

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 24, 2012

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; flow electrification and spark discharges in automotive systems; micro/nano-electromechanical systems (MEMS/NEMS); web based demonstrations and animations for the enriched teaching of electromagnetism; magnetic fluids for micro/nanofluidics and biomedical applications.

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

Alan J. Grodzinsky, Professor
Jeffrey H. Lang, Professor

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

David L. Trumper, Professor (Mechanical Engineering)
Alan Hatton, Professor (Chemical 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, Laboratoire D'Electrostatique et Materiaux Dielectriques (LEMD), 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	Visiting Professor	Jul. 1996; Jan. 2001; Jul. 2001	
Laboratoire D'Etudes Aerodynamiques	Visiting Professor	July 1999	
Kyushu Institute of Technology, EE Dept.			
Kitakyushu, Japan			
Ecole Centrale de Lyon	Visiting Researcher	Nov. 1999	Jan. 2000
Centre National de la Recherche Scientifique,		Jan. 1, 2010	Jan. 31, 2010
Lyon, France (CEGELY)			
Ecole Superieure de Physique et Chimie	Visiting Researcher,	March 2000	June 2000
Industrielle, Paris, France	Paris Sciences Scholar 2000		
Universite de Nice, Laboratoire de Physique	Visiting Researcher	Feb. 17, 2007	Mar. 16, 2007
de la Matière Condensée, Centre National			
de la Recherche Scientifique			
Royal Academy of Engineering	Distinguished Visiting Fellow`	Dec. 8, 2007	Dec. 21, 2007
University of Manchester, England			
Universiti Sains Malaysia School of Electrical and	Visiting Professor	May 25, 2008	May 30, 2008
Electronic Engineering, Penang, Malaysia			
Tsinghua University, Beijing, China	Visiting Professor	Jan. 10, 2009	Jan. 17, 2009
Department of Electrical Engineering,			
High Voltage Laboratory			
Chongqing University, Chongqing, China	Visiting Professor	July 24, 2010	July 31, 2010
High Voltage Laboratory	Visiting Professor	June 11, 2011	June 17, 2011

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	Dec. 2003
Thomas and Gerd Perkins Professorship in Electrical Engineering	Sept. 2000	Aug. 2015

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	Dec. 2003
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	Dec. 2001
Amtrak High Speed Rail Group	Aug. 1998	Sep. 1998
TND Service, Inc.	Sep. 1998	Mar. 2000
Avo-Multi-Amp Corp.	Oct. 1998	Dec. 2003
Woods Industries	Dec. 1998	Aug. 2001
Draper Laboratory	Aug. 1999	Aug. 2000
Profiles Technology	Dec. 2001	Dec. 2002
Sionex Corp.	Jan. 2002	2010
General Electric Global Research	Jul. 2002	Dec. 2005
Calgon Carbon Co.	Feb. 2002	Dec. 2005
Ford Motor Co.	May 2004	2010
Essilor	Aug. 2005	Apr. 2006
Checkpoint	March 2004	March 2007
University of Arkansas	Jan. 2005	Dec. 2006
William F. McMurry & Associates	2004	2010
Walco, Dolphin Measurement Systems	Oct. 2005	Present
American Council for an Energy Efficient Economy (ACEEE)	Sept. 2006	Oct. 2006
Satcon Technology Corporation	Jan. 2007	2010
InESA Inc.(Information, Engineering, Science, Analysis)	Feb. 2008	Present
Scott Fetzer Company	April 2008	July 2008
Haynes and Boone	Sept.2010	Oct. 2010
Instrumentation Laboratories	Sept.2010	Oct. 2010
Texas Instruments	Oct. 2012	Dec.2012
Exponent	Dec. 2012	

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	Aug. 2002
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	Aug. 2005

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	April, 2005
Stellar Advisory Group Faculty	June 2004	Present
MIT Hillel Board of Directors	2005	2008
MIT Faculty Committee on the Library System	Sept. 2011	
EECS Industrial Interactions Working Group	Sept. 2011	

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,		1978
IEEE Symposium on Electrical Insulation		
U.S. Organizer IEEE U.S./Japan Seminar on Electrical Conduction and Breakdown in Dielectrics		Oct. 1979
Associate Editor, <u>IEEE Transactions on Electrical Insulation/ Dielectrics and Electrical Insulation</u>	1980	Present
General Chairman, IEEE Second International Conference on Magnetic Fluids		Mar. 1980
Guest Editor, <u>IEEE Transactions on Magnetics</u>		Mar. 1980
Guest Editor, <u>IEEE 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	Oct. 2006
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	Aug. 2002
Board Member of the Conference on Electrical Insulation	Jan. 1998	Dec. 2000

and Dielectric Phenomena 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	2005
M.I.T. Humanitarian Demining Group	Sep. 1997	2004
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 International Conference on Dielectric Liquids	Jul. 1999	Aug. 2008
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
International Scientific Committee on Magnetic Fluids	Sep. 2004	Present
Board of Advisors for Highland Instruments, Inc.	Oct. 2007	Present

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	Nov. 2002	

Gallery of Fluid Motion with video entitled "Hele-Shaw Ferrohydrodynamics for Rotating and Axial Magnetic Fields," C. Lorenz and M. Zahn		
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	
Royal Academy of Engineering Distinguished Visiting Fellow, University of Manchester, England	Dec. 8, 2007	Dec. 21, 2007
Inuishi Memorial Lecturer Award at International Symposium On Electrically Insulating Materials (ISEIM, 2011)	Sept. 6, 2011	Sept. 10, 2011

14. Current Organization Membership:

Organization

IEEE
Dielectrics and Electric Insulation Society

International Scientific Committee on Magnetic Fluids
Highland Instruments, Inc. Board of Advisors
Electrostatics Society of America

Offices Held

Elected Fellow, 1993
Administrative Committee (1989-94);
Chair, Liquid Dielectrics Committee (1985-2006); Chair, Nominating Committee (1984-87);
Conference and Committee Assistant/Associate Editor of Transactions (1977 – present)
Member (2004 –present)
Member (2007-present)
Member (1971-present)

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) EP0954760.
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 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, January 28, 2003; U.S. Patent No. 6,815,669, Nov. 9, 2004; U. S. 7,547,879 B2, June 16, 2009.

14. C.G. Fonstad and M. Zahn, "Method and System for Field Assisted Statistical Assembly of Wafers," U.S. Patent No. 6,825,049, November 30, 2004; U.S. Patent No. 6,833,277 B2, Dec. 21, 2004.
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, November 26, 2002.
17. N.J. Goldfine, D.E. Schlicker, M. Zahn, W.D. Ryan, I.C. Shay and A.P. Washabaugh, "Inspection Method Using Penetrant and Dielectrometer," U.S. Patent No. 6,781,387, August 24, 2004.
18. C.G. Fonstad and M. Zahn, "Method and System for Magnetically Assisted Statistical Assembly of Wafers," U.S. Patent No. 6,888,178 B2, May 3, 2005.
19. C. G. Fonstad, Jr. and M. Zahn, "System for Field Assisted Statistical Assembly of Wafers," U.S. Patent No. 7,323,757 B2, Jan. 29, 2008.
20. M. Zahn and E. Adalsteinsson, "Systems and Methods for Tuning Properties of Nanoparticles", Provisional application filed Sept. 21, 2005; Patent filed Sept. 21, 2006; International Publication Number WO 2007/035871 A1.
21. M. Zahn, "Uniform Magnetic Field Spherical Coil" for MRI, US2010/0019764 A1, Jan. 28, 2010. International Publication Number WO 2008/036412 A3; U.S. Patent No. 8,093,896 B2, Jan. 10, 2012.
22. M. Zahn, J.W.G. Hwang, and J.H. Lang, "A Low Ionization Potential Additive Method to Increase the Electric Breakdown Strength of Insulation Materials", Provisional Patent Application filed March 23, 2010; Provisional Filing Date: March 23, 2011; Low Ionization Potential Additive to Dielectric Compositions, PCT/US2011/029647, WO 2011/119747 A1, International Filing Date: March 23, 2011, HSR Docket No.: 0050.2180-002 PCT.
23. M. Zahn and T.A. Hatton, "Magnetic Colloid Petroleum Oil Spill Clean-Up of Ocean Surface, Depth, and Shore Regions", Patent Application filed June 15, 2010; Filing Date: February 23, 2011.

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
FT04	6.642	Continuum Electromechanics	Lectures
ST05	6.641	Electromagnetic Fields, Forces, and Motion	Lectures
FT05	6.013	Electromagnetics and Applications	Lectures
ST06	6.641	Electromagnetic Fields, Forces, and Motion	Lectures
FT06	6.642	Continuum Electromechanics	Lectures
ST08	6.641	Electromagnetic Fields, Forces, and Motion	Lectures
FT08	6.642	Continuum Electromechanics	Lectures
ST09	6.641	Electromagnetic Fields, Forces, and Motion	Lectures
FT09	6.UAT	Preparation for Undergraduate Advanced Project	Recitations
ST10	6.641	Electromagnetic Fields, Forces and Motion	Lectures
FT10	6.642	Continuum Electromechanics	Lectures
ST11	6.641	Electromagnetic Fields, Forces and Motion	Lectures
ST12	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.

Dec. 10, 2007-Dec. 20, 2007, Royal Academy of Engineering Distinguished Visiting Fellow Lectures on Applications of Electromagnetic Fields and Energy.

May 25-30, 2008, Lectures on Applications of Electromagnetic Fields and Energy at School of Electrical and Electronic Engineering, Universiti Sains Malaysia, Penang, Malaysia.

Jan. 10-17, 2009, Lectures on Electromagnetic Fields, Forces, and Motion at the Department of Electrical Engineering, Tsinghua University, Beijing, China.

Dec. 14-17 2009, Lectures on Electromagnetic Fields, Forces and Motion at Hyosung Corporation, Changwon Plant, Changwon City, South Korea.

Jan., 2010, Seminars on Applications of Electric and Magnetic Fields, Ecole Centrale de Lyon, Laboratoire Ampere, Lyon, France.

July 24-31, 2010, Lectures on Electromagnetic Fields, Forces and Motion, High Voltage Laboratory, Chongqing University, Chongqing, China.

June 11-17, 2011, Lectures on Continuum Electromechanics, High Voltage Laboratory, Chongqing University, Chongqing, China.

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. Now available for free download at <http://ocw.mit.edu/resources/res-6-002-electromagnetic-field-theory-a-problem-solving-approach-spring-2008/textbook-contents/>

2. Theses

1. Zahn, M., "Space Charge Dynamics of Liquids, MIT Department of Electrical Engineering", ScD thesis, 1970.
2. Zahn, M., "Pulse Compression Using Bragg Scattering of Light by Ultrasonic Waves", Department of Electrical Engineering, MS thesis, 1968.

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, No. 7, 1197-1206; Erratum 15, No. 11, 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, "Novel 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.
23. Zahn, M., and T.J. McGuire, "Polarity Effect Measurements Using the Kerr Electro-optic Effect with Coaxial Cylindrical Electrodes," *IEEE Transactions on Electrical Insulation* EI-15, 233-239, June 1980. **
24. Zahn, M., E.O. Forster, E.F. Kelley, and R.E. Hebner, Jr., "Hydrodynamic Shock Wave Propagation After Electrical Breakdown," *Journal of Electrostatics* 12, 535-546, 1982.
25. Zahn, M., D.B. Fenneman, S. Voldman, and T. Takada, "Charge Injection and Transport in High Voltage Water/Glycol Capacitors," *Journal of Applied Physics* 54, 315-325, January 1983. **
26. Zahn, M., T. Takada, and S. Voldman, "Kerr Electro-optic Field Mapping Measurements in Water Using Parallel Cylindrical Electrodes," *Journal of Applied Physics* 54, 4749-4761, September 1983. **
27. Zahn M., and T. Takada "High Voltage Electric Field and Space Charge Distributions in Highly Purified Water," *Journal of Applied Physics* 54, 4762-4775, September 1983.
28. Rosensweig, R.E., M. Zahn, and R. Shumovich, "Labyrinthine Instability in Magnetic and Dielectric Fluids," *Journal of Magnetism and Magnetic Materials* 39, 127-132, November 1983. **
29. Zahn, M., and S. Rhee. "Electric Field Effects on the Equilibrium and Small Signal Stabilization of Electrofluidized Beds," *IEEE Transactions on Industry Applications*, IA-20, 137-147, January/February 1984. **
30. Zahn, M., "Charge Injection and Transport in a Lossy Capacitor Stressed by a Marx Generator," *IEEE Transactions on Electrical Insulation* EI-19, 179-181, June 1984.
31. Zahn, M., and S. Rhee, "One Dimensional Small Signal Waves in Electrofluidized Beds," *IEEE Transactions on Industry Applications* IA-20, 1591-1597, November/December 1984. **
32. Zahn, M., and R. Shumovich, "Labyrinthine Instability in Dielectric Fluids," *IEEE Transactions on Industry Applications* IA-21, 53-61, January/February 1985. **
33. Zahn, M., Y. Ohki, K. Rhoads, M. LaGasse, and H. Matsuzawa, "Electro- optic Charge Injection and Transport Measurements in Highly Purified Water and Water/Ethylene Glycol Mixtures," *IEEE Transactions on Electrical Insulation* EI-20, 199-211, April 1985. **
34. Zahn, M., "Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Dielectrics," *Physics in Technology* 16, 288-295, November 1985.
35. Zahn, M., Y. Ohki, D.B. Fenneman, R.J. Gripshover, and V.H. Gehman, "Dielectric Properties of Water and Water/Ethylene Glycol Mixtures for Use in Pulsed Power System Design," *Proceedings of the IEEE* 74, 1182-1221, September 1986.
36. Zahn, M., and R.E. Rosensweig, "Magnetic Field Gradient Effects on Magnetic Fluid Stabilization," *Journal of Magnetism and Magnetic Materials*, Vol. 65, pp. 293-300, March 1987.
37. Zahn, M., M. Hikita, K.A. Wright, C.M. Cooke, and J. Brennan, "Kerr Electro-optic Field Mapping Measurements in Electron Beam Irradiated Polymethylmethacrylate," *IEEE Transactions on Electrical Insulation* EI-22, pp. 181-185, April 1987.**
38. Lyon, D.J., J.R. Melcher, and M. Zahn, "Couette Charger for Measurement of Equilibrium and Energization Flow Electrification Parameters: Application to Transformer Insulation," *IEEE Transactions on Electrical Insulation* EI-23, pp. 159-176, November 1986. **
39. Gasworth, S.M., J.R. Melcher, and M. Zahn, "Flow-induced Charge Accumulation in Thin Insulating Tubes," *IEEE Transactions on Electrical Insulation* EI-23, 103-115, February 1986. **
40. Zahn, M., L. Antis, and J. Mescua, "Computation Methods for One Dimensional Bipolar Charge Injection" *IEEE Transactions on Industry Applications* IA-24, No. 3, pp. 411-421, May-June 1988. **
41. Moissis, A.A., and M. Zahn. "Boundary Value Problems in Electrofluidized and Magnetically Stabilized Beds," *Chemical Engineering Communications* 67, 181-204, 1988. **
42. Zahn, M., "The Contributions of Arthur Robert von Hippel to Electric Insulation Research," *IEEE Transactions on Electric Insulation* EI-23, 791-800, October 1988.
43. Hikita, M., M. Zahn, K.A. Wright, C.M. Cooke, and J. Brennan, "Kerr Electro-Optic Field Mapping Measurements in Electron Beam Irradiated Polymethylmethacrylate," *IEEE Transactions on Electric Insulation*, Vol. 23, No. 5, 861-880, October 1988. **
44. Washabaugh. A.P., M. Zahn, and J.R. Melcher, "Electrohydrodynamic Traveling-Wave Pumping of Homogeneous Semi-Insulating Liquids," *IEEE Transactions on Electrical Insulation*, EI-24, No. 5, 807-834, October 1989. **
45. Zahn, M., "Ferrodynamical Torque-Driven Flows," *Journal of Magnetism and Magnetic Materials*, 85, 181-186, 1990.
46. Howells, E., M. Zahn, and S.R. Lindgren, "Static Electrification Effects in Transformer Oil Circulating Pumps," *IEEE Transactions on Power Delivery* 5, 1000-1006, April 1990.

