. Melcher Memorial Lecturer at First Joint Meeting of the IEEE Industrial Applications Society – Electrostatic Process Committee and the Electrostatic Society of America (ESA), Little Rock, AR.	Jun. 2003	

14. Current Organization Membership:

Organization

IEEE
Dielectrics and Electric Insulation Society

Offices Held

Elected Fellow, 1993
Administrative Committee;
Chair, Liquid Dielectrics
Committee; Chair,
Nominating Committee;
Conference and Committee
Member

Electrostatics Society of America

15. Patents and Patent Applications Pending:

1. M. Zahn, P.G. Grimes, and R.J. Bellows, "Shunt Current Elimination and Device," assigned to Exxon Research Engineering Co., U.S. Patent No. 4,197,169, April 8, 1980.
2. P.G. Grimes and M. Zahn, "Shunt Current Elimination and Device Employing Tunneled Protective Current," assigned to Exxon Research and Engineering Co., U.S. Patent No. 4,277,317, July 7, 1981.
3. P.G. Grimes, M. Zahn and R. J. Bellows, , "Shunt Current Elimination," assigned to Exxon Research and Engineering Co., U.S. Patent No. 4,312,735, January 26, 1982.
4. R.E. Rosensweig and M. Zahn, "Magnetized Drive Fluids," U.S. Patent No. 4,579,173, April 1, 1986.
5. J.R. Melcher, A.J. Morin II, and M. Zahn, "Method and Apparatus for Measurement of Charge Entrained in Fluids," U.S. Patent No. 4,873,489, October 10, 1989.
6. H. Zakheim, P.M. Clinton, J.D. Goldschneider, C.A. Kasmer, M. Zahn, and C.L. Hoffmeyer, "Magnetic Media Mill," U.S. Patent No. 5,022,592, June 11, 1991.

7. H. Zakheim, J.D. Goldschneider, M. Zahn, and C.L. Hoffmeyer, "Process and Apparatus for Magnetic Media Milling," U.S. Patent No. 5,178,338, January 12, 1993.
8. H. Zakheim, P.M. Clinton, J.D. Goldschneider, C.A. Kasmer, M. Zahn, and C.L. Hoffmeyer, "A Process and Apparatus for Magnetic Media Milling," U.S. Patent No. 5,183,214, February 2, 1993.
9. N.J. Goldfine, D.E. Schlicker, M. Zahn, and W.D. Ryan, "Magnetometer with waveform shaping," U. S. Patent No. 6,144,206, November 7, 2000.
10. D.E. Schlicker, N.J. Goldfine, M. Zahn, and W.D. Ryan, "Detection Array for Buried Objects," Application Filed, November 7, 1997.
11. N.J. Goldfine, D.E. Schlicker, M. Zahn, and W.D. Ryan, "Magnetometer and Dielectrometer Detection of Subsurface Objects," International Application Number: PCT/US98/00102, January 6, 1998 (International Filing Date).
12. N.J. Goldfine, M. Zahn, A.V. Mamishev, D.E. Schlicker, and A.P. Washabaugh, "Methods for Utilizing Dielectrometry Signals Using Property Estimation Grids," International Application Number: PCT/US99/10393, May 12, 1999.
13. R. Miller and M. Zahn, "Longitudinal Field Driven Field Asymmetric Ion Mobility Filter and Detection System", International Patent Application Number: PCT/US00/30921, May 17, 2001 (International Publication Date); U.S. Patent No. 6,512,224 B1, Jan. 28, 2003.
14. C.G. Fonstad and M. Zahn, "Nano-scale Statistical Assembly for Heterogeneous Material Integration," provisional application for patent filed March 7, 2002.
15. N.J. Goldfine, M. Zahn, A.V. Mamishev, D.E. Schlicker, and A.P. Washabaugh, "Methods for Processing, Optimization, Calibration, and Display of Measured Dielectrometry Signals Using Property Estimation Grids," U.S Patent No. 6, 380,747, April 30, 2002
16. N.J. Goldfine, D.E. Schlicker, M. Zahn, W.D. Ryan, Y. Sheiretov, and A.P. Washabaugh, "Segmented Field Dielectrometer," U.S. Patent No. 6,486,673, Nov. 26, 2002

Teaching Experience of Markus Zahn

At University of Florida

<u>Term</u>	<u>Subject Number</u>	<u>Title</u>	<u>Role</u>
FT70	EE 332	Circuits II	Lectures
	EE430	Electrical Energy Conversion Laboratory	Lectures, in charge
	EE591	Electromechanical Energy Conversion I	Lectures
WT71	EE592	Electromechanical Energy Conversion II	Lectures
	EE430	Electrical Energy Conversion Laboratory	Lectures, in charge
	EE352	Fields and Waves I	Lectures
ST71	EE591	Electromechanical Energy Conversion I	Lectures
	EE 353	Fields and Waves II	Lectures
	EFA30	Electrical Energy Conversion Lab.	Lectures, in charge
FT71	EE692	Continuum Electromechanics	Lectures
	EE381	Elements of Electric Energy Eng. I	Lectures
	EEA30	Electrical Energy Conversion Lab.	Laboratory, in charge
WT72	EE591	Electromechanical Energy Conversion I	Lectures
	EE382	Elements of Electric Energy Eng. II	Lectures
	EE430	Electrical Energy Conversion Lab.	Laboratory, in charge
ST72	EE592	Electromechanical Energy Conversion II	Lectures
	EE381	Elements of Electric Energy Eng. I	Lectures
FT72	EE333	Circuits III	Lectures
	EE430	Electrical Energy Conversion Laboratory	Laboratory, in charge
	EE498	Supervised Projects	In charge
WT73	EE353	Fields and Waves II	Lectures
	EE430	Electrical Energy Conversion Laboratory	Lectures
	EE498	Special Projects	In charge
ST73	EE352	Fields and Waves I	Lectures
	EE592	Electromechanical Energy Conversion	Lectures
	EE498	Special Projects	In charge
SS73	EE493	Special Projects	In charge
FT73	EE301	Introduction to Electrical Engineering	Lectures
	EE430	Electrical Energy Conversion Laboratory	Laboratory, in charge
	EE685	Advanced Electromechanical Energy Conversion	Lectures
WT74	EE 301	Introduction to Electrical Engineering	Lectures
	EE691	Continuum Electromechanics I	Lectures
	ENT399	Supervised Work Experience	In charge
ST74	EE301	Introduction to Electrical Engineering	Lectures
	EE691	Continuum Electromechanics II	Lectures
	ENT399	Supervised Work Experience	In charge
SS74	EE498	Special Projects	In charge
FT74	EE301	Introduction to Electrical Engineering	Lectures
WT75	EE301	Introduction to Electrical Engineering	Lectures
ST75	EE481	Electromechanical Energy Conversion I	Lectures
	EE685	Advanced Electromechanical Energy Conversion	Lectures
FT75	EE651	Electromagnetic Field Theory & Application	Lectures
WT76	ENT337	Fields and Waves	In charge
	EE652	Electromagnetic Field Theory & Appl.II	Lectures
ST76	EE481	Electrical Machines	Lectures
	EE653	Wave Propagation in Anisotropic Media	Lectures
	EE692	Continuum Electromechanics II	Lectures
FT77	EE352	Electromagnetic Fields and Applications I	Lectures
	EE381	Elements of Electric Energy Conversion I	Lectures
	EE430	Electrical Energy Conversion Laboratory	Laboratory, in charge

