

# CURRICULUM VITAE

William Douglass Dorland

## 1. PERSONAL INFORMATION

William Dorland  
Department of Physics  
Director, Honors College  
Professor, promoted 2009  
Born: 11/29/65, USA

### Educational background

B. S., Physics, 1988, The University of Texas at Austin  
M. A., Astrophysical Sciences, 1990, Princeton University  
M. P. A., Public and International Affairs, 1993, Princeton University  
Ph. D., Astrophysical Sciences, 1993, Princeton University

### Employment background

University of Maryland, (7/09 - present), Professor  
University of Oxford, Merton College, (Summer 2009), Visiting Scholar  
University of Vienna, (2009-10), Wolfgang Pauli Fellow  
University of Maryland, (7/05 - 6/09), Associate Professor  
Imperial College, London, (Fall 03 - present), Visiting Reader<sup>1</sup>  
University of Maryland, (9/01 - 6/05), Assistant Professor  
Imperial College, London, (9/01 - 8/02), Reader<sup>1</sup>  
University of Maryland, (1/98 - 8/01), Associate Research Scientist  
University of Texas, (2/96 - 12/97), Associate Research Scientist  
University of Texas, (9/93 - 2/96), Postdoctoral Fellow  
U. S. State Department, (6/90 - 8/90), Intern

<sup>1</sup>*Reader is the UK equivalent rank to Associate Professor in the US.*

## 2. RESEARCH, SCHOLARLY, AND CREATIVE ACTIVITIES

### a. Books

#### iii. Books authored

- \* “Nuclear Forensics: Roles, State of the Art, Program Needs”, APS Panel on Public Affairs/AAAS Joint Study (2008).
- \* “Plasma Science: Advancing Knowledge in the National Interest”, National Research Council of the National Academies, National Academies Press, 2007. S. C. Cowley, J. Peoples, J. Callen, F. Chang-Diaz, T. Ditmire, W. Dorland, W. Gekelman, S. Girshick, D. Hammer, E. Ippen, M. Kushner, K. Lynch, J. Menard, L. Merminga, E. Quataert, T. Sommere, C. Surko, M. Tabak.

#### iii. Chapters in Books

- ‡\* W. Dorland, G. W. Hammett, T. S. Hahm, and M. A. Beer, “Nonlinear Gyrofluid Model of ITG Turbulence”, in *Ion Temperature Gradient Driven Turbulent Transport*, W. Horton, M. Wakatani, and A. Wootton, Eds., American Institute of Physics, (1993).

\* D. S. Zimmerman, S. A. Triana, D. R. Sisan, W. A. Tillotson, W. Dorland, and D. P. Lathrop, “Characterization of the Magnetorotational Instability from a Turbulent Background State,” in *MHD Couette Flows: Experiments and Models*, eds. R. Rosner, Gunther Rudiger, and A. Bonanno (AIP Press, 2004).

\* indicates papers with significant authorship contributions. † indicates invited paper. ‡ indicates senior authorship.

## b. Articles in Refereed Journals

‡\* G. W. Hammett, W. Dorland and F. W. Perkins, *Fluid Models of Phase Mixing, Landau Damping, and Nonlinear Gyrokinetic Dynamics*, *Physics of Fluids B*, **4**, 2052-2061, (1992).

†\* G. W. Hammett, M. A. Beer, W. Dorland, S. C. Cowley, and S. A. Smith, *Developments in the Gyrofluid Approach to Tokamak Turbulence Simulations*, *Plasma Phys. Control. Fusion*, **35**, 973-985, (1993).

‡\* W. Dorland and G. W. Hammett, *Gyrofluid Turbulence Models with Kinetic Effects*, *Phys. Fluids B*, **5**, 812-835, (1993).

†\* S. E. Parker, W. Dorland, R. A. Santoro, M. A. Beer, Q. P. Liu, W. W. Lee, and G. W. Hammett, *Comparisons of Gyrofluid and Gyrokinetic Simulations*, *Phys. Plasmas*, **1**, 1461-1468, (1994).

‡\* J. Q. Dong, W. Horton, and W. Dorland, *Isotope Scaling and  $\eta_i$  Mode with Impurities in Tokamak Plasmas*, *Phys. Plasmas*, **1**, 3635-3640, (1994).