47. Morin, A.J., II, M. Zahn, J.R. Melcher, and D. Otten, "An Absolute Charge Sensor for Fluid Electrification Measurements," *IEEE Transactions on Electrical Insulation*, Vol. 26, No. 2, pp. 181-199, April 1991. **
48. Morin, A.J., II, M. Zahn, and J.R. Melcher, "Fluid Electrification Measurements of Transformer Pressboard/Oil Insulation in a Couette Charger," *IEEE Transactions on Electrical Insulation*, Vol. 26, No. 2, pp. 870-901, October 1991. **
49. Suzuki, T., K.E. Walrath, M. Zahn, and J.R. Melcher, "Dielectric Study at Microwave Frequencies of Water-Treed Crosslinked Polyethylene," *IEEE Transactions on Electrical Insulation*, Vol. 27, No. 6, pp. 1083-1088, December, 1992. **
50. Zahn, M. and P.N. Wainman, "Effects of Fluid Convection and Particle Spin on Ferrohydrodynamic Pumping in Traveling Wave Magnetic Fields," *Journal of Magnetism and Magnetic Materials* 122, 323-328, 1993. **
51. Washabaugh, A.P., M. Zahn, and J.R. Melcher, "Charge Density Enhancement Due to Recirculatory Flow," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 1, No. 1, pp. 38-52, Feb. 1994. **
52. Zahn, M., "Transform Relationships Between Kerr Effect Optical Phase Shifts and Non-Uniform Electric Field Distributions," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 1, No. 2, pp. 235-246, April 1994.
53. Zahn, M. and H.A. Haus, "Contributions of Prof. James R. Melcher to Engineering Education," *Journal of Electrostatics* 34, pp. 109-162, March 1995.
54. Sheiretov, Y. and M. Zahn, "Dielectrometry Measurements of Moisture Dynamics in Oil-Impregnated Pressboard," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 2, No. 3, pp. 329-351, June 1995. **
55. Zahn, M. and D.R. Greer, "Ferrohydrodynamic Pumping in Spatially Uniform Sinusoidally Time-Varying Magnetic Fields," *Journal of Magnetism and Magnetic Materials*, 149, No. 1, pp. 165-173, August, 1995. **
56. Washabaugh, A.P. and M. Zahn, "Flow Electrification Measurements of Transformer Insulation Using a Couette Flow Facility," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 3, No. 2, pp. 161-181, April, 1996. **
57. Washabaugh, A.P. and M. Zahn, "A Chemical Reaction-based Boundary Condition for Flow Electrification," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 4, No. 6, pp. 688-709, December, 1997. **
58. Atten, P., B. Malraison, and M. Zahn, "Electrohydrodynamic Plumes in Point-Plane Geometry," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 4, No. 6, December 1997, pp. 710-718.
59. Zahn, M. "Power Dissipation and Magnetic Forces on MAGLEV Rebars," *IEEE Transactions on Magnetics*, Vol. 33, No. 2, March 1997, pp. 1021-1036. **
60. Mamishev, A.V., B.C. Lesieutre, and M. Zahn, "Optimization of Multi-Wavelength Interdigital Dielectrometry Instrumentation and Algorithms," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 5, No. 3, pp. 408-420, June 1998. **
61. Üstündag, A., T.J. Gung, and M. Zahn, "Kerr Electro-Optic Theory and Measurements of Electric Fields with Magnitude and Direction Varying Along the Light Path," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 5, No. 3, pp. 421-442, June 1998. **
62. Beroual, A., M. Zahn, A. Badent, K. Kist, A.J. Schwabe, H. Yamashita, K. Yamazawa, M. Danikas, W.G. Chadband, and Y. Torshin, "Propagation and Structure of Streamers in Liquid Dielectrics," *IEEE Electrical Insulation Magazine*, Vol. 14, No. 2, pp. 6-17, March-April 1998.
63. Zahn, M. "Optical, Electrical and Electromechanical Measurement Methodologies of Field, Charge and Polarization in Dielectrics," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 5, No. 5, pp. 627-650, October 1998. **
64. Mamishev, A.V., Y. Du, B.C. Lesieutre, and M. Zahn, "Development and Applications of Fringing Electric Field Dielectrometry Sensors and Parameter Estimation Algorithms," *Journal of Electrostatics*, Vol. 46, No. 2-3, pp. 109-123, April 1999. **
65. Gung, T.J., A. Üstündag, and M. Zahn, "Preliminary Kerr Electro-Optic Field Mapping Measurements in Propylene Carbonate Using Point-Plane Electrodes," *Journal of Electrostatics*, Vol. 46, No. 2-3, pp. 79-89, April 1999. **
66. Du, Y., M. Zahn, B.C. Lesieutre, A.V. Mamishev, and S.R. Lindgren, "A Review of Moisture Equilibrium in Transformer Paper-Oil Systems," *IEEE Electrical Insulation Magazine*, Vol. 15, pp. 11-20, January/February 1999. **
67. Zahn, M., and L.L. Pioch, "Magnetizable Fluid Behavior with Effective Positive, Zero, or Negative Dynamic Viscosity," *Indian Journal of Engineering and Material Sciences*, Vol. 5, pp.400-410, December 1998. **
68. Zahn, M. and L.L. Pioch, "Ferrofluid Flows in AC and Traveling Wave Magnetic Fields with Effective Positive, Zero, or Negative Viscosity," *Journal of Magnetism and Magnetic Materials*, 201, pp. 144-148, July 1, 1999. **
69. Mamishev, A.V., A.R. Takahashi, Y. Du, B.C. Lesieutre, and M. Zahn, "Parameter Estimation in Dielectrometry Measurements," *Journal of Electrostatics* Vol. 56, pp. 465-492, 2002. **
70. Mamishev, A.V., Y. Du, J.H. Bau, B.C. Lesieutre, and M. Zahn, "Evaluation of Diffusion-Driven Material Property Profiles Using a Three-Wavelength Interdigital Sensor," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 8, No. 5, pp. 785-798, October, 2001. **

71. Lesieutre, B.C., A.V. Mamishev, Y. Du, E. Keskiner, M. Zahn, and G.C. Verghese, "Forward and Inverse Parameter Estimation Algorithms of Interdigital Dielectrometry Sensors," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 8, No. 4, pp. 577-588, August, 2001. **
72. Üstündag, A. and M. Zahn, "Comparative Study of Theoretical Kerr Electromagnetic Fringe Patterns in Two Dimensional and Axisymmetric Electrode Geometries", *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 8, No. 1, pp. 15-26, March 2001. **
73. Üstündag, A. and M. Zahn, "Finite Element Based Kerr Electro-Optic Reconstruction of Space Charge", *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 8, No. 4, pp. 612-628, August, 2001. **
74. Du, Y., A.V. Mamishev, B.C. Lesieutre, M. Zahn, and S.H. Kang, "Moisture Solubility for Differently Conditioned Transformer Oils," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 8, No. 5, pp. 805-811, October, 2001. **
75. Zahn, M., "Magnetic Fluid and Nanoparticle Applications to Nanotechnology," *Journal of Nanoparticle Research*, Vol. 3, pp. 73-78, 2001.
76. Rinaldi, C. and M. Zahn, "Effects of Spin Viscosity on Ferrofluid Duct Flow Profiles in Alternating and Rotating Magnetic Fields," *Journal of Magnetism and Magnetic Materials*, Vol. 252, pp.172-175, 2002. **
77. Rinaldi, C. and M. Zahn, "Effects of Spin Viscosity on Ferrofluid Flow Profiles in Alternating and Rotating Magnetic Fields," *Physics of Fluids*, Vol. 14, No. 8, pp. 2847-2870, August, 2002. **
78. Mamishev, A.V. S.R. Cantrell, Y. Du, B.C. Lesieutre, and M. Zahn, "Uncertainty in Multiple Penetration Depth Fringing Electric Field Sensor Measurements," *IEEE Transactions on Instrumentation and Measurements*, Vol. 51, No. 6, pp. 1192-1199, December 2002. **
79. Helgeson, A. and M. Zahn, "Kerr Electro-optic Measurements of Space Charge Effects in High Voltage Pulsed Propylene Carbonate," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 9, No. 5, pp. 838-844, October, 2002.
80. Zahn, M. and A. Üstündag, "Discussion: Optical Measurement of Non-Uniform Electric Field Vector Distribution in a Dielectric Liquid Using Triplet Measurement System," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 9, No. 6, pp. 972-974, December, 2002.
81. Mamishev, A.V., K. Sundara-Rajan, F. Yang, Y. Du and M. Zahn, "Interdigital Sensors and Transducers," *Proceedings of the IEEE*, Vol. 92, Issue 5, pp. 808-845, May 2004. **
82. Wagner, T.A., M. Zahn, A.J. Grodzinsky, and A. Pascual-Leone, "Three-Dimensional Head Model Simulation of Transcranial Magnetic Stimulation," *IEEE Transactions on Biomedical Engineering*, Vol. 51, No. 9, pp. 1586-1598, Sept. 2004.**
83. Lorenz, C. and M. Zahn, "Hele-Shaw Ferrohydrodynamics for Rotating and DC Axial Magnetic Fields," *Physics of Fluids Gallery of Fluid Motion*, Vol. 15 S4, No. 9, Sept. 2003.**; see also S4, <http://pof.aip.org/pof/gallery/2003toc.jsp>
84. Shay, I.C. (formerly Y. Sheiretov) and M. Zahn, "Cylindrical Geometry Electroquasistatic Dielectrometry Sensors," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 12, No. 1, pp. 41-49, Feb. 2005.**
85. Rosenthal, A.D., C. Rinaldi, T. Franklin, and M. Zahn, "Torque Measurements in Spin-Up Flow of Ferrofluids," *Journal of Fluids Engineering*, Vol. 126, pp. 198-205, March 2004.**
86. Rinaldi, C., F. Gutman, X. He, A.D. Rosenthal, and M. Zahn, "Torque Measurements on Ferrofluid Cylinders in Rotating Magnetic Fields," *Journal of Magnetism and Magnetic Materials*, Vol. 289, pp. 307-310, 2005.**
87. Rhodes, S.E., J.A. Perez, S.M. Elborai, S-H. Lee, and M. Zahn. "Ferrofluid Spiral Formations and Continuous to Discrete Phase Transitions Under Simultaneously Applied DC Axial and AC In-plane Rotating Magnetic Fields," *Journal of Magnetism and Magnetic Materials*, Vol. 289, pp. 353-355, 2005.**
88. Rosensweig, R.E., S. Elborai, S-H. Lee, and M. Zahn, "Ferrofluid Meniscus in a Horizontal or Vertical Magnetic Field," *Journal of Magnetism and Magnetic Materials*, Vol. 289, pp. 192-195, 2005.**
89. Rinaldi, C., M. Zahn, "Ferrohydrodynamic Instabilities in DC Magnetic Fields," *J. of Visualization*, Vol. 7, No.1, p. 8, 2004. **
90. Lorenz, C., C. Rinaldi, and M. Zahn, "Hele-Shaw Ferrohydrodynamics for Simultaneous In-Plane Rotating and Vertical DC Magnetic Fields," *J. of Visualization*, Vol. 7, No. 2, p.109, 2004.**
91. Franklin, T., C. Rinaldi, J.W.M. Bush, and M. Zahn, "Deformation of Ferrofluid Sheets Due to an Applied Magnetic Field Transverse to Jet Flow," *J. of Visualization*, Vol. 7, No. 3, p.175, 2004.**
92. Amin, M.S., S.M. Elborai, S.-H. Lee, X. He, and M. Zahn, "Surface Tension Measurement Techniques of Magnetic Fluids at an Interface Between Different Fluids Using Perpendicular Field Instability," *Journal of Applied Physics*, Vol. 97, 10R308.1-3, 2005.**
93. Kim, D.K., D. Kan, T. Veres, F. Normadin, J.K. Liao, H.H. Kim, S.-H. Lee, M. Zahn and M. Muhammed, "Monodispersed Fe-Pt Nanoparticles for Biomedical Applications," *Journal of Applied Physics*, Vol. 97, 10Q918.1-3, 2005.**