WT78	EE353	Electromagnetic Fields and Applications II	Lectures
	EE382	Elements of Electric Energy Engineering II	Lectures
	EE430	Electrical Energy Conversion Laboratory	Laboratory, in charge
ST78	EE352	Electromagnetic Fields and Applications I	Lectures
	EEA30	Electrical Energy Conversion Laboratory	Laboratory, in charge
FT78	EEL3472	Electromagnetic Fields and Applications I	Lectures
	EEL4201L	Electrical Energy Conversion Laboratory	Laboratory, in charge
WT79	EEL3473	Electromagnetic Fields and Applications II	Lectures
	EELA201L	Electrical Energy Conversion Laboratory	Laboratory, in charge
ST79	EEL3472	Electromagnetic Fields and Applications I	Lectures
	EEL6267	Advanced Electromechanical Energy	Laboratory, in charge
FT79	EEL3472	Electromagnetic Fields and Applications I	Lectures
	EEL6267	Advanced Electromechanical Energy Conversion	Lectures
WT80	EEL3473	Electromagnetic Fields and Applications II	Lectures
ST80	EEL3472	Electromagnetic Fields and Applications I	Lectures

At Massachusetts Institute of Technology

FT80	6.601	Fields, Forces, and Motion	Lectures
ST81	6.012	Electronic Devices and Circuits	Recitation (2 sections)
SS81	6.013	Electromagnetic Fields and Energy	Lectures
FT82	6.671	Continuum Electromechanics I	Lectures
FT82	6.672	Continuum Electromechanics II	Lectures
ST83	6.013	Electromagnetic Fields and Energy	Recitation (2 sections)
FT83	6.014	Electrodynamics	Recitation (2 sections)
ST84	6.002	Circuits and Electronics	Recitation (2 sections)
FT84	6.013	Electromagnetic Fields and Energy	Lectures (part)
		Continuum Electromechanics II	Lectures (part)
ST85	6.003	Signals and Systems	Recitation (1 section)
ST86	6.012	Electronic Devices and Circuits	Recitation (2 sections)
ST87	6.973	Dielectric Physics of Polarization, Conduction, and Electrical Breakdown	Lectures
FT87	6.013	Electromagnetic Fields and Energy	Recitation (2 sections)
ST88	6.973	Dielectric Physics of Polarization, Conduction, and Electrical Breakdown	Lectures
FT88	6.013	Electromagnetic Fields and Energy	Lectures
ST89	6.013	Electromagnetic Fields and Energy	Lectures
ST90	6.012	Electronic Devices and Circuits	Recitation (2 sections)
SS90	6.47s	Electrostatic Charging in Power Apparatus and Fuel Transfer Systems	Lectures
FT90	6.013	Electromagnetic Fields and Energy	Lectures
ST91	6.671	Continuum Electromechanics I	Lectures
FT91	6.014	Electrodynamics	Recitation (1 section)
	6.672	Continuum Electrodynamics II	Lectures, in charge
	6.S27	Demonstrations of Electromagnetic Fields and Energy	Lectures
ST92	6.014	Electrodynamics	Recitation (2 sections)
FT93	6.003	Signals and Systems	Recitation (2 sections)
	6.S27	Demonstrations of Electromagnetic Fields and Energy	Lectures
ST 94	6.671	Continuum Electromechanics I	Lectures
FT 94	6.672	Continuum Electromechanics II	Lectures
	6S27	Demonstrations of Electromagnetic Fields and Energy	Lectures
ST 95	6.013	Electromagnetic Fields and Energy	Lectures
FT 95	6S27	Demonstrations of Electromagnetic Fields and Energy	Lectures
ST 96	6.671	Continuum Electromechanics I	Lectures
FT 96	6.013	Electromagnetic Fields and Energy	Lectures
	6S27	Demonstrations of Electromagnetic Fields and Energy	Lectures

ST 97	6.672	Continuum Electromechanics II	Lectures
FT 97	6.012	Electronic Devices and Circuits	Recitation Instructor
	6S27	Demonstrations of Electromagnetic Fields and Energy	Lectures
ST 98	6.671	Continuum Electromechanics I	Lectures
FT 98	6.013	Electromagnetic Fields and Energy	Lectures
	6S27	Demonstrations of Electromagnetic Fields and Energy	Lectures
ST99	6.672	Continuum Electromechanics II	Lectures
FT00	6.013	Electromagnetic Fields and Energy	Lectures
	6S27	Demonstrations of Electromagnetic Fields and Energy	Lectures
ST01	6.672	Continuum Electromechanics II	Lectures
FT01	6.013	Electromagnetic Fields and Energy	Lectures
ST02	6.671	Continuum Electromechanics I	Lectures
FT02	6.013	Electromagnetics and Applications	Recitation Instructor
ST03	6.641	Electromagnetic Fields, Forces, and Motion	Lectures
FT03	6.013	Electromagnetics and Applications	Lectures
ST04	6.641	Electromagnetic Fields, Forces, and Motion	Lectures

Other Teaching Experience

Summer 1979, “Electromagnetic Field Theory,” Exxon Research and Engineering Company, Linden, NJ (4 1/2 hours of lecture per week).

Jan. 1988, “Dielectric Physics of Polarization, Conduction, and Electrical Breakdown,” National Defense Academy, Yokosuka, Japan (16 hours).

