

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: August 1, 2005

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.

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

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

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

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

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

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

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

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

| <u>Rank</u> | <u>Beginning</u> | <u>Ending</u> |
|---|------------------|---------------|
| Instructor | July 1969 | Aug. 1970 |
| Visiting Associate Professor | Sept. 1976 | Aug. 1977 |
| Associate Professor (without tenure) | July 1980 | June 1986 |
| Associate Professor (with tenure) | July 1986 | June 1992 |
| Professor | June 1992 | Dec. 2003 |
| Thomas and Gerd Perkins Professorship in Electrical Engineering | Sept. 2000 | Aug. 2005 |

10. Consulting Record:

| <u>Firm</u> | <u>Beginning</u> | <u>Ending</u> |
|--|------------------|---------------|
| National Bureau of Standards | Jun. 1972 | Jul. 1975 |
| Exxon Research and Engineering Co. | Dec. 1973 | Dec. 1983 |
| Lipe-Rollway Corp. | Sep. 1977 | Oct. 1977 |
| Dow Chemical Co. | Jan. 1981 | Dec. 1983 |
| Teleco Oilfield Services | Mar. 1983 | Dec. 1989 |
| Barry Blesser, Consultant | Oct. 1983 | Dec. 1983 |
| Philips Laboratories | Dec. 1983 | Dec. 1984 |
| International Paper Co. | Jan. 1984 | Dec. 1991 |
| Optical Diagnostic Services | Oct. 1984 | Dec. 1985 |
| Ferrofluidics Corp. | Nov. 1984 | 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 |

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| 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 | Present |
| General Electric Global Research | Jul. 2002 | Present |
| Calgon Carbon Co. | Feb. 2002 | Present |
| Ford Motor Co. | May. 2004 | Present |

11. Department and Institute Committees, Other Assigned Duties:

| <u>Activity</u> | <u>Beginning</u> | <u>Ending</u> |
|---|------------------|---------------|
| Undergraduate Counselor (Dept.) | Sep. 1980 | Present |
| Graduate Committee on Admissions and Fellowships (Dept.) | Jan. 1984 | Present |
| Edgerton Award Committee (Inst.) | Sep. 1984 | Jun. 1985 |
| Preliminary Written Examination Committee (Dept.) | Sep. 1987 | Dec. 1998 |
| Committee for Faculty Resolution on Prof. Melcher (Inst.) | | Jan. 1991 |
| Graduate Counselor (Dept.) | Feb. 1991 | June 1992 |
| Freshman Advisor/Freshman Seminar | Sep. 1991 | 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 | Present |
| MIT Faculty Committee on the Library System | Sep. 1999 | Aug. 2002 |
| Chairman of the MIT Faculty Committee on the Library System | Sep. 2001 | Aug. 2004 |
| Member, Lemelson-MIT Screening Committee | Oct. 2002 | Present |

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, <u>IEEE 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 | | Oct. 1979 |
| 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</u> | 1980 | Present |
| General Chairman, IEEE Second International Conference on Magnetic Fluids | | Mar. 1980 |
| Guest Editor, <u>IEEE Transactions on Magnetism</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 |

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

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 |

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

14. Current Organization Membership:

Organization

IEEE
Dielectrics and Electric Insulation Society

Offices Held

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

Electrostatics Society of America

15. Patents and Patent Applications Pending:

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

7. H. Zakheim, J.D. Goldschneider, M. Zahn, and C.L. Hoffmeyer, "Process and Apparatus for Magnetic Media Milling," U.S. Patent No. 5,178,338, January 12, 1993.
8. H. Zakheim, P.M. Clinton, J.D. Goldschneider, C.A. Kasmer, M. Zahn, and C.L. Hoffmeyer, "A Process and Apparatus for Magnetic Media Milling," U.S. Patent No. 5,183,214, February 2, 1993.
9. N.J. Goldfine, D.E. Schlicker, M. Zahn, and W.D. Ryan, "Magnetometer with waveform shaping," U. S. Patent No. 6,144,206, November 7, 2000.
10. D.E. Schlicker, N.J. Goldfine, M. Zahn, and W.D. Ryan, "Detection Array for Buried Objects," Application Filed, November 7, 1997.
11. N.J. Goldfine, D.E. Schlicker, M. Zahn, and W.D. Ryan, "Magnetometer and Dielectrometer Detection of Subsurface Objects," International Application Number: PCT/US98/00102, January 6, 1998 (International Filing Date).
12. N.J. Goldfine, M. Zahn, A.V. Mamishev, D.E. Schlicker, and A.P. Washabaugh, "Methods for Utilizing Dielectrometry Signals Using Property Estimation Grids," International Application Number: PCT/US99/10393, May 12, 1999.
13. R. Miller and M. Zahn, "Longitudinal Field Driven 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.
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.
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.