94. Elborai, S.M., D.K. Kim, X. He, S.-H. Lee, S. Rhodes, and M. Zahn, "Self-Forming, Quasi-Two-Dimensional Magnetic Fluid Patterns With Applied In-Phase-Rotating and DC-Axial Magnetic Fields," *Journal of Applied Physics*, Vol. 97, 10Q303.1-3, 2005.**
95. He, X., S.M. Elborai, D.K. Kim, S.-H. Lee, and M. Zahn, "Effective Magnetoviscosity of Planar-Couette Magnetic Fluid Flow," *Journal of Applied Physics*, Vol. 97, 10Q302.1-3, 2005.**
96. Lee, S.-H., X. He, D.K. Kim, S.M. Elborai, H.-S. Choi, I.-H. Park, and M. Zahn, "Evaluation of the Mechanical Deformation in Incompressible Linear and Nonlinear Magnetic Material Using Various Electromagnetic Force Density Methods," *Journal of Applied Physics*, Vol. 10E108.1-3, 2005.**
97. Kim, D.K., M.S. Amin, S. Elborai, S.-H. Lee, Y. Koseoglu, M. Zahn and M. Muhammed, "Energy Absorption of Superparamagnetic Iron Oxide Nanoparticles by Microwave Irradiation," *Journal of Applied Physics*, Vol. 97, 10J510.1-3, 2005.**
98. Wagner, T.A., F. Fregni, U. Eden, C. Ramos-Estebanez, A.J. Grodzinsky, M. Zahn, and A. Pascual-Leone, "Transcranial Magnetic Stimulation and Stroke: A Computer Based Human Model Study," *NeuroImage*, Vol. 30, Issue 3, 15 April 2006, pp. 857-870.**
99. Rinaldi, C., A. Chaves, S. Elborai, X. He, and M. Zahn, "Magnetic Fluid Rheology and Flows," *Current Opinion in Colloid and Interface Science*, Vol. 10, 2005, pp. 141-157.**
100. Amin, M.S., T.F. Peterson, Jr., and M. Zahn, "Measurements of Electric Charge Associated with Evaporation and Condensation of Water on Metallic Surfaces as a Consequence of Pressure, Humidity, and Temperature Change," *Journal of Electrostatics*, 64, 2006, pp. 597-603.**
101. Amin, M.S., T.F. Peterson, Jr., and M. Zahn, "Advanced Faraday Cage Measurements of Charge and Open-Circuit Voltage Using Water Dielectrics," *Journal of Electrostatics*, 64, 2006, pp. 424-430.**
102. Rhodes, S., X. He, S. Elborai, S.-H. Lee, and M. Zahn, "Magnetic Fluid Behavior in Uniform DC, AC, and Rotating Magnetic Fields," *Journal of Electrostatics*, 64, 2006, pp. 513-519.**
103. Morozov K., M. Shliomis, and M. Zahn, "Magnetoviscosity in Suspensions of Grains With Finite Magnetic Anisotropy," *Physics Review E* 73, 066312, 2006.
104. Sheiretov Y. and M. Zahn, "Design and Modeling of Shaped-field Magnetoquasistatic Sensors," *IEEE Transaction on Magnetics*, March 2006, Vol. 42, Issue:3, pp. 411-421. **
105. Wagner, T.A., U. Eden, F. Fregni, C. Ramos-Estebanez, A. Grodzinsky, M. Zahn, and A. Pascual-Leone, "Transcranial Magnetic Stimulation and Brain Atrophy: A computer-based human brain model study," *Experimental Brain Research (Springer)*, vol. 186, No. 4, pp. 539-550, April, 2008. **
106. Wagner, T.A., F. Fregni, S. Fecteau, A. Grodzinsky, M. Zahn and A. Pascual-Leone, "Transcranial Direct Current Stimulation: A computer based human model study", *Neuroimage* 35, 2007, pp. 1113-1124.**
107. Chaves, A, C. Rinaldi, S. Elborai, X. He, and M. Zahn, "Bulk Flow in Ferrofluids in a Uniform Rotating Magnetic Field", *Physical Review Letters*, 96(19), article 194501, 15 May 2006, pp. 1-4.**
108. Kim M-C, D-K Kim, S-H Lee, M.S. Amin, I-H Park, C-J Kim, and M. Zahn, "Dynamic Characteristics of Superparamagnetic Iron Oxide Nanoparticles (SPION) in a Viscous Fluid under an External Magnetic Field," *IEEE Transactions on Magnetics*, April 2006, Vol. 42, No 4, pp 979-982.**
109. Chaves, A., M. Zahn, and C. Rinaldi, "Spin-up Flow of Ferrofluids: Asymptotic Theory and Experimental Measurements," *Physics of Fluids*, 20, 053102, May 28, 2008. **
110. Cheng, D. I., Rumlper II, J. M. Perkins, M. Zahn, C. G. Fonstad Jr., E. S. Cramer, R. Zuneska, and F. J. Cadieu, "Use of patterned magnetic films to retain and orient micro-components during fluidic assembly," *Journal of Applied Physics*, 105, Issue 7, 07C123 (2009), 23 March, 2009.
111. Cantillon-Murphy, P., L. L. Wald, M. Zahn and E. Adalsteinsson, "Measuring SPIO and Gd contrast agent magnetization using 3T MRI," *NMR in Biomedicine* (2009), July, 2009. Vol. 22, Issue 8, pp. 891-897.
112. Hwang, J. G., M. Zahn, F. O'Sullivan, L. A. A. Pettersson, O. Hjortstam, and R. Liu, "Effects of nanoparticle charging on streamer development in transformer oil-based nanofluids, *Journal of Applied Physics*, 107, 014310-1 to 014310-17, January, 2010.
113. Huang, H-F, M. Zahn, and E. Lemaire, "Continuum Modeling of Micro-particle Electrorotation in Couette and Poiseuille Flows – The Zero Spin Viscosity Limit," *Journal of Electrostatics*, 68, 2010, pp. 345-359.
114. Yang, Y., Z. Jia, Q. Li, L. Hou, J. Liu, L. Wang, Z. Guan, and M. Zahn, "A Shield Ring Enhanced Equilateral Hexagon Distributed Multi-Needle Electrospinning Spinneret", *IEEE Transactions on Dielectrics and Electrical Insulation*, October, 2010, Vol. 17, No. 5, pp. 1592-1601.
115. Khushrushahi, S. and M. Zahn, "Ultrasound Velocimetry of Ferrofluid Spin-Up Flow Measurements Using a Spherical Coil Assembly to Impose a Uniform Rotating Magnetic Field", accepted for publication, *Journal of Magnetism and Magnetic Materials*, Vol. 323, pp. 1302-1308, 2011.
116. Cantillon-Murphy, P., L. L. Wald, E. Adalsteinsson and M. Zahn, "Proposing Magnetic Nanoparticle Hyperthermia in Low-Field MRI," *Concepts in Magnetic Resonance Part A*, Vol. 36A(1), 2010, pp. 36-47.

117. Cantillon-Murphy, P., L. L. Wald, E. Adalsteinsson and M. Zahn, "Heating in the MRI Environment Due to Superparamagnetic Fluid Suspensions in a Rotating Magnetic Fields," *Journal of Magnetism and Magnetic Materials*, Vol. 322, pp. 727-733, 2010.
118. Cantillon-Murphy, P., L. L. Wald, E. Adalsteinsson and M. Zahn, "Simulating Magnetic Nanoparticle Behavior In Low Field MRI Transverse Rotating Fields and Imposed Fluid Flow," *Journal of Magnetism and Magnetic Materials*, Vol. 322, pp. 2607-2617, 2010.
119. Zhou Yuanxiang, Wang Yunshan, Markus Zahn, Wang Ninghua, Sun Qinghua, Liang Xidong, and Guan Zhichen, "Morphology Effects on Space Charge Characteristics of Low Density Polyethylene," *Japanese Journal of Applied Physics* 50, pp. 017101-017108, 2011.
120. Wang, J., Q. Yang, W. Sima, T. Yuan, and M. Zahn, "A Smart Online Over-Voltage Monitoring and Identification System," *Energies*, 4, pp. 599-615, 2011.
121. Mao, L., S. Elborai, X. He, M. Zahn, and H. Koser, "Direct Observation of Closed-Loop Ferrohydrodynamic Pumping Under Traveling Magnetic Fields," *Physical Review B* 84, pp. 104431-1 to 104431-7, 2011.
122. Hwang, J.G., M. Zahn, and L.A.A. Pettersson, "Bipolar charging and discharging of a perfectly conducting sphere in a lossy medium stressed by a uniform electric field," *Journal of Applied Physics*, 109, 084331-1 to 084331-11, April 2011.
123. Huang, H-F, M. Zahn, and E. Lemaire, "Negative Electrorheological Responses of Micro-Polar Fluids in the Finite Spin Viscosity Limit Small Spin Velocity Limit," *I. Couette Flow Geometries, Journal of Electrostatics*, 69, pp. 442-455, 2011.
124. Li, J. Q. Yang, W. Sima, C. Sun, T. Yuan, and M. Zahn, "A New Estimation Model of the Lightning Shielding Performance of Transmission Lines Using a Fractal Approach," *IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 18, No. 5, pp. 1712-1723, October 2011.
125. Yang, Q., R. Wang, W. Sima, C. Jiang, and M. Zahn, "Electrical Circuit Flashover Model of Polluted Insulators Under AC Voltage Based on the Arc Root Voltage Gradient Criterion", *Energies*, 5, pp. 752-769, 2012.
126. Hwang, J.G., M. Zahn, and L.A.A. Pettersson, "Mechanisms Behind Positive Streamers, and Their Distinct Propagation Modes in Transformer Oil," accepted for publication in the *IEEE Transactions on Dielectrics and Electrical Insulation*, expected publication in Feb., 2012.
127. Li, J., T. Yuan, Q. Yang, W. Sima, C. Sun, and M. Zahn, "Numerical and Experimental Investigation of Grounding Electrode Impulse-Current Dispersal Regularity Considering the Transient Ionization Phenomenon", *IEEE Transactions on Power Delivery*, Vol. 26, No. 4, pages 2647-2658, October, 2011.
128. Jadidian, Jouya, M. Zahn, N. Lavesson, O. Widlund, and K. Borg, "Effects of Impulse Voltage Polarity, Peak Amplitude, and Rise Time on Streamers Initiated From a Needle Electrode in Transformer Oil", *IEEE Transactions on Plasma Science*, Vol. 40, No. 3, pages 909-918, March 2012.
129. Jadidian, Jouya, M. Zahn, N. Lavesson, O. Widlund, and K. Borg, 'Surface Flashover Breakdown Mechanisms On Liquid Immersed Dielectrics', *Applied Physics Letters* 100, 172903 (4 pages), 2012.

3. Proceedings of Refereed Conferences (** Outgrowth of supervised student research)

1. Zahn, M. and J.K. Skinner, "Self-excited Alternating Operation of Coupled Commutator Machines," Proceedings of the Midwest Power Symposium, Rolla MO, October 1972.**
2. Hebner, R.E., E.C. Cassidy, M. Zahn, and R.J. Sojka, "Electric Field Distributions and Space Charge Behavior in Nitrobenzene Under Low Frequency Alternating Voltage," 1973 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Montreal, Canada, 1973, pp. 112-119.**
3. Zahn, M., "Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction in Liquid Dielectrics," 1974 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Downingtown, PA, 1974, pp. 525-539.
4. Zahn, M., "Self-excited Alternating Operation of Electric and Magnetic Machines," IEEE Southeastcon, Orlando, FL, 1974.
5. Zahn, M., "Duality Between Surface Coupled Interfacial Waves for Electrically Charged and Self-Gravitating Drops," Proceedings of the International Colloquium on Drops and Bubbles, Jet Propulsion Laboratory and California Institute of Technology, Pasadena CA, 1974, pp.122-138.
6. Zahn, M., "Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction In Discharging Dielectrics," 1975 Conference on Dielectric Materials, Measurements and Applications, Cambridge, England, 1975, pp. 290-294.
7. Zahn, M., "Transient Electric Field and Space Charge Behavior for Drift Dominated Bipolar Conduction in Dielectric Liquids," Proceedings of the Fifth International Conference on Conduction and Breakdown of Dielectric Liquids, Delft, Holland, 1975, pp. 61-64.