\* K. McGuire, H. Adler, P. Alling, C. Ancher, H. Anderson, J. L. Anderson, J. W. Anderson, V. Arunasalam, G. Ascione, D. Ashcroft, Cris W. Barnes, G. Barnes, S. Batha, G. Bateman, M. Beer, M. G. Bell, R. Bell, M. Bitter, W. Blanchard, N. L. Bretz, C. Brunkhorst, R. Budny, C. E. Bush, R. Camp, M. Caorlin, H. Carnevale, S. Cauffman, Z. Chang, C. S. Chang, C. Z. Cheng, J. Chrzanowski, J. Collins, G. Coward, M. Cropper, D. S. Darrow, R. Daugert, J. DeLooper, R. Dendy, W. Dorland, L. Dudek, H. Duong, R. Durst, P. C. Efthimion, D. Ernst, H. Evenson, N. Fisch, R. Fisher, R. J. Fonck, E. Fredd, E. Fredrickson, N. Fromm, G. Y. Fu, T. Fujita, H. P. Furth, V. Garzotto, C. Gentile, J. Gilbert, J. Gioia, N. Gorelenkov, B. Grek, L. R. Grisham, G. Hammett, G. R. Hanson, R. J. Hawryluk, W. Heidbrink, H. W. Herrmann, K. W. Hill, J. Hosea, H. Hsuan, M. Hughes, R. Hulse, A. Janos, D. L. Jassby, F. C. Jobs, D. W. Johnson, L. C. Johnson, M. Kalish, J. Kamperschroer, J. Kesner, H. Kugel, G. Labik, N. T. Lam, P. H. LaMarche, E. Lawson, B. LeBlanc, J. Levine, F. M. Levinton, D. Loesser, D. Long, M. J. Loughlin, J. Machuzak, R. Majeski, D. K. Mansfield, E. S. Marmor, R. Marsala, A. Martin, G. Martin, E. Mazzucato, M. Mauel, M. P. McCarthy, J. McChesney, B. McCormack, D. C. McCune, G. McKee, D. M. Meade, S. S. Medley, D. R. Mikkelsen, S. V. Mirnov, D. Mueller, M. Murakami, J. A. Murphy, A. Nagy, G. A. Navratil, R. Nazikian, R. Newman, M. Norris, T. O’Connor, M. Oldaker, J. Ongena, M. Osakabe, D. K. Owens, H. Park, W. Park, P. Parks, S. F. Paul, G. Pearson, E. Perry, R. Persing, M. Petrov, C. K. Phillips, M. Phillips, S. Pitcher, R. Pysker, A. L. Qualls, S. Raftopoulos, S. Ramakrishnan, A. Ramsey, D. A. Rasmussen, M. H. Redi, G. Renda, G. Rewoldt, D. Roberts, J. Rogers, R. Rossmassler, A. L. Roquemore, E. Ruskov, S. A. Sabbagh, M. Sasao, G. Schilling, J. Schivell, G. L. Schmidt, R. Scillia, S. D. Scott, I. Semenov, T. Senko, S. Sesnic,

R. Sissingh, C. H. Skinner, J. Snipes, J. Stencel, J. Stevens, T. Stevenson, B. C. Stratton, J. D. Strachan, W. Stodiek, J. Swanson, E. Synakowski, H. Takahashi, W. Tang, G. Taylor, J. Terry, M. E. Thompson, W. Tighe, J. R. Timberlake, K. Tobita, H. H. Towner, M. Tuszewski, A. von Halle, C. Vannoy, M. Viola, S. von Goeler, D. Voorhees, R. T. Walters, R. Wester, R. White, R. Wieland, J. B. Wilgen, M. Williams, J. R. Wilson, J. Winston, K. Wright, K. L. Wong, P. Woskov, G. A. Wurden, M. Yamada, S. Yoshikawa, K. M. Young, M. C. Zarnstorff, V. Zaverceev, and S. J. Zweben, *Review of DT results from TFTR*, Phys. Plasmas, **2**, 2176-2188, (1995).

†\* M. Kotschenreuther, W. Dorland, M. A. Beer and G. W. Hammett, *Quantitative Predictions of Tokamak Energy Confinement from First-Principles Simulations with Kinetic Effects*, Phys. Plasmas, **2**, 2381-2389, (1995).