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 |

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| 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

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|-------|-------|---|-------------------------|
| 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 |

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| 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 |

Other Teaching Experience

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

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

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

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

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

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

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

Publications of Markus Zahn

1. Books

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

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

1. Zahn, M., and J.R. Melcher, "Space Charge Dynamics of Liquids," *Physics of Fluids* 15, 1197-1206 and 2082, 1972.
2. Zahn, M., "Dynamics of Stratified Liquids In the Presence of Space Charge," *Physics of Fluids* 15, 1408-1417, 1972.
3. Zahn, M., "Self-excited AC High Voltage Generation Using Water Droplets," *American Journal of Physics* 41, 196-202, 1973.
4. Zahn, M., and J.K. Skinner, "Self-excited Alternating Operation of Coupled Commutator Machines," *Journal of the Franklin Institute* 296, 1-13, 1973.
5. Zahn, M., R.L. Goslin, and L. Wicks, "Self-excited Alternating High Voltage Generation Using a Modified Electrostatic Influence Machine," *American Journal of Physics* 42, 289-294, 1974.
6. Zahn, M., and R.J. Sojka, "Space Charge Dynamics of Viscous Liquids," *Physics of Fluids* 17, 490-492, 1974. **
7. Zahn, M., "Space Charge Coupled Interfacial Waves," *Physics of Fluids* 17, 343-352, 1974.
8. Cassidy, E.C., R.E. Hebner, M. Zahn, and R.J. Sojka "Kerr Effect Studies of An Insulating Liquid Under Varied High Voltage Conditions," *IEEE Transactions on Electrical Insulation* EI-9, 43-56, 1974.**
9. Zahn, M., C.F. Tsang, and S.C. Pao, "Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction," *Journal of Applied Physics* 45, 2432-2440, 1974. **
10. Zahn, M., "Surface Coupled Interfacial Waves for Self-Gravitating Systems," *Physics of Fluids* 17, 2130-2132, 1974.
11. Zahn, M., and S.C. Pao, "Effects of Step Changes in Excitation from a Steady State on the Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction. I. Step Changes in Current," *Journal of Electrostatics* 1, 235-248, 1975. **
12. Zahn, M., and S.C. Pao, "Effects of Step Changes in Excitation from a Steady State on the Transient Electric Field and Space Charge Behavior for Unipolar Ion Conduction. II. Step Changes in Voltage," *Journal of Electrostatics* 1, 249-264, 1975. **
13. Zahn, M., S.C. Pao, and C.F. Tsang, "Effects of Excitation Risetime and Charge Injection Conditions On the Transient Field and Charge Behavior for Unipolar Ion Conduction," *Journal of Electrostatics* 2, 59-78, 1976.**
14. Zahn, M., "On the Gravitational Instability of an Infinite Homogeneous Medium," *American Journal of Physics* 44, 29-31, 1976.
15. Zahn, M., "Drift Dominated Conduction Within An Ohmic Medium," *Journal of Applied Physics*, Vol. 47, pp. 3122-3126, 1976.
16. Zahn, M., "Point Charge Between Two Parallel Grounded Planes," *American Journal of Physics* 44, 1132-1134, 1976.
17. Zahn, M., "Transient Drift Dominated Unipolar Conduction Between Concentric Cylinders and Spheres," *IEEE Transactions on Electrical Insulation*, EI-11, 150-157, 1976.
18. Zahn, M., and H. Chatelon, "Charge Injection Between Concentric Cylindrical Electrodes, *Journal of Applied Physics* Vol. 48, pp. 1797-1805, 1977. **
19. Zahn, M., "Transient Drift Dominated Conduction In Dielectrics," *IEEE Transactions on Electrical Insulation* EI-12, 176-190, 1977.
20. Zahn, M., "Impact Charging of an Isolated Cylinder with Skewed Field and Flow," *Journal of Electrostatics* 5, 85-99, Sept. 1978.
21. Zahn, M., and R.E. Rosensweig, "Stability of Magnetic Fluid Penetration Through a Porous Medium with Uniform Magnetic Field Oblique to the Interface," *IEEE Transactions on Magnetics* MAG-16, 275-282, March 1980.
22. Zahn, M., and K.E. Shenton, Eds., "Magnetic Fluids Bibliography," *IEEE Transactions on Magnetics* MAG-16, 387-415, March 1980.
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., "Ferrohydrodynamic 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. 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. **
50. 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. **
51. 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.
52. Zahn, M. and H.A. Haus, "Contributions of Prof. James R. Melcher to Engineering Education," *Journal of Electrostatics* 34, pp. 109-162, March 1995.
53. 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. **
54. 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. **
55. 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. **
56. 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. **
57. 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.
58. Zahn, M. "Power Dissipation and Magnetic Forces on MAGLEV Rebars," *IEEE Transactions on Magnetics*, Vol. 33, No. 2, March 1997, pp. 1021-1036.**
59. 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. **
60. 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. **
61. 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.
62. 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. **
63. 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. **
64. 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. **
65. 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. **
66. 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. **
67. 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. **
68. 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. **
69. 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. **
70. 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. **