8. Zahn, M., "Transient Drift Dominated Unipolar Conduction Between Coaxial Cylinders," 1975 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Gaithersburg, MD, 1975, pp. 396-408.
9. Zahn, M., and R.J. Sojka, "Transient Drift Dominated Bipolar Conduction with Recombination," 1976 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Buck Hill Falls, PA, 1976, pp. 117-127. **
10. Zahn, M., "Effect of Prestressing, Excitation Risetime, Excitation Frequency and Charge Injection on the Charging and Discharging Transients for Drift Dominated Conduction In Electrical Insulators," IEEE International Symposium on Electrical Insulation, Philadelphia, PA, June 1976, pp. 239-242.
11. Zahn, M., and R.J. Sojka, "Transient Bipolar Kerr Effect Studies of Nitrobenzene Under High Field Conditions," 1977 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Colonie, NY, 1978, pp. 69-74. **
12. Zahn, M., and W. Stanaland, "Bipolar Conduction with Alternating Excitations," Proceedings of the Sixth International Conference on Conduction and Breakdown of Dielectric Liquids, Rouen, France, July 1978, pp. 57-64. **
13. Zahn, M., and T.J. McGuire, "Polarity Effect Measurements Using the Kerr Electro-optic Effect With Coaxial Cylindrical Electrodes," 1979 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Whitehaven, PA, 1979, pp. 149-159. **
14. Bellows, R.J., P. Grimes, J.A. Shropshire, and M. Zahn, "Advances In Zinc Bromine Batteries for Motive Power," Electric Vehicle 1980 Conference, St. Louis MO, May 1980.
15. Zahn, M., "Drift Diffusion Unipolar Conduction," 1980 IEEE International Symposium on Electrical Insulation, Boston, MA, June 1980, pp. 162-166.
16. Zahn, M., and W. Stanaland, "Nonlinear Bipolar Conduction with Sinusoidal Voltage Excitations," 1980 Conference on Electrical Insulation and Dielectric Phenomena, Boston, MA, October 1980, pp. 366-374. **
17. Zahn, M., P. Grimes, R. Bellows, and J. Shropshire, "Parasitic Current Elimination in Series-Connected Electrochemical Cell Systems with Shared Electrolyte. I. Theory," 158th Meeting of the Electrochemical Society, Hollywood, FL, October 1980.
18. Grimes, P., R. Bellows, J. Shropshire, and M. Zahn, "Parasitic Current Elimination in Series-Connected Electrochemical Cell Systems with Shared Electrolyte. II. Experimental," 158th Meeting of the Electrochemical Society, Hollywood, FL, October 1980.
19. Grimes, P., R. Bellows, and M. Zahn, "Power Dissipation in Shunt-Current Parasitic Process In Series-Connected Electrochemical Cells with Common Electrolyte," Electrochemical Society Meeting, Minneapolis, MN, May 1981.
20. Grimes, P., R. Bellows, and M. Zahn, "Parasitic Current Elimination In Series-Connected Electrochemical Cell Systems with Shared Electrolyte, Part III. - Channel Interconnects," Electrochemical Society Meeting, Minneapolis, MN, May 1981.
21. Zahn, M., E.O. Forster, E.F. Kelley, and R.E. Hebner, Jr., "Hydrodynamic Shock Wave Propagation After Electrical Breakdown," Proceedings of the Seventh International Conference on Conduction and Breakdown in Dielectric Liquids, W.F. Schmidt, Ed., Berlin, Germany. 1981, pp. 398-403.
22. Zahn, M., "Drift Dominated Unipolar Conduction Small Signal Impedance and Stability," 1981 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Whitehaven, PA, 1981, pp. 108-115.
23. Zahn, M., and M. Saidi, "Effects of Fluid Flow on the Electric Field Distribution In Charged Liquid Dielectrics," 1982 IEEE International Symposium on Electrical Insulation, Philadelphia, PA, June 1982, pp. 281-282. **
24. Zahn, M., and Shi-Woo Rhee, "Electric Field Effects on Stabilization Against Bubbling, Small and Large Amplitude Waves, and Boundary Value Problems in Electrofluidized Beds - Models, Analysis, and Supporting Experiments," Conference Report of the Industrial Applications Society Annual Meeting, San Francisco, CA, October 1982, pp. 1027-1034. **
25. Zahn, M., D. Fenneman, T. Takada and S. Voldman, "Charging and Discharging Characteristics of a Capacitor with a Charge Injecting Electrode," 1982 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Amherst, MA, 1982, pp. 534-540. **
26. Grimes, P., R. Bellows, and M. Zahn, "Shunt Current Control in Electrochemical Systems - Theoretical Analysis," Recent Advances in Electrochemical Cell Design - AIChE Symposium, American Institute of Chemical Engineers Meeting, Houston, TX, March 1983.
27. Zahn, M., T. Takada, Y. Ohki, and J. Gottwald, "Charge Injection and Transport Analysis and Measurements in Highly Purified Water," 4th IEEE Pulsed Power Conference, Albuquerque, NM, June 1983, pp. 312-315. **
28. Zahn, M., "Charge Injection and Transport in a Lossy Capacitor Stressed by a Marx Generator," Proceedings of the First International Conference on Conduction and Breakdown in Solid Dielectrics, Toulouse, France, July 1983, pp. 34-39.

29. Gasworth, S.M., J.R. Melcher, and M. Zahn, "Flow-Induced Charge Accumulation and Field Generation in Thin Insulating Tubes," IEEE Conference Record of 1983 Interfacial Phenomena in Practical Insulating Systems, National Bureau of Standards, Gaithersburg, MD, September 1983, PP. 64-72. **
30. Gasworth, S.M., J.R. Melcher, and M. Zahn, "Induction Sensing of Electrokinetic Streaming Current," IEEE Conference Record of 1983 Interfacial Phenomena in Practical Insulating Systems, National Bureau of Standards, Gaithersburg, MD, September 1983, pp. 78-86. **
31. Zahn, M., and R. Shumovich, "Labyrinthine Instability in Dielectric Fluids," Conference Record IEEE Industry Applications Society Annual Meeting, Mexico City, Mexico, October 1983, pp. 1142-1148.**
32. Zahn M., and S. Rhee, "One Dimensional Small Signal Waves in Electro- fluidized Beds," Conference Record IEEE Industry Applications Society Annual Meeting, Mexico City, Mexico, October 1983, pp. 1002-1007.**
33. Zahn, M., T. Takada Y. Ohki, and J. Gottwald, "Charge Injection and Transport Analysis and Measurements in Highly Purified Water," Conference Record IEEE Industry Applications Society Annual Meeting, Mexico City, Mexico, October 1983, pp. 1034-1041.**
34. Zahn, M., and R. Shumovich, "Labyrinthine Instability in Dielectric Fluids," 1983 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Buck Hill Falls, PA, October 1983, pp. 170-175. **
35. Zahn, M., T. Takada, Y. Ohki, and J. Gottwald, "Charge Injection and Transport Analysis and Measurements in Highly Purified Water," 1983 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Buck Hill Falls, PA, October 1983, pp. 176-184. **
36. Gasworth, S.M., J.R. Melcher, and M. Zahn, "Charge Accumulation and Filtration in Insulating Expansions Filled with Agitated Dielectric Liquids," 1983 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Buck Hill Falls, PA, October 1983, pp. 200-209. **
37. Zahn, M., Y. Ohki, and H. Matsuzawa, "Kerr Electro-optic Field Mapping Measurements in Ethylene Glycol/Water Mixtures as a Function of Mixture Ratio," 1984 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Claymont, DE, October 1983, pp. 297-306.
38. Zahn, M., and D.W. Ericson, "Electro-optic Field Mapping Measurements in Ethylene Carbonate," 1984 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Claymont, DE, October 1983, pp. 327-333. **
39. Zahn, M., Y. Ohki, J. Gottwald, K. Rhoads, and M. LaGasse, "Effects of Electrode Material on Charge Injection Transport, Energy Storage, and Dissipation in Highly Purified Water," Proceedings of 1984 IEEE Symposium on Electrical Insulation, Montreal, Canada, June 1984, pp. 304-310. **
40. Zahn, M., Y. Ohki, K. Rhoads, M. LaGasse, and H. Matsuzawa, "Effects of Electrode Material on Charge Injection and Transport in Highly Purified Water and Water/Ethylene Glycol Mixtures," IEEE Conference Record of 1984 Sixteenth Power Modulator Symposium, Washington, DC, June 18-20, 1984, pp. 259-267. **
41. Zahn, M., Y. Ohki, J. Gottwald, K. Rhoads, and M. LaGasse, "Effects of Electrode Material on Charge Injection and Transport in Highly Purified Water," Conference Record for Eighth International Conference on Conduction and Breakdown in Dielectric Liquids, Pavia, Italy, July 24-27, 1984, pp. 88-95. **
42. Zahn, M., "Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Dielectrics," Proceedings of the International Conference on Properties and Applications of Dielectric Materials, Xi'an, China, June 1985, pp. 40-44.
43. Zahn, M., and J. Mescua "Double Injection Charge Transport in Dielectrics," Proceedings of the 5th IEEE Pulsed Power Conference, Arlington, VA, June 1985, pp. 331-334. **
44. Rhoads, K.G., M. Zahn, M. Ishii, and M. Yoda, "Electro-optic Field and Charge Measurements in Water/Ethylene Glycol Mixtures Using an Optical Multichannel Analyzer System," Proceedings of the 5th IEEE Pulsed Power Conference, Arlington, VA, June 1985, pp. 8-11. **
45. Zahn, M., and J. Mescua "Electro-optic Field Mapping Measurements and Charge Transport Analysis in High Voltage Stressed Dielectrics," 18th Symposium on Electrical Insulating Materials, Tokyo, Japan, September 30-October 1, 1985, pp. 25-38.
46. Zahn, M., and J. Mescua, "Bipolar Charge Transport Analysis in High Voltage Stressed Dielectrics," 1985 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Buffalo, NY, October 1985, pp. 103-108.
47. LaGasse, M.J., M. Zahn, and J. Huang, "Kerr Electro-optic Field Mapping Measurements in Highly Purified Water Between Coaxial Electrodes," 1985 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Buffalo, NY, October 1985, pp. 89-95. **
48. Zahn, M., and L. Antis, "Effects of Injected Charge on Electric Field Distributions in Pulse Power Dielectrics," Workshop on Electrical Quantities in Pulse Power Systems - II, Gaithersburg, MD, March 1986, pp. 11-16. **

49. Zahn, M., J. Mescua, and L. Antis, "Space Charge Effects in High Voltage Stressed Dielectric Liquids," Conference Record of the 1986 IEEE International Symposium on Electrical Insulation, Washington, DC, June 1986, pp. 76-81. **
50. Zahn, M., M. Hikita, K.A. Wright, and C.M. Cooke, "Kerr Electro-optic Field Mapping Measurements in Electron Beam Irradiated Polymethylmethacrylate," Proceedings of the 2nd International Conference on Conduction and Breakdown in Solid Dielectrics, Erlangen, Germany, July 1986, pp. 489-493.
51. Cooke, C.M., M. Zahn, K.A. Wright, and M. Hikita, "Space Charge Accumulation in Polymethylmethacrylate Resulting from Electron Beam Irradiation," IEEE 23rd Conference on Nuclear and Space Radiation Effects, Providence, RI, July 1986.
52. Zahn, M., J. Brennan, R. Carreras, C.M. Cooke, M. Hikita, M. Masui, H. Reyes, K. Rhoads, S. Shepard, G. Sun, T. Wang, and K.A. Wright, "Kerr Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Gas, Liquid, and Solid Dielectrics," Conference Report of the 1986 IEEE Industry Applications Society Annual Meeting, Denver, CO, September-October, 1986, pp. 1260-1265. **
53. Zahn, M., L. Antis, and J. Mescua, "Computation Methods for One-dimensional Bipolar Charge Injection," Conference Report of the 1986 IEEE Industry Applications Society Annual Meeting, Denver, CO, September-October, 1986, pp. 1307-1315. **
54. Moissis, A.A., and M. Zahn, "Electrofluidized Bed Responses to Small Signal Excitations," Conference Report of the 1986 IEEE Industry Applications Society Annual Meeting, Denver, CO, September-October, 1986, pp. 1396-1403. **
55. Cooke, C.M., K.A. Wright, M. Hikita, and M. Zahn, "Trapped Charge Distributions in PMMA from Energetic Electron Irradiation by Electro-optic Measurements," 1986 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Claymont, DE, November 1986, pp. 43-49.
56. Melcher, J.R., D. Lyon, and M. Zahn, "Flow Electrification in Transformer Oil/Cellulosic Systems," 1986 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Claymont, DE, November 1986, pp. 257-265. **
57. Carreras, R.F., and M. Zahn, "Kerr Electro-optic Field Mapping Measurements in High Voltage Stressed Liquid and Gaseous Sulfur Hexafluoride," 1986 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Claymont, DE, November 1986, pp. 287-292. **
58. Hikita M., M. Zahn, C.M. Cooke, K.A. Wright, and J. Brennan, "Kerr Electro-optic Field and Charge Mapping Measurements in Electron Beam Irradiated Polymethylmethacrylate (PMMA) in Air and Vacuum," 6th IEEE Pulsed Power Conference, Arlington, VA, June 1987, pp. 653-656. **
59. Zahn, M., T.D. Wang, and G. Sun, "Charge Injection and Transport in Polymethylmethacrylate," 6th IEEE Pulsed Power Conference, Arlington, VA, June 1987, pp. 650-652. **
60. Rhoads, K.G., and M. Zahn, "Kerr Electro-optic Field and Charge Mapping Measurements Focusing on the Metal Electrode/Water Interface," 6th IEEE Pulsed Power Conference, Arlington, VA, June 1987, pp. 50-53. **
61. Zahn, M., and R.B. Ortega, "Fringing Field Effects in Short Circuited Volume-charged Dielectrics," 1987 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Gaithersburg, MD, October 1987, pp. 294-299. **
62. Hikita, M., C.M. Cooke, M. Zahn, K.A. Wright, and J. Brennan, "Electric Field and Charge Profiles of Electron Beam Irradiated PMMA Until Breakdown Using Kerr Electro-optic Measurements," 1987 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Gaithersburg, MD, October 1987, pp. 300-306. **
63. Morin II, A.J., J.R. Melcher, and M. Zahn, "An Absolute Charge Sensor for Fluid Electrification Measurements," Conference Record of the 1988 IEEE International Symposium on Electrical Insulation, Boston, MA, June 1988, pp. 18-22. **
64. Zahn, M., "Transient Charge Conduction in High Field Stressed Dielectrics," Conference Record of the 1988 IEEE International Symposium on Electrical Insulation, Boston, MA, June 1988, pp. 282-286.
65. Washabaugh, A.P., M. Zahn, and J.R. Melcher, "Electrokinetic Pumping Using Traveling Wave High Voltages," Conference Report of the 1988 IEEE Industry Applications Society Annual Meeting, Pittsburgh, PA, October 1988, pp. 1563-1569. **
66. Morin II, A.J., M. Zahn, and J.R. Melcher, "Equilibrium Electrification Parameters Inferred from Couette Charger Terminal Measurements," 1988 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Ottawa, Canada, October 1988, pp. 286-292. **
67. Sheen, D., T. Fujiwara, and M. Zahn, "Sensitive Low Field Kerr Electro-Optic Measurements in Transformer Oil," 1988 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, Ottawa, Canada, October 1988, pp. 334-339. **