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- †G. D. Kerbel *et al.*, *Interactive Scientific Exploration of Gyrofluid Tokamak Turbulence*, Intl. Journal of Supercomputing Appl., **10**, 182 (1996).
- R. J. Hawryluk *et al.*, *Review of D-T results from TFTR*, Fusion Tech., **30**, Part A, 648 (1996).
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### c. Monographs, Reports, and Extension Publications

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## e. Talks, Abstracts, and Other Professional Papers Presented

### i. Invited talks by William Dorland

- Multi-Site Collaboration in the Numerical Tokamak Project: Gyrofluid Simulations*, DoE Workshop: Distributed Collaborative Research Environments, CEBAF, December, 1993.
- Transport Modelling at the Institute for Fusion Studies*, Transport in Fusion Plasmas Workshop, Gothenberg, Sweden, June, 1994.
- Comparisons of Nonlinear Toroidal Turbulence Simulations with Experiment*, International Atomic Energy Agency Conference on Plasma Physics and Controlled Nuclear Fusion Research, Seville, Spain, October, 1994.
- Thermal Conductivity in Turbulent Plasma: Implications for ITER* ITER Expert Group on Confinement and Modelling, ITER Joint Working Site, March, 1995.
- Comparisons of Gyrofluid and Gyrokinetic Simulations and Predictions*, Numerical Tokamak Symposium, Incline Village, Nevada, April, 1995.
- Turbulence and Transport Simulations*, Sherwood Fusion Theory Conference, Incline Village, Nevada, April, 1995.
- Thermal Conductivity in Turbulent Plasma: Simulation vs. Experiment*, American Physical Society Spring meeting, Washington, DC, April, 1995.
- Turbulent Thermal Conductivity in Tokamaks*, University of Colorado, Boulder, CO, April, 1995.
- ITG Simulations of Tokamak Experiments*, JT-60U Seminar, Japan, June, 1995.
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- Implications of ITG Theory for ITER*, ITER Working Group on Confinement and Transport, Princeton, September, 1995.
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- The Case for Advanced Confinement*, General Atomics, May, 1996.
- 3D Simulations of Tokamak Plasma Turbulence: Experimental Tests and Predictions*, Workshop on the Theory of Fusion Plasmas, Varenna, Italy, August, 1996.
- Using Realistic Turbulence Simulations to Understand Anomalous Transport in Tokamaks*, Second Workshop on Nonlinear Dynamics, Transport, Turbulence, And Magnetic Fusion, New York University, October, 1996.
- Thermal Conductivity of Turbulent, Magnetized Plasma*, University of Texas Physics Colloquium, November, 1996.

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*Cyclone Project Progress Report*, ITER Working Group on Confinement Database and Modeling, Garching, Germany, September, 1997.

Three Invited Lectures on *Gyrofluid Simulations of Tokamak Microturbulence*, Abdus Salam International Centre for Theoretical Physics, Trieste, 1997.

*Neoclassical Spherical Tokamaks*, American Physical Society, Division of Plasma Physics, Pittsburgh, 1997.

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*Turbulence and Microstability Considerations for AT Operation*, Workshop on Physics Requirements for Advanced Tokamaks, 1999.

Three Invited Lectures on *Gyrokinetics, Secondary Instabilities, and Sheared Flows*, Abdus Salam International Centre for Theoretical Physics, Trieste, 1999.

*Electron Temperature Gradient Driven Turbulence*, Massachusetts Institute of Technology, Colloquium, 2000.

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*Gyrokinetic Turbulence Simulations*, Culham Laboratory Colloquium, Nov 7, 2001.

*Theoretical insights into short wavelength plasma turbulence*, Culham Laboratory, Feb, 2002.

*Collisionless plasma turbulence, with astrophysical applications*, Institute for Fusion Studies, Feb 2002.

*Collisionless plasma turbulence*, 29<sup>th</sup> Annual IoP Plasma Physics Group Conference, March 2002.

*Secondary instabilities in ETG Turbulence*, VII Easter Plasma Meeting, April 2002.

*Gyrokinetic Turbulence in Magnetically Confined Plasmas*, European Physical Society, Montreux 2002.

*Turbulent Heating in the Kinetic Alfvén Wave Cascade*, Center for Scientific Computation and Mathematical Modeling, UM, Nov 26, 2002.

*Theoretical insights into short wavelength plasma turbulence*, Columbia University, Nov 2002.

*US Plasma Microturbulence Project*, Eighth International Symposium on Simulation Science, Hayama, Japan, 2003.

*Sheared flows and boundary layer physics in tokamak plasma*, “New Themes in Plasma and Fusion Turbulence”, Royal Society, London, May, 2003.

*Sheared flows and H-mode pedestal structure*, MIT seminar, May 2003.

*Anomalous heating in a kinetic Alfvén wave cascade*, 7<sup>th</sup> Workshop on the Interrelationship between Plasma Experiment in Laboratory and Space, July 2003.

*Resonant Heating in an Alfvén Cascade*, Workshop on Kinetic Theory, Fields Institute (Toronto), April 2004.

*Resonant Heating in the Alfvén Cascade + Introduction to Gyrokinetics*, Workshop on Theoretical Plasma Physics, International Centre for Theoretical Physics (Trieste), July 2004.