71. 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. **
72. 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. **
73. 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. **
74. Zahn, M., "Magnetic Fluid and Nanoparticle Applications to Nanotechnology," Journal of Nanoparticle Research, Vol. 3, pp. 73-78, 2001.
75. 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. **
76. 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. **
77. 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. **
78. 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.
79. 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.
80. Rinaldi, C. and M. Zahn, "Spin/Magnetization Coupling in Spin-Up Flow of Ferrofluids," submitted to the Journal of Fluid Mechanics, 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, "Theory and Measurements of Ferrofluid Meniscus Shape in Applied Uniform Horizontal and Vertical Magnetic Fields," 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., X. He, S.M. Elborai, M. Muhammed, and M. Zahn, "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. Choi, I. Park, and M. Zahn, "Evaluation of the Mechanical Deformation in Incompressible Magnetic Material Using Various Electromagnetic Force Density Methods," *Journal of Applied Physics*, Vol. 10, E108.1-3, 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," accepted for publication in *NeuroImage*, 2005.**
99. Rinaldi, C., A. Chavez, S. Elborai, X. He, and M. Zahn, "Magnetic Fluid Rheology and Flows," accepted for publication in *Current Opinion in Colloid and Interface Science: Theory*, 2005.
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," accepted for publication in *Journal of Electrostatics*, 2005.**
101. Amin, M.S., T.F. Peterson, Jr., and M. Zahn, "Advanced Faraday Cage Measurements of Charge and Open-Circuit Voltage Using Water Dielectrics," accepted for publication in *Journal of Electrostatics*, 2005.**
102. Rhodes, S., X. He, S. Elborai, S.-H. Lee, and M. Zahn, "Magnetic Fluid Behavior in Uniform DC, AC, and Rotating Magnetic Fields," accepted for publication in *Journal of Electrostatics*, 2005.**
103. 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," submitted for publication in *NeuroImage*, 2005.

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," submitted to the 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. Üstündag, 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, "Rheology 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. 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.

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. Jerould, 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. Rinaldi, C., 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, submitted for publication 2005.

5. Internal Memoranda and Progress Reports

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

6. Invited Lectures

1. July 1975, "Kerr Electro-optic Field Mapping Measurements in Dielectrics," CNRS, Grenoble, France; also Swiss Federal Institute of Technology, High Voltage Lab, Zurich, Switzerland.
2. July 1976, "Electric Fields in Moving Media," Exxon Research and Engineering Company, Linden, NJ.
3. July 1978, "High Voltage Conduction in Breakdown Phenomena in Dielectrics," Hahn-Meitner Institute, Berlin, Germany.
4. January 1980, "Electric Fields and Moving Media," Purdue University, West Lafayette, IN.
5. January 1980, "Magnetic Fluids," Dow Chemical Company, Midland, MI.
6. February 1980, "Kerr Electro-optic Field Mapping Measurements," Drexel University, Philadelphia, PA. Also Gordon Research Conference on Dielectric Phenomena, Holderness School, Plymouth, NH, August 1980; and National Bureau of Standards, Gaithersburg, MD, December 1981.
7. January 1982, "Electrodynamics of Fluidized Beds," Dow Chemical Company, Wayland, MA.
8. March 1982, "Electrokinetics of Dielectric Liquids," Exxon Research and Engineering Company, Linden, NJ.
9. August 1982, "Electrets," Dow Chemical Company, Midland, MI.
10. November 1983, "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetizable Fluids," Philips Laboratories, Briarcliff Manor, NY.
11. December 1983, "Ferrohydrodynamics," Ferrofluidics Corp., Nashua, NH.
12. January 1984, "Kerr Electro-optic Field Mapping Measurements and Charge Transport Analysis in Dielectrics," IREQ, Hydro-Quebec Research Institute, Varennes, Quebec, Canada.
13. March 1984, "Electro-optic Field Mapping Measurements and Space Charge Transport in Highly Purified Water," State University of New York at Buffalo.
14. March 1984, "Electro- and Ferro-hydrodynamic Interactions with Fluids," Polaroid Corp., Waltham, MA.
15. March 1984, "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetizable Fluids," Sigma Xi, Hanscom Chapter, Bedford, MA. Also Bolt, Beranek and Newman, Cambridge, MA, June 1984.
16. June 1984, "Electro-optic Field and Space Charge Mapping Measurements in Highly Purified Water," Sandia National Laboratory, Albuquerque, NM; also Los Alamos National Laboratory, Los Alamos, NM.
17. July 1984, "Electro-optic Field and Space Charge Mapping Measurements and Charge Transport Analysis in High Voltage Stressed Liquid and Solid Dielectrics," CISE, Milan, Italy.
18. August 1984, "Electro-optic Field Mapping Measurements and Charge Transport Analysis in Highly Purified Water and Water/Ethylene Glycol Mixtures," Gordon Research Conference on Dielectric Phenomena Holderness School, Plymouth, NH.
19. September 1984, "Electrokinetic Phenomena in Hydrocarbon Liquids" (with S. Gasworth), MIT ILP Symposium "Emerging Applications of Continuum Electromechanics." Cambridge, MA.
20. February 1985, "Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Dielectrics," Maxwell Laboratories, Inc., San Diego, CA.
21. February 1985, "Charge Injection, Transport, Energy Storage and Dissipation in Highly Purified Water and Water/Ethylene Glycol Mixtures for Use in Pulse Power Systems," 1985 High Voltage Workshop sponsored by the IEEE Electron Devices Society, Naval Postgraduate School, Monterey, CA.
22. August 1985, "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetic Fluids," Westinghouse Research and Development Center, Pittsburgh, PA.
23. September-October 1985: "Charge Injection, Transport, Energy Storage, and Dissipation in Dielectrics"; "Electromagnetic Fields and Forces on Materials," Yamanashi University, Kofu, Japan. "Electrification in Flowing Dielectric Liquids," Waseda University, Tokyo, Japan. "Electro- and Ferro-hydrodynamic Interactions with Polarizable and Magnetizable Fluids," Tohoku University, Sendai, Japan. "Electro-optic