68. Brennan III, F.F., and M. Zahn, "Preliminary Kerr Electro-Optic Field Measurements in Melted Polyethylene," Proceedings of the 3rd International Conference on Conduction and Breakdown in Solid Dielectrics, Trondheim, Norway, July 1989, pp. 555-559. **
69. Zahn, M., "Kerr Electro-Optic Field and Charge Mapping Measurements in Dielectric Gasses, Liquids and Solids," (Invited) Proceedings of the Sixth International Symposium on High Voltage Engineering, New Orleans, LA, August 1989, paper #50.01.
70. Morin II, A.J., M. Zahn, and J.R. Melcher, "Fluid Electrification Measurements in Transformer Pressboard/Oil Insulation," Proceedings of the Sixth International Symposium on High Voltage Engineering, New Orleans, LA, August 1989, paper #13.13. **
71. Washabaugh, A.P., M. Zahn, and J.R. Melcher, "Electrokinetic Pumping of Semi-Insulating Liquids Using Traveling Wave High Voltages," Proceedings of the Sixth International Symposium on High Voltage Engineering, New Orleans, LA, August 1989, paper #13.12. **
72. Kanematsu, A. and M. Zahn, "Kerr Electro-Optic Field Mapping Measurements in Liquid Nitrogen," 1989 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Leesburg, VA, Oct. 1989, pp. 429-434.
73. Morin II, A.J., M. Zahn, and J.R. Melcher, "Effects of Temperature and Moisture on Flow Electrification in Transformer Pressboard/Oil Insulation," 1989 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Leesburg, VA, Oct. 1989, pp. 384-385. **
74. Howells, E., M. Zahn, and S.R. Lindgren, "Static Electrification Effects in Transformer Oil Circulating Pumps," Proceedings of the IEEE Transmission and Distribution Conference, New Orleans, LA, April 1989.
75. Zahn, M., J.R. Melcher, and H.A. Haus, "Experimental Demonstrations for Teaching Electromagnetic Fields and Energy," Proceedings of the IEEE Antennas and Propagation Symposium, Vol. 4, Dallas, TX, May 1990, pp. 1667-1670.
76. M. Zahn, "Kerr Electro-Optic Field Mapping Measurements in Electron Beam Irradiated Dielectrics" (Invited) XIV International Symposium on Discharges and Electrical Insulation in Vacuum, Santa Fe, NM, Sept. 1990, pp. 286-298.
77. Jansen, E.W. and M. Zahn, "Drift/Diffusion Conduction Model for Flow Electrification," 1990 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Pocono Manor, PA, Oct. 1990, pp.672-677. **
78. Washabaugh, A.P., P.A. von Guggenberg, and J.R. Melcher, "Temperature and Moisture Transient Flow Electrification Measurements of Transformer Pressboard/Oil Insulation Using a Couette Facility," 3rd International Conference on Properties and Applications of Dielectric Materials, July 1991, Tokyo, Japan, pp. 867-870. **
79. Washabaugh, A.P., M. Zahn, and J.R. Melcher, "Enhanced Electrification Charge Densities Due to Recirculatory Flow," 3rd International Conference on Properties and Applications of Dielectric Materials, July 1991, Tokyo, Japan, pp. 272-275. **
80. Jansen, E.W. and M. Zahn, "A Drift/Diffusion Conduction Model for Flow Electrification of Turbulent Liquid Dielectric Materials," 3rd International Conference on Properties and Applications of Dielectric Materials, July 1991, Tokyo, Japan, pp. 858-862. **
81. Imai, K., A. Kanematsu, M. Naweta, and M. Zahn, "Kerr Constant Frequency Dependence in Liquid Nitrogen," 3rd International Conference on Properties and Applications of Dielectric Materials, Tokyo, Japan, July 1991, pp. 280-283.
82. Zahn, M., "Electro-Optic Field and Space Charge Mapping Measurements in Gaseous, Liquid, and Solid Dielectrics," Interdisciplinary Conference on Dielectrics: Properties, Characterization, Applications, Antibes, France, March 1992, pp. 130-139.
83. Zahn, M., "Flow Electrification Charging in Electric Power Apparatus and Fuel Transfer Systems," Interdisciplinary Conference on Dielectrics: Properties, Characterization, Applications, Antibes, France, March 1992, pp. 258-267.
84. Zahn, M., "Charge Transport Analysis," Interdisciplinary Conference on Dielectrics: Properties, Characterization, Applications, Antibes, France, March 1992, pp. 85-96.
85. Lindgren, S.R., A.P. Washabaugh, P. von Guggenberg, M. Zahn, M. Brubaker, and J.K. Nelson, "Temperature and Moisture Transient Effects on Flow Electrification in Power Transforms," 1992 CIGRE Meeting, Paris, France. **
86. Zahn, M., A.P. Washabaugh, and J.W. Lou, "Electrical Breakdown in Transformers Due to Flow Electrification," 1993 IEEE 11th International Conference on Conduction and Breakdown in Dielectric Liquids, Baden-Dattwil, Switzerland, July 1993, pp. 322-331.**
87. Atten, P., B. Malraison, and M. Zahn, "Electrohydrodynamic Plumes in Point-Plane Geometry," 1993 IEEE 11th International Conference on Conduction and Breakdown in Dielectric Liquids, Baden-Dattwil, Switzerland, July 1993, pp. 534-538.
88. Zahn, M., P. Atten, and B. Malraison, "Abel Transforms Relating Kerr Effect Optical Phase Shifts and Axisymmetric Electric Field Distributions," 1993 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Pocono Manor, PA, October 1993, pp. 432-437.

89. Sheiretov, Y. and M. Zahn, "A Study of the Temperature and Moisture Dependent Dielectric Properties of Oil-Impregnated Pressboard," 1993 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Pocono Manor, PA, October 1993, pp. 487-492. **
90. Washabaugh, A.P. and M. Zahn, "Application of D.C. Voltages for Determining Flow Electrification Boundary Conditions," 1993 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Pocono Manor, PA, October 1993, pp. 74-79. **
91. Sheiretov, Y. and M. Zahn, "Dielectrometry Measurements of Moisture Dynamics In Oil-Impregnated Pressboard", Conference Record of the 1994 IEEE International Symposium on Electrical Insulation, June 5-8, 1994, Pittsburgh, PA, pp. 33-36. **
92. Washabaugh, A.P. and M. Zahn, "Flow Electrification Measurements In A Couette Flow Facility," Conference Record of the 1994 IEEE International Symposium on Electrical Insulation, June 5-8, 1994, Pittsburgh, PA, pp. 133-136. **
93. Zahn, M., "Kerr Effect Measurements with Non-Uniform Electric Field Distributions Whose Direction Changes Along the Light Path," Conference Record of the 1994 IEEE International Symposium on Electrical Insulation, June 5-8, 1994, Pittsburgh, PA, pp. 137-140. **
94. Zahn, M. and R. Hanaoka, "Kerr Electro-Optic Measurements of Transformer Oil In a Point-Plane Geometry," Proceedings of the 4th International Conference on Properties and Applications of Dielectric Materials, July 3-8, 1994, Brisbane, Australia, pp. 697-700.
95. Sheiretov, Y. and M. Zahn, "Dielectrometry Measurements of Spatial Moisture Profiles in Oil-Impregnated Pressboard," Proceedings of the 4th International Conference on Properties and Applications of Dielectric Materials, July 3-8, 1994, Brisbane, Australia, pp. 701-704. **
96. Washabaugh, A.P., and M. Zahn, "Terminal Voltage and Current Measurements Due to Flow Electrification," Proceedings of the 4th International Conference on Properties and Applications of Dielectric Materials, July 3-8, 1994, Brisbane, Australia, pp. 825-875. **
97. Zahn, M. and R. Hanaoka, "Kerr Electro-Optic Field Mapping Measurements Using Point-Plane Electrodes," Proceedings of the 2nd International Conference on Space Charge in Solid Dielectrics, April 2-7, 1995, Antibes-Juan-Les-Pins, France, pp. 360-372; also Supplement à la Revue "Le Vide": science, technique et applications," No. 275, January-March 1995.
98. Touchard, G., M. Zahn, and A.P. Washabaugh, "Relaxation Charge Development in Plastic Pipes," Proceedings of Electrostatics '95, York, England, April 3-6, 1995. **
99. Mamishev, A.V., Y. Du, and M. Zahn, "Measurement of Dielectric Property Distributions Using Interdigital Dielectrometry Sensors," Conference on Electrical Insulation and Dielectric Phenomena, Oct. 22-25, 1995, Virginia Beach, Virginia, pp. 309-312. **
100. Du, Y., M. Zahn, A.V. Mamishev, and D.E. Schlicker, "Moisture Dynamic Dielectrometry Measurements of Transformer Board Using A Three Wavelength Dielectrometry Sensor," 1996 IEEE International Symposium on Electrical Insulation, June 16-19, 1996, Montreal, Quebec, Canada, pp. 53-56. **
101. Mamishev, A.V. and M. Zahn, "Techniques for Semi-Empirical Characterization of Material and Sensor Properties in Interdigital Dielectrometry," 1996 IEEE International Symposium on Electrical Insulation, June 16-19, 1996, Montreal, Quebec, Canada, pp. 486-489. **
102. Schlicker, D. and M. Zahn, "Anomalous Oil Electrification Phenomena in Couette Flow Between Bare Stainless Steel Electrodes," 1996 IEEE International Symposium on Electrical Insulation, June 16-19, 1996, Montreal, Quebec, Canada, pp. 741-744 **
103. Üstündag, A. and M. Zahn, "Optical Tomography of Kerr Electro-Optic Measurements with Axisymmetric Electric Field," 1996 IEEE International Symposium on Electrical Insulation, June 16-19, 1996, Montreal, Quebec, Canada, pp. 462-465. **
104. Üstündag, A., T.J. Gung, and M. Zahn, "Kerr Electro-Optic Measurement Technique Determination of Nonuniform Electric Fields," 12th International Conference on Conduction and Breakdown in Dielectric Liquids, July 15-19, 1996, Rome, Italy, pp. 457-460. **
105. Badent, A., K. Kist, A.J. Schwab, A. Beroual, W.G. Chadband, M. Danikas, A.B. Sierota, Y. Torshin and Zahn, M., "Preliminary Report for the IEEE DEIS Liquid Dielectrics Committee International Study Group on 'Streamer Propagation in Liquids'," 12th International Conference on Conduction and Breakdown in Dielectric Liquids, July 15-19, 1996, Rome, Italy, pp. 375-378.
106. Washabaugh, A.P. A. Mamishev, Y. Du and M. Zahn, "Dielectric Measurements of Semi-Insulating Liquids and Solids," 12th International Conference on Conduction and Breakdown in Dielectric Liquids, July 15-19, 1996, Rome, Italy, pp. 381-384. **