*Recent Advances in the Theory of Magnetized Plasma Turbulence*, UCLA Physics Department Colloquium, January 2005.

*Multiscale Extensions of Gyrokinetics*, Multiscale Processes in Fusion Plasmas Conference, Institute for Pure and Applied Mathematics, (UCLA) January 2005.

*Instabilities of Transport Barriers*, University of Wisconsin Physics Department Colloquium, February 2005.

*Review of MRI Research in the Laboratory*, Physics of Astrophysical Outflows and Accretion Disks, Kavli Institute for Theoretical Physics, UCSB, May 2005.

*Three Transport Barrier Instabilities*, MIT plasma physics seminar, May 2005.

*Plasma Turbulence in Astrophysics and in the Laboratory*, University of Maryland physics colloquium (2005).

*Teaching Electricity and Magnetism to Graduate Students: Key Concepts from Plasma Physics*, Gordon Research Conference on Physics and Education (2006).

*Gyrokinetic Plasma Turbulence in Astrophysics and in the Laboratory*, University of Delaware physics colloquium (2006).

*Modeling of Turbulent Transport*, Stanford Global Climate and Energy Project Workshop, Princeton University (2006).

*Plasma Turbulence in Astrophysics and in the Laboratory*, Dartmouth College colloquium (2006).

*Landau Damping and Irreversibility in Gyrokinetic Simulations*, International Workshop on Frontiers of Plasma Physics, ICTP, Trieste, Italy (2006).

*Laboratory Studies of Turbulence Induced by the Magnetorotational Instability*, International Workshop on Frontiers of Plasma Physics, ICTP, Trieste, Italy (2006).

*Plasma Turbulence in Astrophysics and in the Laboratory*, Plenary Talk, APS April meeting (2006).

*Irreversibility in Weakly Collisional Plasma Turbulence*, Workshop Plasma Magnetises, University of Nice, France (2006).

*Plasma Turbulence in Tokamaks*, CMPD Winter School (2007).

*Physics Processes Governing the Spectrum of Self-Excited Flows in Turbulent Plasma*, CMPD Winter School (2007).

*Astrophysical Gyrokinetic Turbulence and Heating*, Center for Magnetic Self-Organization (UNH), (2007).

*Multi-scale Transport Physics Research*, National Tokamak Planning Workshop (MIT), (2007).

*Plasma turbulence in astrophysics and in the laboratory: Landau damping and irreversibility in gyrokinetic simulations*, SIAM Conf on Computational Science and Engineering, (2007).

*Anomalous Heating in Weak and Strong Turbulence*, Wolfgang Pauli Institute, Vienna (2007).

*Energy Production and Global Warming*, Academic Kick-off Talk for 2007/08 University of Maryland Honors Program (2007).

*Turbulent Heating of Hot, Magnetized Plasma*, International Conference on New Energy Sources, Tbilisi, Georgia (2007).

*GPU Applications at the University of Maryland*, Astro-GPU Workshop, Institute for Advanced Studies, Princeton, NJ (2007). Also served as panel member for summary session.

*Gyrokinetics and Multiscale Plasma Physics*, Wolfgang Pauli Institute, Vienna (2008).

*Instabilities of flowing fluids/plasmas: Kelvin-Helmholtz and MRI*, UCLA (2008).

*Kinetic Turbulence in Space and Astrophysical Plasmas*, Maryland Space Sciences Seminar (2008).

*Progress in gyrokinetics: Kinetic turbulence in space and astrophysical plasmas*, Culham Laboratory (2008).

*GPU Applications at the University of Maryland*, Culham Laboratory (2008).

*How we crammed a black hole, a star cluster and a turbulent plasma into a GPU (and lived to tell about it)*, NVision (2008).

*5-D Plasma Turbulence*, University of Delaware (2008).

*5-D Plasma Turbulence*, MIT PSFC Seminar (2008).

*5-D Plasma Turbulence*, Princeton Picasso Seminar (2008).

*5-D Plasma Turbulence*, UT-Austin Physics Colloquium (2008).

*5-D Plasma Turbulence*, Univ. Maryland Physics Colloquium (2008).

*Modeling essentially kinetic features of astrophysical turbulence*, AstroNum (2008).

*5-D Plasma Turbulence*, Michigan State University Colloquium (2009).

*Computational Astrophysics*, NVidia CUDA Center of Excellence Workshop (2009).

*Transport and Turbulence*, DOE Exascale Workshop (2009).

*Clustered many-core computing with CPUs + GPUs*, [3 talks] Institute for Advanced Study Prospects in Theoretical Physics (2009).