- Field Mapping Measurements and Charge Transport Analysis in High Voltage Stressed Dielectrics” and “Charge Injection, Transport, Energy Storage, and Dissipation in High Voltage Stressed Dielectrics,” 18th Symposium on Electrical Insulating Materials, Tokyo, Japan. “Charge Injection, Transport, Energy Storage, and Dissipation in Dielectrics” and “Electrical Charge Phenomena in Dielectrics and Their Applications,” Japan Institute of Electrical Engineers, Electrical Insulation Group, Osaka, Japan. “Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Dielectrics”; “Dielectric Requirements in Pulsed Power Systems”; “Charge Injection, Transport, Energy Storage, and Dissipation in Dielectrics” and “The Electrical Engineering Curriculum at MIT,” Musashi Institute of Technology, Tokyo, Japan.
24. October 1985, “Fluid Mechanics of Magnetizable Liquids,” MIT Department of Chemical Engineering, Cambridge, MA.
 25. July 1986, “Magnetic Field Gradient Effects on Magnetic Fluid Stabilization,” 4th International Conference on Magnetic Fluids, Tokyo and Sendai, Japan.
 26. August 1986, “Kerr Electro-optic Field Mapping Measurements in Dielectrics,” Gordon Research Conference on Dielectric Phenomena, Holderness, NH.
 27. October 1986, “Electric Field Effects on the Equilibrium, Stabilization, and Small Signal Response of Electrofluidized Beds,” (with Alex 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.
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'Electrostatique, 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.

Theses Supervised by Markus Zahn

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

Advanced Undergraduate Project (AUP)

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

S. B. Theses

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

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

S. M. and M. Eng. Theses

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

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," expected December, 2005.
13. He, X., "Ferrohydrodynamic Flows in Rotating Magnetic Fields," expected December 2005.
14. Elborai, S., "Magnetic Field-Driven Surface and Volume Flows in Ferrofluids," expected December 2005.
15. O'Sullivan, F., "Streamer Propagation and Electrical Breakdown in Nanofluids," expected December 2006.
16. Thomas, Z.M., "Interdigital Dielectrometry Measurements of Moisture Diffusion in Oil/Paper Insulated Power Cables," expected June 2007.

Doctoral Theses, Reader

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

15. Gonzalez, L., "Migration of Submicron Nanomagnetic Particles in Magnetic Fluids Under Time/Space Varying Magnetic Fields," expected December 2005.
16. Levitan, J. "Induced-Charge Electro-Osmosis," expected December 2005.
17. Wagner, T., "Non Invasive Brain Stimulation: Modeling and Experimental Analysis of Transcranial DC Stimulation as a Modality for Neuropathology Treatment, expected January 2006.

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.