107. Gung, T.J. A. Üstündag, and M. Zahn, "Kerr Electro-Optic Measurements of Nonuniform Axisymmetric Electric Field Distributions Using Point-Plane Electrodes," 1996 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, pp. 61-63, 73. **
108. Du, Y. and M. Zahn, "Dielectrometry Measurements of Effects of Anti-Static Additives on Transformer Board" (abstract only), 1996 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, p. 194. **
109. Schlicker, D. and M. Zahn, "Effects of Transformer Aged Oil on Electrification In a Couette Flow" (abstract only), 1996 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, p. 327. **
110. Mamishev, A.V., M. Zahn, B.C. Lesieutre, and B.A. Berdnikov, "Influence of Geometric Parameters on Characteristics of an Interdigital Dielectrometry Sensor," 1996 Annual Report for the Conference on Electrical Insulation and Dielectric Phenomena, pp. 550-553. **
111. Mamishev, A.V., B.A. Berdnikov, J.P. Rivenc, B.C. Lesieutre, and M. Zahn, "Surface Contact Effects on Interdigital Dielectrometry," 10th International Symposium on High Voltage Engineering, Aug. 25-29, 1997, Montreal, Canada, Vol. 6, pp. 357-360. **
112. Gung, T.J., A. Üstündag, and M. Zahn, "Kerr Electro-optic Measurements of Non-uniform Axisymmetric Electric Field Distributions Using Point-Plane Electrodes," 1997 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Minneapolis, MN, Oct. 19-22, 1997, pp. 222-225. **
113. Du, Y., M. Zahn, and B.C. Lesieutre, "Dielectrometry Measurements of Effects of Moisture and Anti-Static Additive on Transformer Board", 1997 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Minneapolis, MN, Oct. 19-22, 1997, pp. 226-229. **
114. Mamishev, A.V., B.C. Lesieutre, and M. Zahn, "Parameter Estimation Using an Interdigital Dielectrometry Sensor with Finite Element Software", 1997 Annual Report of the Conference on Electrical Insulation and Dielectric Phenomena, Minneapolis, MN, Oct. 19-22, 1997, pp. 234-237. **
115. Mamishev, A.V., Y. Du, B.C. Lesieutre, and M. Zahn, "Measurement of Stratified Distributions of Dielectric Properties and Dependent Physical Variables", 1997 Fall Meeting of the Materials Research Society, Dec. 1-5, 1997, Boston, MA, paper no. EE 4-11. **
116. Mamishev, A.V., C. Lin, Y. Du, B.C. Lesieutre, and M. Zahn, "Improvements of Algorithms for On-Line Interdigital Dielectrometry Measurement of Material Properties," IEEE International Symposium on Electrical Insulation, pp. 444-447, June, 1998. **
117. Mamishev, A.V., Y. Du, B.C. Lesieutre, and M. Zahn, "Development and Application of Multi-Wavelength Interdigital Dielectrometry Sensors and Parameter Estimation Algorithms," Electrostatics Society of America-Institute of Electrostatics Japan Joint Symposium on Electrostatics, San Francisco, CA, June 23-26, 1998, pp. 169-181. **
118. Mamishev, A.V., Y. Du, B.C. Lesieutre, and M. Zahn, "Measurement of Moisture Spatial Profiles in Transformer Pressboard," 1998 IEEE Conference on Electrical Insulation and Dielectric Phenomena, Atlanta, GA, October 25-28, 1998, pp. 323-326. **
119. Du, Y., A.V. Mamishev, B.C. Lesieutre, and M. Zahn, "Measurement of Moisture Diffusion as a Function of Temperature and Moisture Concentration in Transformer Pressboard," 1998 IEEE Conference on Electrical Insulation and Dielectric Phenomena, Atlanta, GA, October 25-28, 1998, pp. 341-344. **
120. Gung, T.J., A. Üstündag, and M. Zahn, "Kerr Electro-optic Measurement Tomography of Nonuniform Axisymmetric Electric Field Distributions Using Point-Plane Electrodes," 1997 Conference on Electrical Insulation and Dielectric Phenomena, pp. 222-225, Oct. 19-22, 1997, pp. 222-225. **
121. Gung, T.J., A. Üstündag, and M. Zahn, "Preliminary Kerr Electro-optic Field Mapping Measurements in Propylene Carbonate Using Point-Plane Electrodes," Electrostatics Society of America-Institute of Electrostatics Japan Joint Symposium on Electrostatics, June 23-26, 1998, pp. 95-106. **
122. Üstündag, A., T.J. Gung, and M. Zahn, "A New Reconstruction Algorithm for Kerr Electro-optic Measurement of Space Charge in Arbitrary Geometries," 1998 Conference on Electrical Insulation and Dielectric Phenomena, Oct. 26-28, 1998, Atlanta, GA, pp. 364-367. **
123. Zahn, M. "Optical, Electrical, and Electro-Mechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics," 1998 Conference on Electrical Insulation and Dielectric Phenomena, Oct. 26-28, 1998, Atlanta, GA, pp. 1-14. **
124. Mamishev, A.V., Y. Du, B.C. Lesieutre, and M. Zahn, "One-sided measurement of material dielectric properties using a liquid dielectric immersion technique," in Proceedings of the 1999 IEEE International Conference on Dielectric Liquids, Nara, Japan, pp. 341-344, July 1999. **
125. Goldfine, N., D. Schlicker, A. Washabaugh, D. Clark, and M. Zahn, "New Quasistatic Magnetic and Electric Field Imaging Arrays and Algorithms for Object Detection, Identification, and Dissemination," Proceedings of SPIE (International Society of Optical Engineering), Detection and Remediation Technologies for Mines and Minelike Targets IV, Vol. 3, 710, pp. 89-100, 5-9 April, 1999.

126. Du, Y., A.V. Mamishev, B.C. Lesieutre, and M. Zahn, "Measurements of moisture solubility for differently conditioned transformer oil," in Proceedings of the 13th International Conference on Conduction and Breakdown in Dielectric Liquids, Nara, Japan, pp. 357-360, July 1999. **
127. Üstündağ, A., and M. Zahn, "Theoretical Fringe Pattern Based Kerr Electro-Optic Measurements in Two Dimensional and Axisymmetric Electrode Geometries," 2nd International Workshop on Electrical Conduction, Convection, and Breakdown in Fluids, 4-5 May, 2000, Grenoble, France, pp. 71-74. **
128. Zahn, M., "Nonlinear Ferrofluid Duct Flow Profiles in Alternating and Traveling Wave Magnetic Fields," 20th International Congress on Theoretical and Applied Mechanics, August 27 – September 2, 2000, Chicago, Illinois.
129. Zahn, M., Y. Du, and A. Mamishev, "Interdigital Frequency-Wavelength Dielectrometry Sensor Design and Parameter Estimation on Electric Charges in Non-Conductive Materials (CSC'4), Tours, France, 1-6 July 2001, pp. 87-95.**
130. Cantrell, S.H., A.V. Mamishev, and M. Zahn, "Uncertainty Analysis for Multiple Penetration Depth Dielectrometry," International Conference on Advances in Processing, Testing and Applications of Dielectric Materials, Sept. 17-19, 2001, Wroclaw Poland, pp. 119-122. **
131. Helgeson, A. and M. Zahn, "Kerr Electro-Optic Measurements of Space Charge Effects in High Voltage Pulsed Propylene Carbonate Using Parallel-Plate Electrodes," International Symposium on Electrical Insulation, April, 2002, Boston, MA, pp. 298-301. **
132. Shay, I.C. and M. Zahn, "Cylindrical Geometry Electroquasistatic Dielectrometry Sensors," 2002 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, October 20-24, 2002, Cancun, Quintana Roo, Mexico, pp. 126-129. **
133. Helgeson, A. and M. Zahn, "Comparison of Electric Field and Charge Density Distributions Using the Kerr Electro-Optic Method with Blade-Plane and Point-Plane Electrodes," 2002 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, October 20-24, 2002, Cancun, Quintana Roo, Mexico, pp. 827-831.**
134. Du, Y., M. Zahn, N. Altamirano, M. Darda, A.V. Mamishev, and B.C. Lesieutre, "Moisture and Temperature Effects on the Dielectric Spectrum of Transformer Pressboard," 2002 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, October 20-24, 2002, Cancun, Quintana Roo, Mexico, pp. 878-881. **
135. Mamishev, A.V., A.R. Takahashi, Y. Du, B.C. Lesieutre, and M. Zahn, "Assessment of Performance of Fringing Electric Field Sensor Arrays," 2002 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, October 20-24, 2002, Cancun, Quintana Roo, Mexico, pp. 918-921. **
136. Rinaldi, C., J.H. Lee, A.D. Rosenthal, T. Franklin, and M. Zahn, "Ferrohydrodynamics in Time-Varying Magnetic Fields," Proceedings of International Mechanical Engineering Conference and Exposition 2002, Nov. 17-22, 2002, New Orleans, LA. **
137. Rinaldi, C., X. He, A. Rosenthal, T. Franklin, C. Lorenz, and M. Zahn, "Theology and Behavior of Magnetic Fluids in Alternating/Rotating Magnetic Fields," Proceedings of the 4th ASME/JSME Joint Fluids Engineering Conference, 2003, ASME Fluids Engineering Division Summer Meeting, Honolulu, Hawaii, July 6-10, 2003, Paper FEDSM, 2003-45039.**
138. Rinaldi, C., A.D. Rosenthal, X. He, C. Lorenz, and M. Zahn, "Rotating Magnetic Field Effects in Suspensions of Magnetic Particles," Frontiers of Nano Engineering –2003, Brazil, Oct. 2-3, 2003.**
139. He, X. and M. Zahn, "Effective Magnetoviscosity for Ferrofluid Planar Couette Flow," XXI International Conference of Theoretical and Applied Mechanics, Warsaw, Poland, August 15-21, 2004.**
140. Rhodes, S.E., J.A. Perez, S.M. Elborai, S-H. Lee, and M. Zahn. "Ferrohydrodynamic Hele-Shaw Cell Flows and Instabilities with Simultaneous DC Axial and In-plane Rotating Magnetic Fields," XXI International Conference of Theoretical and Applied Mechanics, Warsaw, Poland, August 15-21, 2004.**
141. Rosensweig, R.E., S. Elborai, S-H. Lee, and M. Zahn. "Ferrofluid Meniscus Shape in an Applied Uniform Horizontal or Vertical Magnetic Field," XXI International Conference of Theoretical and Applied Mechanics, Warsaw, Poland, August 15-21, 2004.**
142. Franklin, T.A., J.W.M. Bush, and M. Zahn, "Ferrohydrodynamic Jets, Sheet Flows, and Instabilities," XXI International Conference of Theoretical and Applied Mechanics, Warsaw, Poland, August 15-21, 2004.**
143. Zahn, M. "Dual Ferrohydrodynamic and Electrohydrodynamic Flow Instabilities and Patterns," 5th International Electrohydrodynamics Workshop, Aug. 30-31, 2004, Poitiers, France.
144. Amin, M.S., T.F. Peterson, and M. Zahn, "Measurements of Electric Charge Associated With Evaporation and Condensation of Water on Metallic Surfaces as a Consequence of Pressure, Humidity, and Temperature Change," 5th International Electrohydrodynamics Workshop, Aug. 30-31, 2004, Poitiers, France.**
145. Rhodes, S., X. He, S.M. Elborai, S.-H. Lee, and M. Zahn, "Fluid Behavior in Uniform DC, AC, and Rotating Fields," 4th Société Française d'Electrostatique, Sept. 2-3, 2004, Poitiers, France.**
146. Amin, M.S., T.F. Peterson, and M. Zahn, "Advanced Faraday Cage Measurements of Charge and Open-Circuit Voltage Using Water Dielectrics," 4th Société Française d'Electrostatique, Sept. 2-3, 2004, Poitiers, France.**

147. Amin, M. S., T.F. Peterson, and M. Zahn, "Advanced Faraday Cage Measurements of Triboelectric Charge and Open-Circuit Voltage Using Teflon and Acrylic," 4th Société Française d'Electrostatique, Sept. 2-3, 2004, Poitiers, France.**
148. Amin, M.S., S. Elborai, S-H Lee, X. Lee, X. He, and M. Zahn, "New Surface Tension Measurement Techniques of Magnetic Fluids at an Interface between Different Fluids Using Perpendicular Field Instability," 49th Conference on Magnetism and Magnetic Materials," November 2004, Jacksonville, Florida.**
149. Lee, S-H, D-K Kim, M-C Kim, M.S. Amin, I-H Park, and M. Zahn, "Dynamic Characteristics of Superparamagnetic Oxide Nanoparticles in a Viscous Fluid under an External Magnetic Field," 15th Conference on Electromagnetic Fields, June 2005, Shenyang, China. **
150. Zahn, M. "Dual Ferrohydrodynamic and Electrohydrodynamic Flow Instabilities and Patterns in Uniform DC, AC, and Rotating Fields," 15th IEEE International Conference on Dielectric Liquids, Coimbra, Portugal, June 26 – July 1, 2005, pp. 161-164.
151. Zahn, M., "Derivation of the Korteweg-Helmholtz Electric and Magnetic Force Densities Including Electrostriction and Magnetostriction from the Quasistatic Poynting's Theorem", 2006 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, Oct. 15-18, 2006, Kansas City, MO; 2006 International Symposium on Electrohydrodynamics, Buenos Aires, Argentina, Dec. 4-6, 2006, pp. 3-6.
152. Lee, S-H, F.O. Sullivan, I-H Park, M. Zahn, L. Pettersson, R. Liu, O. Hjortstam, A. Jaksts, T. Auletta, and U. Gafvert, "Finite Element Analysis of Charge Transport in a Dielectric Liquid", 2006 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, Oct. 15-18, 2006, Kansas City, MO., pp. 129-132.**
153. O'Sullivan, F., S-H Lee, M. Zahn, L. Pettersson, R. Liu, O. Hjortstam, T. Auletta, and U. Gafvert, "Modeling the Effect of Ion Dissociation on Charge Transport in Transformer Oil", 2006 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, Oct. 15-18, 2006, Kansas City, MO., pp. 756-759.**
154. Mazumder, M. K., M. Zahn, R. Sharma, J. Zhang, C. Calle, C. Immer, and N. Mardesich, "Development of Self-Cleaning Transparent Dust Shields Using Low-Power Electrodynamics Fields for Solar Panels on Mars," ESA/IEEE-IAS/IEJ/SFE Conference on Electrostatics 2006, June 6-9, 2006, Berkeley, CA.
155. Thomas, Z. M., M. Zahn, and W. Yang, "Sensors for Measurement of Moisture Diffusion In Power Cables with Oil – Impregnated Paper," Sensors and Their Applications XIV, Liverpool, UK, 11-13 Sept. 2007, Journal of Physics: Conference Series 76 (2007) 012006.**
156. Wagner, T., A. Pascual-Leone, and M. Zahn, "Transcranial Magnetic Stimulation: Modeling the Induced Current Density," Ansoft Conference Boston, Oct. 19, 2007.**
157. Cantillon-Murphy, P., E. Adalsteinsson, and M. Zahn, "Numerical Simulations of Magnetic Fields and Spin Velocity for Unsaturated Ferrofluid Driven by External Static and Rotating Magnetic Fields," Joint Annual Meeting ISMRM-ESMRMB, 19-25 May 2007, paper #3250,
158. Cantillon-Murphy, P., E. Adalsteinsson, and M. Zahn, "Numerical Simulations of Magnetic Nanoparticle Suspensions as Interactive MRI Contrast Agents, COMSOL Conference Boston, 2007.**
159. O'Sullivan, F., J. G. Hwang, M. Zahn, O. Hjortstam, L. Pettersson, R. Liu, and P. Biller, "A Model for the Initiation and Propagation of Positive Streamers in Transformer Oil," IEEE International Symposium on Electrical Insulation, 8-11 June, 2008, pp. 210-214.**
160. Thomas, Z. M. and M. Zahn, "Dielectrometry Measurements of Moisture Diffusion and Temperature Dynamics In Oil Impregnated Paper Insulated Electric Power Cables," IEEE International Symposium on Electrical Insulation, 8-11 June, 2008 pp. 539-542.**
161. Hwang, J. G., F. O'Sullivan, M. Zahn, O. Hjortstam, L. A. A. Pettersson, and R. Liu, "Modeling of Streamer Propagation in Transformer Oil-Based Nanofluids," IEEE Conference on Electrical Insulation and Dielectric Phenomena, (CEIDP), 26-29 Oct. 2008, pp. 361-366.
162. Cheng, D. I., Rumpel II, J. M. Perkins, M. Zahn, C. G. Fonstad Jr., E. S. Cramer, R. Zuneska, and F. J. Cadieu, "Use of Patterned Magnetic Films to Retain and Orient Micro-Components During Fluidic Assembly," 53rd Annual Conference on Magnetism and Magnetic Materials, Austin, Texas, Nov. 10-14, 2008.
163. Cheng, D. I., Rumpel II, J. M. Perkins, M. Zahn, C. G. Fonstad Jr., E. S. Cramer, R. Zuneska, and F. J. Cadieu, "Use of patterned magnetic films to retain and orient micro-components during fluidic assembly," Proceedings of the 53rd Annual Conference on Magnetism and Magnetic Materials, presented 13 November, 2008.
164. Hwang, J. G., M. Zahn, F. O'Sullivan, L. A. A. Pettersson, O. Hjortstam, and R. Liu, "Electron Scavenging by Conductive Nanoparticles in Oil Insulated Power Transformers," Invited paper at the 2009 Electrostatics Joint Conference, Paper 1.1, (June 16-18, 2009, Boston University).
165. Huang, H-F, M. Zahn, E. Lemaire, and M.I. Shliomis, "Continuum modeling of micro-particle electrorotation in Couette and Poiseuille flows-the zero spin viscosity limit," 2009 Electrostatics Joint Conference, Paper 1.3 (June 16-18, 2009, Boston University)