*Magnetized plasma turbulence in the laboratory and in nature*, PPPL Colloquium (2009).

*Modeling essentially kinetic features of astrophysical turbulence: Turbulence in 5 dimensions*, West Virginia University Physics Colloquium [Bernard R. Cooper Lecture] (2009).

*What next?*, University of Vienna (2009).

*The Trinity algorithm: Local gyrokinetics + global transport = predictive model of tokamak plasma dynamics*, Institute for Pure and Applied Mathematics Workshop, UCLA (2009).

*Shear-flow driven instabilities in transport barriers*, Oxford University Colloquium (2009).

### *iii. Unrefereed conference proceedings*

- N. Bretz *et al.*, in Proceedings of Intl. Conf. on Plasma Physics, Brazil, (1994).
- R. J. Hawryluk *et al.*, *Review of Recent D-T Experiments from TFTR*, in proceedings of the 1994 IAEA conference on Plasma Physics and Controlled Nuclear Fusion Research, Vol. I, 11, (1994).
- M. G. Bell, *et al.*, *Fusion Power Production in TFTR*, in proceedings of the 1994 IAEA conference on Plasma Physics and Controlled Nuclear Fusion Research, 1, 171, (1995).
- \* G. W. Hammett, M. A. Beer, J. C. Cummings, W. Dorland, W. W. Lee, H. E. Mynick, S. E. Parker, R. A. Santoro, M. Artun, H. P. Furth, T. S. Hahm, G. Rewoldt, W. M. Tang, R. E. Waltz, G. D. Kerbel, J. Milovich, *Advances in Simulating Tokamak Turbulent Transport*, in proceedings of the 1994 IAEA conference on Plasma Physics and Controlled Nuclear Fusion Research.
- \* W. Dorland, M. Kotschenreuther, M. A. Beer, G. W. Hammett, R. E. Waltz, R. R. Dominguez, P. M. Valanju, W. H. Miner, Jr., J. Q. Dong, W. Horton, F. L. Waelbroeck, T. Tajima, and M. J. LeBrun, *Comparisons of Nonlinear Toroidal Turbulence Simulations with Experiment*, in proceedings of the 1994 International Atomic Energy Agency (IAEA) conference on Plasma Physics and Controlled Nuclear Fusion Research.
- \* W. Dorland, M. Kotschenreuther, Q. P. Liu, M. A. Beer, and G. W. Hammett, *3D Simulations of Tokamak Plasma Turbulence: Experimental Tests and Predictions*, in "Theory of Fusion Plasmas" proceedings, Varenna (1996), edited by J. W. Connor, E. Sindoni, and J. Vaclavik.
- \* K. M. McGuire *et al.*, *Physics of High Performance Deuterium-Tritium Plasmas in TFTR*, in proceedings of the 1996 International Atomic Energy Agency (IAEA) conference on Plasma Physics and Controlled Nuclear Fusion Research.
- T. Takizuka, D. Boucher, T. N. Carlstrom, J. G. Cordey, J. W. Connor, A. N. Chudnovskij, J. C. DeBoo, W. Dorland, Yu. V. Esipchuk, S. J. Fielding, T. Fukuda, R. S. Granetz, M. Greenwald, G. T. Hoang, W. Houlberg, Y. Kamada, O. J. W. F. Kardaun, S. M. Kaye, M. Kikuchi, A. Kus, Y. Martin, T. Matsuda, Y. Miura, O. Naito, Y. Ogawa, J. Ongena, W. Ossipenko, F. W. Perkins, E. Righi, F. Ryter, D. P. Schissel, J. A. Snipes, U. Stroth, H. Tamai, K. Thomsen, M. Valovic, *Threshold Power and Energy Confinement for ITER*, in proceedings of the 1996 International Atomic Energy Agency (IAEA) conference on Plasma Physics and Controlled Nuclear Fusion Research.