Jun. 1990, “Electrostatic Charging in Fuel Transfer Systems,” Ford Motor Company (16 hours).

Jun.1991, “Electrostatic Charging in Fuel Transfer Systems,” General Motors Corp. (16 hours).

Sep. 1992-May 1993, “Continuum Electromechanics,” Centre National de la Recherche Scientifique, Grenoble, France (40 hours).

Mar.1993-May 1993, “Demonstrations of Electromagnetic Fields and Energy,” Joseph Fourier University, Grenoble, France (20 hours).

Nov. 1999-Jan. 2000, “High Voltage Conduction and Breakdown Phenomena in Dielectrics”, Ecole Centrale de Lyon, CNRS, Centre de Genie Electrique de Lyon (CEGELY), Lyon, France.

Publications of Markus Zahn

1. Books

Zahn, M., Electromagnetic Field Theory: A Problem Solving Approach, John Wiley & Sons, 1979 (with Solutions Manual); Spanish translation Interamericana, Mexico, 1983; Polish translation, 1988; republished by Robert E. Krieger Publishing Co., Inc, 1987, 2003.

2. Papers in Refereed Journals (** Outgrowth of supervised student research)

1. Zahn, M., and J.R. Melcher, "Space Charge Dynamics of Liquids," *Physics of Fluids* 15, 1197-1206 and 2082, 1972.
2. Zahn, M., "Dynamics of Stratified Liquids In the Presence of Space Charge," *Physics of Fluids* 15, 1408-1417, 1972.
3. Zahn, M., "Self-excited AC High Voltage Generation Using Water Droplets," *American Journal of Physics* 41, 196-202, 1973.
4. Zahn, M., and J.K. Skinner, "Self-excited Alternating Operation of Coupled Commutator Machines," *Journal of the Franklin Institute* 296, 1-13, 1973.
5. Zahn, M., R.L. Goslin, and L. Wicks, "Self-excited Alternating High Voltage Generation Using a Modified Electrostatic Influence Machine," *American Journal of Physics* 42, 289-294, 1974.
6. Zahn, M., and R.J. Sojka, "Space Charge Dynamics of Viscous Liquids," *Physics of Fluids* 17, 490-492, 1974. **
7. Zahn, M., "Space Charge Coupled Interfacial Waves," *Physics of Fluids* 17, 343-352, 1974.
8. Cassidy, E.C., R.E. Hebner, M. Zahn, and R.J. Sojka "Kerr Effect Studies of An Insulating Liquid Under Varied High Voltage Conditions," *IEEE Transactions on Electrical Insulation* EI-9, 43-56, 1974. **
9. Zahn, M., C.F. Tsang, and S.C. Pao, "Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction," *Journal of Applied Physics* 45, 2432-2440, 1974. **
10. Zahn, M., "Surface Coupled Interfacial Waves for Self-Gravitating Systems," *Physics of Fluids* 17, 2130-2132, 1974.
11. Zahn, M., and S.C. Pao, "Effects of Step Changes in Excitation from a Steady State on the Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction. I. Step Changes in Current," *Journal of Electrostatics* 1, 235-248, 1975. **
12. Zahn, M., and S.C. Pao, "Effects of Step Changes in Excitation from a Steady State on the Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction. II. Step Changes in Voltage," *Journal of Electrostatics* 1, 249-264, 1975. **
13. Zahn, M., S.C. Pao, and C.F. Tsang, "Effects of Excitation Risetime and Charge Injection Conditions On the Transient Field and Charge Behavior for Unipolar Ion Conduction," *Journal of Electrostatics* 2, 59-78, 1976. **
14. Zahn, M., "On the Gravitational Instability of an Infinite Homogeneous Medium," *American Journal of Physics* 44, 29-31, 1976.
15. Zahn, M., "Drift Dominated Conduction Within An Ohmic Medium," *Journal of Applied Physics*, Vol. 47, pp. 3122-3126, 1976.
16. Zahn, M., "Point Charge Between Two Parallel Grounded Planes," *American Journal of Physics* 44, 1132-1134, 1976.
17. Zahn, M., "Transient Drift Dominated Unipolar Conduction Between Concentric Cylinders and Spheres," *IEEE Transactions on Electrical Insulation*, EI-11, 150-157, 1976.
18. Zahn, M., and H. Chatelon, "Charge Injection Between Concentric Cylindrical Electrodes, *Journal of Applied Physics* Vol. 48, pp. 1797-1805, 1977. **
19. Zahn, M., "Transient Drift Dominated Conduction In Dielectrics," *IEEE Transactions on Electrical Insulation* EI-12, 176-190, 1977.
20. Zahn, M., "Impact Charging of an Isolated Cylinder with Skewed Field and Flow," *Journal of Electrostatics* 5, 85-99, Sept. 1978.
21. Zahn, M., and R.E. Rosensweig, "Stability of Magnetic Fluid Penetration Through a Porous Medium with Uniform Magnetic Field Oblique to the Interface," *IEEE Transactions on Magnetics* MAG-16, 275-282, March 1980.
22. Zahn, M., and K.E. Shenton, Eds., "Magnetic Fluids Bibliography," *IEEE Transactions on Magnetics* MAG-16, 387-415, March 1980.
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32. Zahn, M., "Conduction and Breakdown in Dielectric Liquids", in the Encyclopedia of Electrical and Electronic Engineering, John Wiley & Sons, Inc., Vol. 4, pp. 89-123, 1999.
33. Du, Y., B. Lesieutre, and M. Zahn, "Measurements and Modeling of Moisture Dynamics in Transformer Insulation Using Interdigital Dielectrometry Sensors," EPRI Final Report TR-113575, January 2000. **
34. Committee for Mine Warfare Assessment, Naval Studies Board, "Naval Mine Warfare, Operational and Technical Challenges for Naval Forces," National Academy Press, Washington, D.C., 2001.
35. Washabaugh, A.P., and M. Zahn, "Dielectrometry Sensor Overview for Non-Destructive Measurements," The American Society for Nondestructive Testing, Inc., *Nondestructive Testing Handbook: Electromagnetic Methods*, third edition, 2003.
36. Rinaldi, C., T. Franklin, M. Zahn, and T. Cader, "Magnetic Fluids: Applications of Fluid Suspensions of Magnetic Nanoparticles," in Marcel Dekker Encyclopedia of Nanoscience and Nanotechnology, 2003.