166. Hwang, J. G., M. Zahn, L. A. A. Pettersson, O. Hjortstam, and R. Liu, "Modeling Streamers in Transformer Oil: The Transitional Fast 3rd Mode Streamer," Proceedings of the IEEE 9th International Conference on Properties and Applications of Dielectric Materials (ICPADM 2009), pp. 573-578.
167. Khushrushahi, S. and M. Zahn, "Ultrasound Velocimetry of Ferrofluid Spin-Up Flow Measurements Using a Spherical Coil Assembly to Impose a Uniform Rotating Magnetic Field", 12th International Conference on Magnetic Fluids, August 1-5, 2010, Sendai, Japan.
168. Khushrushahi, S. and M. Zahn, "Understanding Ferrofluid Spin-up Flows in Rotating Uniform Magnetic Fields", COMSOL Conference 2010, Oct. 7-9, 2010, Boston, MA.
169. Jadidian, J., G. Hwang, M. Zahn, N. Lavesson, O. Widlund, and K. Borg, "Migration-Ohmic Charge Transport in Liquid-Solid Insulation Systems," 17th IEEE International Conference on Dielectric Liquids (ICDL 2011), June 26-30, 2011, Trondheim, Norway.
170. Jadidian, J., and M. Zahn, "Unipolar Charge Transport in Oil-Pressboard Systems with Planar, Coaxial Cylindrical and Concentric Spherical Electrode Geometries, International Symposium on Electrical Insulating Materials 2011 (ISEIM 2011), September 6-11, 2011, Kyoto, Japan.
171. Jadidian, J., G. Hwang, M. Zahn, N. Lavesson, O. Widlund, and K. Borg, "Streamer Dynamics in Transformer Oil: Influence of Applied Voltage Rise-Time," 38th International Conference on Plasma Science, June 26-30, 2011, Chicago, Illinois.
172. Jadidian, J., J. G. Hwang, M. Zahn, N. Lavesson, O. Widlund, and K. Borg, "Streamer Initiation and Propagation in Transformer Oil Under Positive and Negative Impulse Voltage," Paper 1P-6, 18th IEEE International Pulsed Power Conference, June 19-23, 2011, Chicago, Illinois.
173. Khushrushahi, S., A. Guerrero, C. Rinaldi, and M. Zahn, "An Analysis of Spin-Diffusion Dominated Ferrofluid Spin-Up Flows in Uniform Rotating Magnetic Fields", COMSOL Conference Boston 2011, Oct. 13, 2011.
174. Weddemann, A., J. Jadidian, S. Khushrushahi, Y. Kim, and M. Zahn, "Ferromagnetic Materials for MEMS- and NEMS-Devices", COMSOL Conference Boston 2011, Oct. 13, 2011.
175. Khushrushahi, S., A. Weddemann, Y. Kim, and M. Zahn, "Planar Geometry Ferrofluid Flows in Spatially Uniform Sinusoidally Time-Varying Magnetic Fields", COMSOL Conference Boston 2011, Poster Session, Oct. 14, 2011.
176. Kim, Y.S., A. Weddemann, J. Jadidian, S. Khushrushahi, and M. Zahn, "Shape Optimization of Electric and Magnetic System using Level Set Technique and Sensitivity Analysis", COMSOL Conference Boston 2011, Poster Session, Oct. 14, 2011.

4. Other Major Publications (** Outgrowth of supervised student research)

1. Zahn, M., Solutions Manual for Electromechanical Dynamics, Part III, (Authors: H.H. Woodson & J.R. Melcher), John Wiley and Sons, 1969.
2. Zahn, M., "Conduction Phenomena in Dielectric Solids." Chapter 4 in 1976 Digest of Literature on Dielectrics, National Academy of Science, M.R. Wertheimer and A. Yelon, Editors, 206-239, 1976.
3. Rosensweig, R.E., M. Zahn, and T. Vogler, "Stabilization of Fluid Penetration Through a Porous Medium Using a Magnetizable Fluid," Thermomechanics of Magnetic Fluids, P. Berkovsky, Ed., Hemisphere Publishing Company, 195-211, 1978.
4. Zahn, M., Review of Physics of Dielectrics for the Engineer, by R. Coelho, in Journal of Electrostatics, 1980.
5. Zahn, M., and R.E. Rosensweig, "Second International Conference on Magnetic Fluids" (Guest Editorial), IEEE Trans. on Magnetics MAG-16, 171, March 1980.
6. Zahn, M., and Y. Inuishi, "U.S./Japan Seminar on Electrical Conduction and Breakdown in Dielectrics" (Guest Editorial), IEEE Trans. on Electrical Insulation EI-15, 129, June 1980.
7. Zahn, M., "Conference Reports, Second International Conference on Magnetic Fluids," Physics In Technology 11, 245-246, November 1980.
8. Rosensweig, R.E., G.R. Jerauld, and M. Zahn, "Structure of Magnetically Stabilized Fluidized Solids," Continuum Models of Discrete Systems 4, 0. Brulin and R.K.T. Hsieh, Eds., North Holland Publishing Co., 1981, pp. 137-144.
9. Rosensweig, R.E., M. Zahn, W.K. Lee, and P.S. Hagen, "Theory and Experiments in the Mechanics of Magnetically Stabilized Fluidized Solids," Theory of Dispersed Multiphase Flow, Academic Press, 359-384, 1982.
10. Takada, T., and M. Zahn, "Kerr Electro-optic Field Mapping Measurements in Highly Purified Water Capacitor." Proc. 16th Symposium on Electrical Insulating Materials, (in Japanese), Tokyo, Japan, September 1983, pp. 267-270.
11. Ohki, Y., T. Takada, and M. Zahn, "Measurement of Electric Field Distribution in Purified Water by Means of Kerr Effect," (in Japanese), Study Meeting for Electrical Discharges, IEE Japan, Kanazawa, Japan, August 4, 1984.
12. Ohki, Y., H. Matsuzawa T. Takada, and M. Zahn, "Kerr Constant of Water and Water/Ethylene Glycol Mixture," (in Japanese), Study Meeting for Electrical Discharges, IEE Japan, ED-84-68, Kyoto, Japan, September 14, 1984.

13. Gasworth, S.M., J.R. Melcher, and M. Zahn, "Electrification Problems Resulting from Liquid Dielectric Flow," Report EPRI EL-4501, Final Report of Research Project 1536-7 to Electric Power Research Institute, April 1986. **
14. Mehta, H., T.V. Oommen, and M. Zahn, "Update on EPRI Projects on Static Electrification," Minutes of the 53rd Annual International Conference of Doble Clients, Sec. 6-1301 to 1306, Boston, MA, April 1986.
15. Zahn, M., J.R. Melcher, and D. Lyon, "Electrokinetic Measurements of Flow Electrification in Dielectric Liquids," Proceedings of the EPRI Workshop on Static Electrification in Transformers, Monterey, CA, November 1986. **
16. Zahn, M., D. Lyon, and J.R. Melcher, "Flow Induced Electrification in Transformer Oil/Cellulosic Systems," Proceedings of the EPRI Workshop on Static Electrification in Transformers, Monterey, CA, November 1986. **
17. Zahn, M., "Space Charge Effects in Dielectric Liquids," in The Liquid State and Its Electrical Properties, NATO ASI Series, 367-430, 1989.
18. Morin II, A.J., M. Zahn, and J.R. Melcher, "Fluid Electrification Measurements of Transformer Pressboard/Oil Insulation in a Couette Charger Using an Absolute Charge Sensor," Public Service Electric and Gas/Electric Power Research Institute Workshop on Static Electrification in Transformers, Princeton, NJ, November 1989. **
19. Zahn, M., J.R. Melcher, and M.L. Silva, "Selected Demonstrations from Electromagnetic Fields and Energy," Videotapes of 26 demonstrations prepared at MIT, 1989-90.
20. Zahn, M. and R.E. Rosensweig, "Magnetic and Dielectric Fluids in Porous Media," in Advances in Porous Media, Volume 1, edited by M. Yavuz Corapcioglu, pp. 125-178, Elsevier, 1991.
21. Zahn, M., J.R. Melcher, and H.A. Haus, "Experimental Demonstrations for Teaching Electromagnetic Fields and Energy," in Computer Applications for Electromagnetic Education, Center for Computer Applications for Electromagnetic Education, Salt Lake City, UT, 1991.
22. Zahn, M., J.R. Melcher, and M.L. Silva, "Fundamental Demonstrations of Electromagnetic Fields and Energy," (videotapes) Center for Computer Applications in Electromagnetic Education, Salt Lake City, UT, 1991.
23. von Guggenberg, P.A., M. Zahn, and J.R. Melcher, "Diagnostic Methods for Moisture Detection in Transformer Insulation," Proceedings: Static Electrification in Power Transformers, June 1993, pp. 1-6-1- 1-6-24. **
24. Washabaugh, A.P., M. Zahn, and J.R. Melcher, "Temperature and Moisture Transient Flow Electrification Measurements of Transformer Pressboard/Oil Insulation Using a Couette Facility," Proceedings: Static Electrification in Power Transformers, June 1993, pp. 2-1-1 - 2-1-13. **
25. Washabaugh, A.P., M. Zahn, and J.R. Melcher, "A Flow Loop Facility for Electrification Measurements" Proceedings: Static Electrification in Power Transformers, June 1993, pp. 3-2-1 - 3-2-17. **
26. Washabaugh, A.P. and M. Zahn, "A Study of the Effects of BTA on Flow Electrification Using Rotating Cylindrical Electrodes," Proceedings: Static Electrification in Power Transformers, Sept. 28-30, 1994, Milwaukee, Wisconsin, EPRI TR-105019, Project 3334-78, May, 1995, pp. 2-7-1 to 2-7-28. **
27. Zahn, M. "Electric and Magnetic Fields in the Environment," in Encyclopedia of Energy Technology and the Environment, John Wiley and Sons, Inc., 1995, pp. 1089-1100.
28. Zahn, M., "Solid, Liquid, and Gaseous Electrical Insulation," in Encyclopedia of Applied Physics, VCH Publishers, American Institute of Physics, 1997, pp. 431-466.
29. Zahn, M., "Power Dissipation and Magnetic Forces on MAGLEV Rebars," Final Report for MIT MAGLEV Project, Oct. 1995.
30. Zahn, M. and J.C. Weaver, "Electric and Magnetic Fields," Encyclopedia of Environmental Analysis and Remediation, John Wiley & Sons, Inc., 1998, pp. 1518-1533.
31. Washabaugh, A.P. and M. Zahn, "Static Electrification", in the Encyclopedia of Electrical and Electronic Engineering, John Wiley & Sons, Inc., Vol. 20, pp. 423-435, 1999. **
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. Luis, J., M. Zahn, and T. Keim, "Detection and Mitigation of Arcs in Automotive Electrical Systems," MIT/Industry Consortium on Advanced Automotive Electrical/Electronic Components and Systems, Consortium Project Report, Research Unit 7b.1, Sept. 2002, January 21, 2003. **
36. Mishrikey, M.D., T. Keim, and M. Zahn, "Emission Detection Method of Arcs in Automotive Systems, MIT/Industry Consortium on Advanced Automotive Electrical/Electronic Components and Systems, Consortium Project Report, Research Unit 7b.1, March 12, 2004. **
37. 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.