- \* S. D. Scott *et al.*, *Isotope Scaling of Heating and Confinement in Multiple Regimes of TFTR*, in proceedings of the 1996 International Atomic Energy Agency (IAEA) conference on Plasma Physics and Controlled Nuclear Fusion Research.
- \* M. Kotschenreuther, W. Dorland, Q. P. Liu, G. W. Hammett, M. A. Beer, S. A. Smith, A. Bondeson, and S. C. Cowley, *First Principles Calculations of Tokamak Energy Transport*, in proceedings of the 1996 International Atomic Energy Agency (IAEA) conference on Plasma Physics and Controlled Nuclear Fusion Research.
- \* W. Dorland, *et al.*, *Gyrokinetic Simulations of Tokamak Microturbulence*, in Proceedings of the 2000 International Atomic Energy Agency (IAEA) Fusion Energy Conference, Sorrento.
- K. W. Hill, W. Dorland, D. R. Ernst, D. Mikkelsen, G. Rewoldt, S. Higashijima, N. Asakura, H. Shirai, T. Takizuka, S. Konoshima, Y. Kamada, H. Kubo, Y. Miura, *Study of Integrated High-Performance Regimes with Impurity Injection in JT-60U Discharges*, IAEA Fusion Energy Conference, 2002.
- \* D. R. Mikkelsen, W. Dorland, D. W. Ross, M. Greenwald, S. Wolfe, P. Bonoli, C. Fiore, A. Hubbard, J. Irby, E. Marmor, D. Mossessian, J. Rice, G. Taylor, J. Terry, *Non-linear Simulations of Drift-Wave Turbulence in Alcator C-Mod*, IAEA Fusion Energy Conference, 2002.
- \* F. Jenko, B. Scott, W. Dorland, A. Kendl, D. Strintzi, *Simulations of Finite Beta Turbulence in Tokamaks and Stellarators*, IAEA Fusion Energy Conference, 2002.
- D. Stutman, *et al.*, *Studies of Improved Electron Confinement on NSTX*, IAEA Fusion Energy Conference, 2004.
- \* P. N. Guzdar, S. M. Mahajan, Z. Yoshida, W. Dorland, *et al.*, *Theory and Theory-Based Models for the Pedestal, Edge Stability and ELMs in Tokamaks*, IAEA Fusion Energy Conference, 2004.
- \* D. R. Ernst, N. Basse, P. T. Bonoli, P. J. Catto, W. Dorland, *et al.*, *Mechanisms for ITB Formation and Control in Alcator C-Mod Identified through Gyrokinetic Simulations of TEM Turbulence*, IAEA Fusion Energy Conference, 2004.
- \* D. R. Ernst, *et al.*, IAEA Fusion Energy Conference, 2006.
- \* J. Connor, *et al.*, IAEA Fusion Energy Conference, 2006.
- \* *indicates papers with significant authorship contributions.*

### **i. Contracts and Grants**

Principal Investigator, Computational Center for Studies of Plasma Microturbulence, DoE, 2000-2005, \$495,000.

Principal Investigator, Maryland Controlled Fusion Research Program, DoE, 2005-2007, \$2,029,212.

Principal Investigator, "Center for Multiscale Plasma Dynamics", 2004-2009, \$2,875,000.

Principal Investigator, Maryland Controlled Fusion Research Program, DoE, 2008-2010, \$2,349,403.

Principal Investigator, SciDAC Center for Simulation of Plasma Microturbulence, DoE, 2008-2010, \$293,363

Co-Investigator, “Algorithms, Scientific Computing and Numerical Studies in Classical and Quantum General Relativity”, NSF, 2009-2010, \$100,000

### **j. Fellowships, Prizes, and Awards**

Phi Beta Kappa, 1988.  
Highest Honors, College of Natural Science, University of Texas, 1988.  
Special Honors in Physics, University of Texas, 1988.  
Department of Energy Fusion Postdoctoral Fellowship, 1993-1995.  
Fellow, American Physical Society, 2005.  
Richard A. Ferrell Distinguished Faculty Fellow, 2008.  
E. O. Lawrence Award, 2009.

### **k. Reviewing Activities for Journals and Other Learned Publications**

**Editorial Board**, *Multiscale Modeling and Simulation* (SIAM)  
**Editorial Board**, *Research Letters in Physics* (Hindawi)  
I referee 5-8 articles per year total, for these journals: Physics of Plasmas, Plasma Physics and Controlled Fusion, Nuclear Fusion, and Physical Review Letters.

## **3. Teaching, Mentoring and Advising**

### **a. Courses taught in the last five years**

#### **i. General**

AMSC 664 - Advanced Scientific Computation II Spring 2003 (4 students)  
Physics 161 - General Physics: Mechanics and Particle Dynamics Fall 2003 (100 students)  
AMSC 663 - Advanced Scientific Computation I Fall 2003 (10 students)  
AMSC 664 - Advanced Scientific Computation II Spring 2004 (10 students)  
Physics 762 - Plasma Physics II Spring 2005 (5 students)  
Physics 121 - Fundamentals of Physics I (Team taught; Laboratory supervisor) Spring 2006 (~ 300 students)  
Physics 122 - Fundamentals of Physics II (Team taught; Laboratory and tutorial supervisor) Spring 2006 (~ 350 students)  
AMSC 663 - Advanced Scientific Computation I Fall 2006 (7 students)  
Physics 121 - Fundamentals of Physics I (Team taught; Laboratory supervisor) Spring 2007 (289 students)  
Physics 122 - Fundamentals of Physics II (Team taught; Laboratory and tutorial supervisor) Spring 2007 (392 students)  
AMSC 664 - Advanced Scientific Computation II Spring 2007 (7 students)  
Honors 238W - Physics for Decision Makers: The Global Energy Crisis Fall 2007 (17 students).  
Physics 106 - Light, Perception, Photography and Visual Phenomena Spring 2008 (108 students).  
Honors 100 - Honors Colloquium Fall 2009 (157 students).