5. Internal Memoranda and Progress Reports

1. Zahn, M., "Pulse Compression Using Bragg Scattering of Light by Ultrasonic Waves," Technical Report 20, Microwave and Quantum Magnetics Group, Department of Electrical Engineering and Center for Materials Science and Engineering, Massachusetts Institute of Technology, 1968.
2. Kurzweg, U.H., M. Zahn, and R.E. Wyatt, "Integral Methods for the Analysis of Semiconductor Devices," Chapter 5 of ARPA Interim Report Computer Aided Engineering of Semiconductor Integrated Circuits, prepared by D.P. Kennedy, April 1976.
3. Kurzweg, U.H., M. Zahn, A. Gregalot and R.E. Wyatt, "An Integral Equation-Relaxation Procedure for the Determination of Equilibrium Potentials in Semiconductor Devices," in ARPA Final Report Computer Aided Engineering of Semiconductor Integrated Circuits, prepared by D.P. Kennedy, August 1977.

6. Invited Lectures

1. July 1975, "Kerr Electro-optic Field Mapping Measurements in Dielectrics," CNRS, Grenoble, France; also Swiss Federal Institute of Technology, High Voltage Lab, Zurich, Switzerland.
2. July 1976, "Electric Fields in Moving Media," Exxon Research and Engineering Company, Linden, NJ.
3. July 1978, "High Voltage Conduction in Breakdown Phenomena in Dielectrics," Hahn-Meitner Institute, Berlin, Germany.
4. January 1980, "Electric Fields and Moving Media," Purdue University, West Lafayette, IN.
5. January 1980, "Magnetic Fluids," Dow Chemical Company, Midland, MI.
6. February 1980, "Kerr Electro-optic Field Mapping Measurements," Drexel University, Philadelphia, PA. Also Gordon Research Conference on Dielectric Phenomena, Holderness School, Plymouth, NH, August 1980; and National Bureau of Standards, Gaithersburg, MD, December 1981.

7. January 1982, "Electrodynamics of Fluidized Beds," Dow Chemical Company, Wayland, MA.
8. March 1982, "Electrokinetics of Dielectric Liquids," Exxon Research and Engineering Company, Linden, NJ.
9. August 1982, "Electrets," Dow Chemical Company, Midland, MI.
10. November 1983, "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetizable Fluids," Philips Laboratories, Briarcliff Manor, NY.
11. December 1983, "Ferrohydrodynamics," Ferrofluidics Corp., Nashua, NH.
12. January 1984, "Kerr Electro-optic Field Mapping Measurements and Charge Transport Analysis in Dielectrics," IREQ, Hydro-Quebec Research Institute, Varennes, Quebec, Canada.
13. March 1984, "Electro-optic Field Mapping Measurements and Space Charge Transport in Highly Purified Water," State University of New York at Buffalo.
14. March 1984, "Electro- and Ferro-hydrodynamic Interactions with Fluids," Polaroid Corp., Waltham, MA.
15. March 1984, "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetizable Fluids," Sigma Xi, Hanscom Chapter, Bedford, MA. Also Bolt, Beranek and Newman, Cambridge, MA, June 1984.
16. June 1984, "Electro-optic Field and Space Charge Mapping Measurements in Highly Purified Water," Sandia National Laboratory, Albuquerque, NM; also Los Alamos National Laboratory, Los Alamos, NM.
17. July 1984, "Electro-optic Field and Space Charge Mapping Measurements and Charge Transport Analysis in High Voltage Stressed Liquid and Solid Dielectrics," CISE, Milan, Italy.
18. August 1984, "Electro-optic Field Mapping Measurements and Charge Transport Analysis in Highly Purified Water and Water/Ethylene Glycol Mixtures," Gordon Research Conference on Dielectric Phenomena Holderness School, Plymouth, NH.
19. September 1984, "Electrokinetic Phenomena in Hydrocarbon Liquids" (with S. Gasworth), MIT ILP Symposium "Emerging Applications of Continuum Electromechanics," Cambridge, MA.
20. February 1985, "Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Dielectrics," Maxwell Laboratories, Inc., San Diego, CA.
21. February 1985, "Charge Injection, Transport, Energy Storage and Dissipation in Highly Purified Water and Water/Ethylene Glycol Mixtures for Use in Pulse Power Systems," 1985 High Voltage Workshop sponsored by the IEEE Electron Devices Society, Naval Postgraduate School, Monterey, CA.
22. August 1985, "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetic Fluids," Westinghouse Research and Development Center, Pittsburgh, PA.
23. September-October 1985: "Charge Injection, Transport, Energy Storage, and Dissipation in Dielectrics"; "Electromagnetic Fields and Forces on Materials," Yamanashi University, Kofu, Japan. "Electrification in Flowing Dielectric Liquids," Waseda University, Tokyo, Japan. "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetizable Fluids," Tohoku University, Sendai, Japan. "Electro-optic Field Mapping Measurements and Charge Transport Analysis in High Voltage Stressed Dielectrics" and "Charge Injection, Transport, Energy Storage, and Dissipation in High Voltage Stressed Dielectrics," 18th Symposium on Electrical Insulating Materials, Tokyo, Japan. "Charge Injection, Transport, Energy Storage, and Dissipation in Dielectrics" and "Electrical Charge Phenomena in Dielectrics and Their Applications," Japan Institute of Electrical Engineers, Electrical Insulation Group, Osaka, Japan. "Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Dielectrics"; "Dielectric Requirements in Pulsed Power Systems"; "Charge Injection, Transport, Energy Storage, and Dissipation in Dielectrics" and "The Electrical Engineering Curriculum at MIT," Musashi Institute of Technology, Tokyo, Japan.
24. October 1985, "Fluid Mechanics of Magnetizable Liquids," MIT Department of Chemical Engineering, Cambridge, MA.
25. July 1986, "Magnetic Field Gradient Effects on Magnetic Fluid Stabilization," 4th International Conference on Magnetic Fluids, Tokyo and Sendai, Japan.
26. August 1986, "Kerr Electro-optic Field Mapping Measurements in Dielectrics," Gordon Research Conference on Dielectric Phenomena, Holderness, NH.
27. October 1986, "Electric Field Effects on the Equilibrium, Stabilization, and Small Signal Response of Electrofluidized Beds," (with Alex Moissis), 1986 SIAM Workshop on Multiphase Flow, Leesburg, VA.
28. July 1987, "Space Charge Effects in Dielectric Liquids," NATO Advanced Study Institute, Sintra, Portugal.
29. August 1987, "Electric and Magnetic Forces on Fluid Flows Through Porous Media and Hele-Shaw Cells," 1987 Fine Particle Society Meeting, Boston, MA.
30. August 1987, "Boundary Value Problems in Electrofluidized and Magnetically Stabilized Beds," 1987 Fine Particle Society Meeting, Boston, MA.
31. January 1988, "Electro- and Ferro-hydrodynamic Interactions with Charged, Polarizable, and Magnetizable Materials," National Bureau of Standards Colloquium, Gaithersburg, MD.