38. 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, pp. 1731-1748, 2004.**
39. Calero, V., C. Rinaldi, and M. Zahn, "Magnetic Fluid and Magnetic Nanoparticle Based Sensors," Encyclopedia of Sensors, Edited by C.A. Grimes, E.C. Dickey, and M.V. Pishko, American Scientific Publishers, Vol. 5, pp. 389-401, 2006. **
40. Sundara-Rajan, K., A. V. Mamisher, and M. Zahn, "Fringing Electric and Magnetic Field Sensors," Encyclopedia of Sensors, Edited by C. A. Grimes, E. C. Dickey, and M. V. Pishko, American Scientific Publications, Vol. 4, pp.89-100, 2005.**
41. Zahn, M., "Obituary: Arthur Robert Von Hippel (1898-2003)," Nature Materials 3, 141, 2004.

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, Gaithersbur, 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 Moïssis), 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 Materiaux 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 Aerodynamique, 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 Aerodynamiques, Université de Poitiers, Poitiers, France.
69. July 12, 2001, "Fluid Measurements Using Optical, Electrical, and Electromechanical Methodologies", Laboratoire d'Etudes Aerodynamiques, 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; Dec. 6, 2006, International Symposium on Electrohydrodynamics, Buenos Aires, Argentina.
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. Sept. 30, 2003, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena," Brown University Fluid Mechanics Seminar, Providence, RI.
77. Oct. 27, 2003, "The Nanoscience and Nanotechnology of Magnetic Nanoparticles and Ferrofluids," 6th Annual BCC Conference Nanoparticles 2003, Cambridge, MA, Oct. 27-28, 2003.
78. Apr. 7, 2004, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena," Harvard University, Squishy Physics Talk, David A. Weitz Research Group.
79. Aug. 16, 2004, "Ferrohydrodynamic Hele-Shaw Cell Flows and Instabilities With Simultaneous DC Axial and In-Phase Rotating Magnetic Fields," International Congress of Theoretical and Applied Mechanics, Session FM4: Complex Fluids.
80. Sept. 3, 2004, "Electrohydrodynamics and Reflections on the Work of Prof. Melcher," 4th Société Française d'Électrostatique, Sept. 2-3, 2004, Poitiers, France.
81. Nov. 15, 2004, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena," Yale University, New Haven, CT.
82. Jan. 20, 2005, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena," ABB Research Laboratories, Vasteras, Sweden.
83. Jan. 21, 2005, "The Nanoscience and Nanotechnology of Magnetic Liquids (Ferrofluids)," Royal Institute of Technology (KTH), Stockholm, Sweden.
84. Feb. 2, 2005, "The Nanoscience and Nanotechnology of Magnetic Liquids (Ferrofluids) for Biomedical Applications," BrainMap Seminar – Martinos Center, Charlestown, MA.
85. Aug. 18, 2005, "The Nanoscience and Nanotechnology of Magnetic Fluids (Ferrofluids) for Biomedical Applications," MIT Workshop on Nanofluid Technology.
86. Nov. 28 – Dec. 2, 2005, "Kerr Electro-Optic Field and Charge Mapping Measurements in Electron Beam Irradiated Polymethylmethacrylate (PMMA) in Air and in Vacuum," Materials Research Society Symposium on Electro Responsive Polymers and Their Applications.
87. Dec. 10, 2007, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics," Honeywell at Motherwell, England.
88. Dec. 11, 2007, "A Model for the Initiation and Propagation of Electrical Streamers in Transformer Oil and Transformer Oil Based Nanofluids," Strathclyde University, Glasgow, Scotland.
89. Dec. 12, 2007, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena," University of Manchester, Manchester, England.
90. Dec. 13, 2007, "Detection, Discrimination, and Identification of Hidden Materials Using Interdigital Dielectrometry and Magnetometry," University of Manchester, Manchester, England.
91. Dec. 14, 2007, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics"; Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena," Schlumberger Cambridge (England) Research, Cambridge, England.
92. Dec. 18, 2007, "Dielectrometry Measurements of Moisture Diffusion and Temperature Dynamics in Oil Impregnated Paper Insulated Electric Power Cables," Electric Energy and Power Systems research group at the University of Manchester, Manchester, England.
93. Dec. 20, 2007, "A Model for the Initiation and Propagation of Electrical Streamers in Transformer Oil and Transformer Oil-Based Nanofluids"; "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics; University of Manchester, Manchester, England.
94. April 03, 2008, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena in Magnetic and Dielectric Fluids," MIT Laboratory for Electromagnetic and Electronic Systems Colloquium.

95. May 19-20, 2008, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena and Applications in Magnetic and Dielectric Fluids," Microsoft Research Asia, Beijing, China (May 19, 2008); Google Tech Talk, Beijing, China (May 20, 2008).
96. May 21, 2008, "From MRI to Nanomaterials: Practical Applications of Electromagnetism and Commercialization of MIT Research," Zhejiang University, Hangzhou, China.
97. May 27-28, 2008, "Detection, Discrimination, and Identification of Hidden Materials Using Interdigital Dielectrometry and Magnetometry" and "Electromagnetic Fields and Applications" (May 27, 2008); "Technology, Transfer and Entrepreneurship: The MIT Experience"(May 28, 2008) Universiti Sains Malaysia, School of Electrical and Electronic Engineering, Penang, Malaysia.
98. Oct. 9, 2008, "Nonlinear Ferrohydrodynamics of Magnetic Fluids," Keynote Speaker at COMSOL 2008 Boston.
99. Jan.30, 2009, "A Model for the Initiation and Propagation of Electrical Streamers in Transformer Oil and Transformer Oil Based Nanofluids," Department of Electrical Engineering, High Voltage Laboratory, Tsinghua University, Beijing, China.
100. Mar. 23, 2009 (Technion) and Mar. 26, 2009 (Ben-Gurion University of the Negev), M. Zahn and H-F Huang, "Microfluidic, Biomedical, and Engineering Applications of Magnetic and Dielectric Fluid Suspensions, Department of Mechanical Engineering, Technion and Ben-Gurion University of the Negev, Israel.
101. June 16, 2009, "Electron Scavenging by Conductive Nanoparticles in Oil Insulated Power Transformers," Invited Speaker at the 2009 Electrostatics Joint Conference, Paper 1.1.
102. Dec.17-19, 2009, "A Pictorial View of MIT", "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena and Applications in Magnetic and Dielectric Fluids", Pusan National University, Busan, South Korea.
103. Jan. 23, 2010, "A Pictorial View of Massachusetts Institute of Technology (MIT)", "Descriptions and Videos of Flow Phenomena in Ferrohydrodynamic Magnetic Liquids (Ferrofluids) and Electrohydrodynamic Charge and Polarizable Liquids", Ecole Centrale de Lyon, Laboratoire Ampere, Lyon, France.
104. Jan. 19, 2010, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics", Ecole Centrale de Lyon, Laboratoire Ampere, Lyon, France.
105. Jan.21, 2010, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics" Schneider Electric, Grenoble, France.
106. Jan. 25, 2010, "James R. Melcher Memorial Lecture: "Electrohydrodynamics and Ferrohydrodynamics", "Rencontres Nicoises de Mecanique des Fluides" (Nice Fluid Mechanics Meeting) Observatoire de Nice, University of Nice, Nice, France.
107. Jan. 26, 2010, "Flow Phenomena in Ferrohydrodynamic Magnetic Liquids (Ferrofluids) and Electrohydrodynamic Charged Polarizable Liquids", Laboratoire de Physique de la Matière Condensée, University of Nice, France.
108. June 23, 2010, "Electrohydrodynamics and Ferrohydrodynamics", Department of Electrical, Computer, and Systems Engineering, Rensselaer Polytechnic University, Troy, NY.
109. July 21, 2010, "Optical, Electrical, and Electro-Mechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics", High Voltage Laboratory, Tsinghua University, Beijing, China.
110. July 23, 2010, "Electrohydrodynamics and Ferrohydrodynamics", Haier Corporate R&D Center, Qingdao, China.
111. July 24, 2010, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena and Applications in Magnetic and Dielectric Fluids", Hado Group, Wuxi, China and Nandasoft, Nanjing, China.
112. July 26-30, 2010, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena and Applications in Magnetic and Dielectric Fluids" and "Optical, Electrical, and Electro-Mechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics", High Voltage Laboratory, Chongqing University, Chongqing, China.
113. August 6, 2010, "Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena and Applications in Magnetic and Dielectric Fluids" and "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics", Toshiba Corp., Tokyo, Japan.
114. Oct. 15, 2010, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics", Graduate Power seminar at Arizona State University.
115. June 11, 2011, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics"; Ferrohydrodynamic and Electrohydrodynamic Flow Phenomena and Applications in Magnetic and Dielectric Fluids, North China Electric Power University, Baoding, China.
116. June 16, 2011, "Optical, Electrical, and Electromechanical Measurement Methodologies of Electric Field, Charge, and Polarization in Dielectrics", High Voltage Laboratory, Chongqing University, Chongqing, China.

Theses Supervised by Markus Zahn

AT MIT

SUMMARY

	<u>Total</u>	<u>Completed</u>	<u>In Progress</u>
Advanced Undergraduate Project (AUP)	2	2	0
S.B	35	35	0
S.M. and M. Eng.	39	38	1
Engineers	2	2	0
Doctoral			
As Supervisor:	22	20	2
As Reader:	23	18	5

Advanced Undergraduate Project (AUP)

1. Schubert, V., "Ferromagnetic Volume and Surface Flow Effects in a Uniform Rotating Magnetic Field," May, 2002.
2. Orji, U., "Characterizing the Behavior of Ferrofluids In External Magnetic Fields," May 2006.

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., "Ferromagnetic 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.
34. Schoen, K.L., "Design and Manufacture of a Modular Cylindrical Apparatus for Ferrofluid Experimentation", June, 2011 (Mechanical Engineering).
35. Snively, M.J., "Effects of Demagnetizing Factors on Transient Motion of Ferrofluid in a Uniform Rotating Magnetic Field", June, 2011 (Mechanical Engineering).

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," August 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.
35. Mishrikey, M. "Detection of Arcs in Automotive Electrical Systems," Jan. 2005.
36. Orji, U., "Ferrohydrodynamic Patterns In Rotating Magnetic Fields," June, 2007.

37. Lawler, C.T., "A Two-Phase Spherical Electric Machine for Generating Rotating Uniform Magnetic Fields," June, 2007.
38. Cannon, Benjamin L., "Electroquasistatic Sensor for Surface and Subsurface Nano-Imaging of Integrated Circuit Features," June, 2010 (co-supervised by M. Zahn, J. Lang, D. Trumper); (Winner of Ernst Guillemin EE SM Thesis Award)
39. Nowocin, John Kendall, "Increase of Electrical Breakdown Strength in Dielectric Liquids by Space Charge Shielding at Both Electrodes Due to Homocharge Injection", expected June 2013.

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," December, 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," October, 2005.
13. He, X., "Ferrohydrodynamic Flows in Rotating Magnetic Fields," September, 2006.
14. Elborai, S., "Ferrofluid Surface and Volume Flows in Uniform, Rotating Magnetic Fields," June, 2006.
15. O'Sullivan, F., "A Model for the Initiation and Propagation of Electrical Streamers in Transformer Oil and Transformer Oil Based Nanofluids," June, 2007.
16. Thomas, Z.M., Dielectrometry Measurements of Moisture Diffusion and Temperature Dynamics in Oil Impregnated Paper Insulated Electric Power Cables," June, 2007.
17. Cantillon-Murphy, P., "On the Dynamics of Magnetic Fluids in Magnetic Resonance Imaging," June, 2008 (co-supervised with Prof. E. Adalsteinsson).
18. Huang, Hsin-Fu, "Electromechanics and Electrorheology of Fluid Flow with Internal Micro-particle Electrorotation", June, 2010.
19. Hwang, J-W, "Elucidating the Mechanisms Behind Pre-Breakdown Phenomena in Transformer Oil Systems", June, 2010.
20. Khushrushahi S., "Ferrofluid Spin-Up Flows from Uniform and Non-Uniform Rotating Magnetic Fields Using Spherical Coils", June, 2010.
21. Zhang, X., "Kerr Electro-optic Electric Field and Space Charge Measurements in High-Voltage Stressed Dielectrics," expected June, 2013.
22. Jadidian, J., "Three Dimensional Positive and Negative Streamers in High-Voltage Stressed Dielectrics, expected June 2013.

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. Ernstmeier, 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," June 2004.
15. Gonzalez, L., "Migration of Submicron Nanomagnetic Particles in Magnetic Fluids Under Time/Space Varying Magnetic Fields," expected December 2008.
16. Levitan, J. "Experimental Investigation of Induced-Charge Electro-Osmosis," August, 2005.
17. Wagner, T., "Non Invasive Brain Stimulation: Modeling and Experimental Analysis of Transcranial DC Stimulation as a Modality for Neuropathology Treatment, January, 2006.
18. Knaian, A.N., "Electropermanent Magnetic Connectors and Actuators: Devices and Their Application in Programmable Matter," June, 2010.
19. Raman, V., "Continuous Size Based Separations of Nonmagnetic Particles Using Magnetophoresis," expected June, 2011.
20. Matlock, T., "Analytical Modeling Based on Experimental Characterization of a Cusped Field Thruster", expected, June 2013.
21. MacKenzie, I., "Force-Linear Reluctance Actuators," expected, June 2014.
22. Amin-Shahidi, D., expected, June 2014.
23. Araghchini, Mohammad, expected, June, 2014.

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.