#### **iv. Independent Study, Tutorial**

I co-supervised the dissertation research and chaired the examination committee of Dr. Wilson Tillotson, Department of Physics, University of Maryland.

I supervised the dissertation research and chaired the examination committee of Dr. Ingmar Broemstrup, Department of Physics, University of Maryland.

I supervised the dissertation research and chaired the examination committee of Dr. Michael Barnes, Department of Physics, University of Maryland.

I supervised the dissertation research and chaired the examination committee of Dr. Kyle Gustafson, Department of Physics, University of Maryland.

I am currently supervising the dissertation research of three graduate students in the Department of Physics at the University of Maryland (Despain, Mahmud, Kanekar).

I am currently co-supervising the Master of Science research of one graduate student in the Applied Mathematics, Statistics and Scientific Computation program at the University of Maryland (Singleton).

I have supervised approximately one semester-long undergraduate research project per semester over the last five years.

#### **b. Course or Curriculum Development**

Working with four program directors to develop Honors College living-learning programs (2009-present).

Working with numerous faculty to develop courses in the Honors College (2009-present).

Worked with Professors Goodman, Rolston and Hammer to develop Physics 105 - Physics for Decision Makers: The Global Energy Crisis. This is a new CORE course in the "Marquee Science" series. The aim of the Marquee courses is to introduce non-majors to the methods and ideas of science, without getting bogged down in specific calculations or techniques. Physics 105 is focused on the science that underlies energy production and global warming. I taught the course the first time it was offered (Fall 2007), as Honors 238W. I meet weekly with Professors Goodman and Rolston, and approximately four times per semester with the Marquee science faculty.

Worked with Professor Stewart to develop AMSC 462, a new course that will be required for undergraduate physics students that wish to obtain a certificate in Computational Physics. Prof. Stewart and I designed the course from scratch. It is a survey of computer science for scientists and engineers. The goal is to enable the student to write efficient, well-organized programs for today's machines. Topics to be treated are computer organization, computer arithmetic, processes and operating systems, the memory hierarchy, comparison of the Fortran and C families of languages, compilers, the run time environment, memory allocation, preprocessors and portability, and documentation.

Worked with Professor David Levermore to develop and run AMSC 663/664. This is the keystone course for the new graduate program in Scientific Computing. It is a project course, in which students working in a variety of scientific areas design, build and test a suite of scientific software suitable for PhD-level research. This is a team-taught, year-long sequence.

**e. Advising (other than Research Direction)**

i. Undergraduate: Advising physics students, 2003-present, 3-4 students per year.

ii. Graduate: Advising physics students 2003-present, 4-6 students per year.

**f. Advising (Research Direction)**

**i. Undergraduate** Justin Sobota (Spring, 2003, Maryland)

Jake Kirsch (Spring 2003, Maryland)

Mark van Buskirk (Spring 2003, Maryland)

Kevin Schoeffler (Spring, 2003-2005, Maryland)

Ryan McCulley (Spring, 2004, Maryland)

Evan Hoffman (Spring, 2004 - 2006, Maryland)

Samuel Pinkava (Spring, 2005, Maryland)

Elizabeth Terry (Fall 2007, Maryland)

Ammar Hussein (Fall 2007, Maryland)

Kieran Bhatia (Fall 2009, Maryland)

**ii. Master's**

Nick Setzer (physics research, Summer 2003)

Bryan Osborn (AMSC, finished in Spring 2004)

James Cooley (AMSC, finished in Spring 2004)

Tamara Singleton (AMSC, will finish in 2009)