32. August 1988, "Electro-optic Field Mapping Measurements in Electron Beam Irradiated Polymers," Gordon Research Conference on Dielectric Phenomena, Holderness, NH.
33. October 1989, "Kerr Electro-Optic Measurements in High Voltage Stressed and Electron Irradiated Polymers," University of Virginia Materials Science Colloquia, Charlottesville, VA.
34. September 1989, "Kerr Electro-Optic Field and Charge Mapping Measurements in Dielectric Gases, Liquids and Solids," Sixth International Symposium on High Voltage Engineering, New Orleans, LA.
35. September 1989, "Ferrohydrodynamic Torque-Driven Flows," Fifth International Conference on Magnetic Fluids, Riga, USSR.
36. May 1990, "Experimental Demonstrations for Teaching Electromagnetic Fluids and Energy," IEEE Antennas and Propagation Society Symposium, Dallas, TX.
37. May 1990, "Selected Demonstrations from Electromagnetic Fields and Energy" (Videotapes), Workshop on Computer Applications in Electromagnetic Education, Dallas, TX.
38. September 1990, "Kerr Electro-Optic Field Mapping Measurements in Electron Beam Irradiated Dielectrics," XIVth International Symposium on Discharges and Electrical Insulation in Vacuum, Santa Fe, NM.
39. October 1990, "Electric and Magnetic Field Interactions with Polarizable and Magnetizable Fluids," Carnegie Mellon University, Department of Electrical and Computer Engineering, Pittsburgh, PA.
40. November 1990, "Seeing Electric Fields," EECS Colloquium Series, MIT, Cambridge, MA.
41. August 1991, "Flow Electrification Phenomena," Poitiers University, Poitiers, France.
42. September 1991, "Kerr Electro-Optic Field Mapping Measurements in Dielectrics," Laboratoire D'Electrostatique et de Matériaux Dielectriques, Centre National de la Recherche Scientifique, Grenoble, France.
43. September 1991, "Sensors Used for Monitoring Transformers," Electricite de France, Clamart, France.
44. November 1992, "Kerr Electro-Optic Field and Charge Mapping Measurements in Electron Beam Irradiated Dielectrics," French Atomic Energy Center, Bordeaux, France.
45. March 1993, "The Absolute Charge Sensor and Couette Charger for Flow Electrification Measurements," Poitiers University, Poitiers, France.
46. March 1993, "Demonstrations of Electromagnetic Fields and Energy," Tel Aviv University, Tel Aviv, Israel.
47. May 1993, "Kerr Electro-Optic Field and Charge Mapping Measurements in High Voltage Stressed and Electron Beam Irradiated Dielectrics," Ecole Centrale de Lyon, Lyon, France.
48. May 1993. "Flow Electrification Phenomena in Transformers." ABB, Ludvika Sweden; also Jeumont-Schneider Transformer Facility, Lyon, France.
49. May 1993, "Kerr Electro-Optic Measurements in Transformer Oil," ABB, Vasteras, Sweden.
50. May 1993, "High Voltage Conduction and Breakdown Phenomena in Dielectrics," Strathclyde University, Glasgow, Scotland.
51. Oct. 24, 1995, "Electrohydrodynamic and Ferrohydrodynamic Interactions with Electrically Charged, Dielectric, and Magnetizable Liquids," Seminar Series of the Benjamin Levich Institute for Physico-Chemical Hydrodynamics, City College of CUNY.
52. July, 1996, "Flow Electrification Phenomena," Laboratoire de Physique et Mécanique des Fluides, Poitiers University, Poitiers, France.
53. Oct. 16, 1997, "Magnetizable Fluid Behavior With Effective Positive, Zero, or Negative Dynamic Viscosity: A Study of Non-Symmetric Stress Tensors," Symposium on Recent Trends in Science and Technology of Magnetic Fluids, India.
54. Oct. 26, 1998, Whitehead Memorial Lecture, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics," 1998 Conference on Electrical Insulation and Dielectric Phenomena, Atlanta, GA.
55. July-August, 1999, "Kerr Electro-optic Measurements" ; "Flow Electrification In Transformers" ; "Electrohydrodynamic and Ferrohydrodynamic Interactions with Electrically Charged, Dielectric, and Magnetizable Liquids," Kyushu Institute of Technology, Kyushu, Japan; Waseda University, Tokyo, Japan; Tokyo Electric Power Company, Tokyo, Japan; and Toshiba Corp., Kawasaki, Japan.
56. November 1999 – January 2000, Electrohydrodynamic and Ferrohydrodynamic Interactions with Electrically Charged Dielectric and Magnetizable Liquids; Kerr Electro-Optic Measurements of Electric Field and Space Charge Distributions in High Field Stressed Gaseous, Liquid, and Solid Dielectrics; Flow Electrification Analysis and Experiments; Dielectrometry Sensors for Non-Destructive Materials Evaluation; Charge Transport Modeling in Dielectrics, Ecole Centrale de Lyon and Centre de Genie Electrique de Lyon (CEGELY), Lyon, France.