**J. Baumgaertel** (Princeton student, summer practicum at Maryland, 2008)

**iii. Doctoral**

W. A. Tillotson (Maryland, physics, defended 2007)

K. Despain (Maryland, physics, started Summer 2003)

I. Broemstrup (Maryland, physics, defended Summer 2008)

M. Barnes (Maryland, physics, defended Fall 2008)

K. Gustafson (Maryland, physics, defended Fall 2009)

M. Mahmud (Maryland, physics, started Fall 2008)

A. Kanekar (Maryland, physics, started Fall 2008)

N. Joiner (Imperial College, physics)

N. Loureiro (Imperial College, physics)

D. Applegate (Imperial College, physics)

**iv. Post-Doctoral**

Angus Macnab (2003-2005)

Tomoya Tatsuno (2003-2006)

George Stantchev (2004-2008)

Gregory Howes (2004-2008)

Nuno Loureiro (2005-2007)

Fulvio Militello (2005-2007)

Ryusuke Numata (2008-present)

Gabriel Plunk (2008-present)

## 4. Service

### a. Professional

#### *i. Offices and committee memberships held in professional organizations*

Member, Executive Committee of Numerical Tokamak Turbulence Project, (1995-1999).  
Chair, APS Division of Plasma Physics Human Rights Committee (1995-1997).  
Chair, APS Committee for the International Freedom of Scientists, 1997-1998. Member, (1996-98).  
Chair, Transport Task Force Modeling Group (1998-2001); Member, TTF Executive Committee (1998-2006).  
Lecturer and Assistant Organizer, Computational Physics Course, Abdus Salam International Centre for Theoretical Physics, Plasma Physics Autumn College, Trieste, (2001, 2003).  
Member, Program Advisory Committee, National Spherical Torus Experiment, (2000-2004).  
Member, Scientific Program Committee, EU-US Turbulence Task Force Workshop, September (2004).  
Organizer, “Numerical Methods for Plasma Astrophysics: From Particle Kinetics to MHD”, joint CSCAMM-PicSIE (Princeton Institute for Computational Science and Engineering) workshops, (2004).  
Director, Workshop on Theoretical Plasma Physics, Abdus Salam International Centre for Theoretical Physics, July (2004).  
Chair, APS-DPP Public Information Committee, (2003-2005).  
Member, APS Panel on Public Affairs, (2005-2007); Chair of National Security Committee (2007).  
Sherwood International Theory Conference Executive Committee (2007-present).  
University Fusion Association Executive Committee (2007-present).  
Member, Spherical Torus Coordinating Committee (2008-present).  
Member, Princeton Plasma Physics Laboratory Advisory Board (2009-present).

#### *ii. Reviewing activities for agencies.*

I review 4-6 grant proposals for the Department of Energy per year.

#### *iv. Other non-University committees, commissions, panels, etc.*

Member, ITER Working Group on Confinement, 1995-1997.  
Panel member, “Future Directions of Plasma Physics”, 1998 European Physical Society (Prague).  
Member, NAS/NRC committee conducting decadal survey of plasma science, “Plasma 2010.”

#### *vi. Paid Consultancies*

Consulted for United Kingdom Atomic Energy Agency, 2001-2002.

## **b. Campus**

### **i. Departmental**

Member, High Performance Computing Advisory Board, Imperial College, London (2001-2002).

Member, Physics Department Web Committee, (Maryland) 2002-2003.

Member, Applied Mathematics and Scientific Computation Graduate Committee, (Maryland) Fall 2003-2005.

Member, Physics Department Salary Committee, (Maryland) 2003-2005.

Member, Physics Department Computational Physics Committee, (Maryland) 2003-2004.

Member, Physics Department Qualifier Committee, (Maryland) 2005-2007.

Member, Physics Department Appointments, Promotions and Tenure Committee.

Member, Physics Department Priorities Committee.

Chair, Physics Department Graduate Teaching Assistant Committee.

Member, University of Maryland Climate Action Plan Working Group (2007-2009).

Chair, CSCAMM Education Committee, 2008.

Director, Maryland Center for Multiscale Plasma Dynamics (2004-2009).

Acting Director, Institute for Research in Electronics and Applied Physics, 7/08-12/08.

Member, PhD Defense Committees: M. Oczkowski (2003), D. Sisan (2004), W. Tillotson (2007, Chair), T. Nakamura (2007), S-W Ng (2007), R. Shuttleworth (2007), C. Mitchell (2007), B. Nam (2007), I. Broemstrup (2008, Chair), M. Barnes (2008, Chair), C. Groer (2008), A. York (2008), J. Vernaleo (2008), R. Fletcher (2008), R. Clary (2009), Christos Papadopoulos (2009), K. Gustafson (2009)

### **d. Service Awards and Honors**

Award for Creative Ideas in International Education, CIEE, 2000.

Outstanding Young Texas Ex, 1998.

Most Outstanding Male Student, University of Texas, 1988.

Friar Society, 1988.