57. March 2000 – May 2000, “Charge Transport Modeling in Dielectrics”; “Electrohydrodynamic and Ferrohydrodynamic Interactions with Electrically Charged, Dielectric, and Magnetizable Liquids,” Ecole Supérieure de Physique et Chimie Industrielle, Paris, France.
58. May 2000, “Measurements and Modeling of Moisture Dynamics in Transformer Insulation Using Interdigital Dielectrometry Sensors,” Sintef, Trondheim, Norway, and Royal Institute of Technology, Stockholm, Sweden.
59. October 2, 2000, “Theory and Applications of Magnetic Fluids (with R.E. Rosensweig and K. Raj), M.I.T. EECS Fall Semester Colloquium Series.
60. October 20, 2000, “The Magic of Magnetic Liquids,” M.I.T. Parents Weekend Experimental Study Group (ESG).
61. November 21, 2000, “The Magic of Magnetic Liquids,” Prof. Jim Livingston’s Freshman Seminar “The Magic of Magnetism.”
62. Jan. 18, 2001, “Electrostatics of Flowing Fuel Systems,” Renault Research Center, Guyancourt, France.
63. Jan. 19, 2001, “Electrostatics of Flowing Fuel Systems,” PSA Peugeot Citroen, Velizy-Villacoublay, France.
64. Jan. 25, 2001, “Electrohydrodynamic and Ferrohydrodynamic Interactions with Electrically Charged, Dielectric, and Magnetizable Liquids,” Laboratoire d’Etudes Aérodynamique, Université de Poitiers, Poitiers, France.
65. Jan. 26, 2001, “Moisture Dynamics in Transformers,” Agoria and Pauwels, Brussels and Mechelen, Belgium.
66. Feb. 20, 2001, “Continuum Electromechanics of Electrohydrodynamic and Ferrohydrodynamic Interactions with Electrically Charged, Dielectric and Magnetizable Liquids,” MIT Fluid Mechanics Laboratory Seminars.
67. April 6, 2001, “Electrohydrodynamic Interactions with Electrically Charged, Dielectric, and Magnetizable Liquids,” 3M Lecture at the Rheology Research Center, University of Wisconsin, Madison, Wisconsin.
68. June 28, 2001, “Fluid Flows and Instabilities Driven by Electromagnetic Forces”, Laboratoire d’Etudes Aérodynamiques, Université de Poitiers, Poitiers, France.
69. July 12, 2001, “Fluid Measurements Using Optical, Electrical, and Electromechanical Methodologies”, Laboratoire d’Etudes Aérodynamiques, Université de Poitiers, Poitiers, France.
70. Sept. 5, 2001, “Kerr Electro-Optic Field and Charge Mapping Measurement in High Voltage Stressed and Electron Beam Irradiated Transparent Polymers,” Keynote Lecture at Polymers in the Third Millennium, Sept. 2-6, 2001 at Université Montpellier II, Montpellier, France.
71. Nov. 26, 2001, “Recent Developments in the Modeling and Applications of Spatially Periodic Dielectric and Magnetic Quasistatic Sensors,” (with Y. Sheiretov), Material Research Society 2001, Boston, MA.
72. June 27, 2002, “Fluid Flows in Alternating and Rotating Electromagnetic Fields,” Symposium on Electrohydrodynamics at the 14th US National Congress of Theoretical and Applied Mechanics, June 27-28, 2002, Blacksburg, VA.
73. Oct. 9, 2002, “Ferrofluid Flows in Alternating and Rotating Electromagnetic Fields,” Department of Mechanical, Materials, and Aerospace Engineering, Illinois Institute of Technology, Chicago, Illinois.
74. Jun. 27, 2003, James R. Melcher Memorial Lecture, “Electrohydrodynamics and Reflections on the work of Prof. Melcher,” First Joint Meeting of the IEEE Industry Applications Society – Electrostatic Processes Committee and the Electrostatics Society of America (ESA), June 24-27, 2003, Little Rock, AR.
75. Aug. 6, 2003, “Molecular Engineering: Fundamental Contributions of Arthur von Hippel to Electroceramics,” International Conference on Electroceramics, MIT, Cambridge, MA, 3-7 August, 2003.
76. Oct. 27, 2003, “The Nanoscience and Nanotechnology of Magnetic Nanoparticles and Ferrofluids,” 6th Annual BCC Conference Nanoparticles 2003, Cambridge, MA, Oct. 27-28, 2003.

Theses Supervised by Markus Zahn

SUMMARY	<u>AT MIT</u>		
	<u>Total</u>	<u>Completed</u>	<u>In Progress</u>
Advanced Undergraduate Project (AUP)	1	1	
S.B	33	33	
S.M. and M. Eng.	34	27	7
Engineers	2	2	
Doctoral			
As Supervisor:	13	11	2
As Reader:	15	12	3

Advanced Undergraduate Project (AUP)

1. Schubert, V., "Ferrofluid Volume and Surface Flow Effects in a Uniform Rotating Magnetic Field," May, 2002.

S. B. Theses

1. Quader, K.N., "Space Charge Effects in Dielectric Liquids," June 1982.
2. Craigmile, D.F., "Electric Field and Charge Transport Analysis and Measurements Using Coaxial Cylindrical Electrodes," May 1983.
3. Lupichuk, A.G., "Electric Field and Charge Transport Analysis and Measurement Using Parallel Plate Electrodes," May 1983.
4. Nguyen, L., "Electrification Due to Forced Convection in Highly Insulating Liquids," May 1983.
5. Tucker, J.H., "Computerized Data Acquisition and Processing for High Voltage Experiments," August 1983.
6. Ericson, D.W., "Kerr Electro-optic Field Mapping Measurements in Ethylene Carbonate," May 1984.
7. Gallon, D.W., "Kerr Electro-optic Field Mapping Measurements in Polymer Solids and Transformer Oil," May 1984.
8. Khorshidi, R., "Electric Field Effect on Solid Phase Viscosity in Fluidized Beds," May 1984.
9. Carreras, R.F., "Streaming Current Measurements in Water," May 1985.
10. Huang, J., "Kerr Effect Measurements of Highly Purified Water in a Coaxial Cylindrical Structure, May 1985.
11. Medina, C.L., "Effects of Electrode Surface Coatings on High Voltage Stressed Purified Water," May 1986.
12. Morehead, J., "Kerr Electro-optic Field Mapping Measurements Using Coaxial Electrodes," May 1986.
13. Weiss, L.L., "Hydrophilic and Hydrophobic Coatings on Electrodes: Effects on Charge Injection," May 1986.
14. Wegerer II. W.J., "A Program for Solving and Plotting Potential Equations and Their Associated E-Fields," May 1987.
15. Brennan III, J.F., "Image Processing of Kerr Electro-optical Field Mapping Measurements," May 1987.
16. Denesuk, M., "Thermal and Electrical Birefringence and Electrical Breakdown in PMMA," May 1987.
17. Ortega, R.B., "Fringing Field Effects in Short Circuited Volume Charged Dielectrics," May 1987.
18. Kardon, S.M., "Electrochemical Effects in Highly Purified Water," May 1987.
19. Traudt, M.J., "Kerr Electro-optic Field and Space Charge Mapping in Electron Beam Irradiated Dielectrics," May 1987.
20. Blauvelt, T., "Effects of Non-uniform Electric Fields on Birefringence Measurements," June 1988.
21. Chan, J., "Fractal Models of Electrical Breakdown," June 1988.
22. Reyes, H., "Computer Interfacing and Processing of Oscilloscope Waveforms," June 1988.
23. Lal, S.R., "Numerical Solutions and Computer Graphics Display of Electromagnetic Field Theory Problems," September 1988.
24. Sikder, R.R., "A Study of Traveling Waves of High Voltage Stressed Water," June 1989.
25. Cadogan, S., "Kerr Electro-Optic Field Mapping of High Voltage Stressed Water," June 1990.

26. Misra, D., "Ferrohydrodynamic Pumping Using Traveling Wave Magnetic Fields," June 1990.
27. Kalt, J.A., "Absolute Charge Sensor Measurements of Flow Electrification in a Couette Charger," June 1990.
28. Agarwala, V., "Kerr Electro-Optic Field Mapping Measurements in Dielectric Liquids," June 1991.
29. Raghavan, R., "A Flow Loop Facility for Flow Electrification Measurements," June 1992.
30. Wainman, P.N., "Traveling Wave Pumping of Ferrofluids," June 1992.
31. Yoshi, J.M., "Kerr Electro-Optic Field and Charge Measurements in High Voltage Stressed Dielectrics," June 1992.
32. Lou, J.W., "Conduction and Electrification in Liquid Dielectrics," June 1993.
33. Yates, A.M., "Coating Property Measurement Using Multiple Meandering Winding Magnetometer," June 1993.

S. M. and M. Eng. Theses

1. Hegi, M., "Effect of Fluid Flow on the Electric Field Distribution in Charged Dielectrics," June 1982.
2. Strutt, D.B., "A New Nondestructive Evaluation Technique for Sandwich Structures with Polymeric Cores," June 1982 (Mechanical Engineering Department).
3. LaGasse, M.J., "Electro-optic Field Mapping Measurements in High Voltage Stressed Water," August 1985.
4. Moissis, A.A., "Electrofluidized Bed Responses to Small Signal Excitations," December 1986.
5. Antis, L.L., "Bipolar Conduction in High Voltage Stressed Dielectrics," June 1987.
6. Lyon, D.J., "Couette Flow Measurement of Equilibrium and Energization Charging in Transformer Insulation," July 1987 (co-supervised with J.R. Melcher).
7. Wang, T.D., "Kerr Electro-optic Field Mapping Measurements in High Voltage Stressed Polymer Dielectrics," June 1987.
8. Carreras, R.F., "Electro-optic Field Mapping Measurements in Gases," January 1988.
9. Sheen, D., "Kerr Electro-optic Field Mapping Measurements in Transformer Oil/Paper Systems," September 1988.
10. Morin II, A.J., "An Absolute Charge Sensor for Fluid Electrification Measurements," September 1989.
11. Washabaugh, A., "Traveling Wave Pumping of Dielectric Liquids," February 1989.
12. Brennan III, J.F., "Kerr Electro-Optic Measurements in Polymers," June 1989.
13. Jansen, E., "Bipolar Conduction Models for Dielectric Electrification," February 1990.
14. Zaima, E., "Kerr Electro-Optic Field Measurements of the Effects of Moisture and Temperature in Transformer Oil/Pressboard Insulation," June 1990.
15. Lee, H.S., "Electrochemical Effects on High Voltage Stressed Water Using Kerr Electro-Optic Field Mapping," September 1990.
16. Beedle, E.A., "Modeling of Charge Deposition Profiles in Electron Beam Irradiated Dielectrics," September 1992.
17. Brown, D.R., "Kerr Electro-Optic Field and Charge Measurements Near Solid/Liquid Interfaces," February 1993.
18. Sheiretov, Y., "Dielectric Properties of Oil Impregnated Pressboard as a Function of Temperature and Moisture," May 1994.
19. Schlicker, D.E., "Flow Electrification in Aged Transformer Oils," September 1996.
20. Pioch, L., "Ferrofluid Flow & Spin Profiles for Positive and Negative Electric Viscosities," May 1997.
21. Lu, A., "Model Based Landmine Detection Using Dielectrometry," May 1999.
22. Canaday, T., "Ferrofluid Duct Flow in Alternating and Traveling Wave Magnetic Fields," May 1999.
23. Du, Y., "Moisture and Temperature Effects on the Dielectric Spectrum of Transformer Insulation Materials," May 1999.
24. Yaghmai, R., "Kerr Electro-optic Field Measurements Using a CCD Area Detector," May 2001.
25. Wu, A., "Investigation of Electric Arcs in 42 Volt Automotive Systems," May, 2001.
26. Wagner, T., "Field Distributions Within the Human Cortex Induced by Transcranial Magnetic Stimulation," May 2001
27. Rosenthal, A., "Ferrofluid Flow and Torque Measurements in Rotating Magnetic Fields," June 2002.
28. McPhee, R., "Optimization of Transmit/Receive Array Topology in 3D Acoustic Imaging," December 2002
29. Franklin, T., "Ferrofluid Flow Phenomena," May 2003.
30. Luis, J., "Detection of Electric Arcs in 42-Volt Automotive Systems," May 2003.
31. Amin, M.S., "Advanced Faraday Cage Measurements of Space Charge," expected May 2004.
32. Sears, J., "Detection and Identification of Dangerous Materials for Security Applications," August 2003.
33. Rhodes, S., "Magnetic Fluid Flow Phenomena in DC and Rotating Magnetic Fields," February 2004.
34. Perez, J., "Ferrofluid Phase Transitions," expected December 2005.

Engineers Theses

1. Voldman, S.H., "Charge Transport in High Voltage Stressed Water/Glycol Capacitors," June 1982 (also used for S.M. degree).
2. Du, Y., "Measurements and Modeling of Moisture Diffusion Processes in Transformer Insulation Using Interdigital Dielectrometry Sensors," May 1999.

Doctoral Theses, Supervisor

1. Rhee, S.W., "Fluid Dynamics and Stability of Fluidized Particle System with Electric Force," June 1984 (Chemical Engineering Department).
2. Gasworth, S.M., "Electrification by Liquid Dielectric Flow," February 1985 (co-supervised with J.R. Melcher).
3. Rhoads, K.G., "Electro-optic Field and Charge Mapping using Computerized Imaging," June 1989.
4. von Guggenberg, P., "Applications of Interdigital Dielectrometry to Moisture and Double Layer Measurements in Transform Insulation," June 1993.
5. Walrath, K., "Evanescent Wave Spectroscopy for Detection of Water and Water Treeing in Polymers," September 1995.
6. Washabaugh, A.P., "Flow Induced Electrification of Liquid Insulated Systems," Dec. 1994.
7. Mamishev, A.V., "Interdigital Dielectrometry Sensor Design and Parameter Estimation Algorithms for Non-Destructive Materials Evaluation," May 1999.
8. Üstündag, A., "Kerr Electro-Optic Tomography for Determination of Nonuniform Electric Field Distributions in Dielectrics," May 1999.
9. Du, Y., "Measurements and Modeling of Moisture Diffusion Processes in Transformer Insulation Using Interdigital Dielectrometry Sensors," May, 1999.
10. Gung, T.J., "Kerr Electro-Optic Measurements and Nonuniform Electric Field Reconstructions," May 1999.
11. Sheiretov, Y., "Deep Penetration Magnetoquasistatic Sensors," May 2001.
12. Schlicker, D.E., "Imaging of Absolute Electrical Properties Using Electroquasistatic and Magnetoquasistatic Sensor Arrays," expected June, 2004.
13. He, X., "Ferrohydrodynamics," expected May, 2005.
14. Elborai, S., "Magnetic Field Effects on Ferrofluid Meniscus Shape," expected May, 2005.

Doctoral Theses, Reader

1. Tse, M.K., "A Nondestructive Technique for Detection and Characterization of Flows In Polymeric Materials," January 1981 (Mechanical Engineering Department).
2. Allison, B.T., "Non-Destructive Evaluation of Polymeric Materials," June 1984 (Mechanical Engineering Department).
3. Ehrlich, R.M., "AC Electrostatic Precipitation," June 1984.
4. Inkpen, S.L., "Discoloration Mechanisms in Electrostatic Spraying of Metallic Paints," June 1986.
5. Nussbaum, J.H., "Electric Field Control of Polyelectrolyte Membrane Swelling," September 1986.
6. Kim, Y.J., "Biophysical and Biochemical Analysis of Articular Cartilage Under Uniaxial Unconfined Compression," September 1992.
7. Schwartz, E., "Measurement of the Surface Tension of Electromagnetically-Levitated Droplets In Microgravity," February 1995.
8. Jones, L.A., "Droplet Control in Gas Metal Arc Welding," October 1995.
9. Kim, W., "Design and Analysis Framework for Linear Permanent Magnet Machines," 1997.
10. Ernstmeyer, J., "Lightning-excited, Quasi-electrostatic Effects in the Lower Ionosphere," 1997.
11. Farhoud, Maya, "Fabrication and Characterization of Nano-Structured Magnetic Particles for Applications in Data Storage, February 2001.
12. Rinaldi-Ramos, C., "Continuum Modeling of Polarizable Systems," June 2002.
13. Lozano, P., "Colloid Thrusters For Micro and Nano-Satellites," February 2003.
14. Velasquez, L., "The Design, Fabrication, and Testing of a Micro-Colloid Thruster Array," expected June 2003.
15. Gonzalez, L., "Migration of Submicron Nanomagnetic Particles in Magnetic Fluids Under Time/Space Varying Magnetic Fields," expected June 2004.

Theses Supervised by Markus Zahn

At University of Florida

SUMMARY

	<u>Total</u>	<u>Completed</u>	<u>In Progress</u>
S.B.			
S.M.			
As Supervisor:	8	8	
As Reader:	7	7	
Engineers			
Doctoral			
As Supervisor:	2	2	
As Reader:	2	2	

S.M. Theses, Supervisor

1. Sojka, Richard J., "Electrohydrodynamic Internal Waves," June 1972.
2. Tsang, Cheung Fung, "Transient Electric Field and Space Charge Behavior for Bipolar Ion Conduction Under Current and Voltage Excitations," May 1974.
3. Pao, Shing Chong, "Drift Dominated Conduction Mechanisms in Dielectrics," August 1974.
4. Beaudet, William R., "Electro-Optic Measurements in a Birefringent Dielectric Medium," August 1975.
5. Chatelon, Helene, "Unipolar and Bipolar Transient Drift Dominated Conduction," December 1976.
6. Davis, Dennis W., "Transient Drift-Dominated Unipolar Conduction," March 1978.
7. McGuire, Thomas J., "Non-Uniform Electric Field Measurements of Space Charge in Dielectric Liquids Using the Kerr Electro-Optic Effect," March 1979.
8. Choi, Tae In, "Ferrofluid Motion In a Rotating Magnetic Field," August 1980.

S.M. Theses, Reader

1. Liebman, Henry F., "DC Inductance Bridge for Measuring Unified Machine Theory Parameters," June 1972.
2. Degler, H. Edward, Jr., "Automatic Rapid Eye Measurement Detection," November 1973.
3. Dassa Eli, "A Study of Striated Muscle Impedance in Situ," May 1974.
4. Collier, Donald C., "An Experimental Phased Array Radar Antenna," December 1974.
5. Tiller, James A., "Electric and Magnetic Field Statistics for Close Lightning Return Strokes," December 1975.
6. Heaney, James A., "A Theoretical Analysis of Electromagnetic Radiation from the Sun as Applied to Electromagnetic Wave Energy Converter," August 1977.
7. Kirmaci, Ismail, "Scattering of Light from Non-Spherical Dielectric Particles: Spheroidal Cladosporiums (2um), Cubical NaCl Crystals (4um)," March 1978.

Doctoral Theses, Supervisor

1. Sojka Richard J., "High Field Drift Dominated Bipolar Conduction in Dielectrics," June 1977.
2. Stanaland, Walter, "Bipolar Conduction with Alternating Excitations," August 1980.

Doctoral Theses, Reader

1. Ma, Han-Rei, "Magnetization Fields in Thin Film Permalloy Bar Arrays," March 1976.
2. Majumdar, Arun K., "Modeling and Identification of the Nerve Excitation Phenomena," March 1976.