

# Curriculum Vitae - Wolfgang Kliemann – December 2008

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## Wolfgang Kliemann

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### **Personal Information**

Born March 23, 1949  
Citizen of the Federal Republic of Germany  
Permanent resident of the United States of America  
Married, no children

## **1. Professional Experience**

### **1.1 Education**

1967-1970 Freie Universität Berlin, Germany, Sociology  
1970-1974 Universität Bielefeld, Germany, Mathematics, Diplom, 1974  
1976-1980 Universität Bremen, Germany, Mathematics, Dr. rer. nat., 1980

### **1.2 Positions Held**

2008-present Chair, Department of Mathematics, Iowa State University  
2001-2005 Associate Vice Provost for Research, Iowa State University  
2000-2001 Associate Dean for Research, College of Liberal Arts and Sciences, Iowa State University  
1999 Associate Chair - Graduate Studies, Department of Mathematics, Iowa State University  
1992-present Professor, Department of Mathematics, Iowa State University  
1987-1992 Associate Professor, Department of Mathematics, Iowa State University  
1983-1987 Assistant Professor, Department of Mathematics, Iowa State University  
1978-1983 Research position ('wissenschaftlicher Mitarbeiter'), Institute for Dynamical Systems, University of Bremen, Germany  
1982 Postdoctoral Work, Institute for the Physics of Fluids, Universidad Autonoma, Madrid, Spain  
1981 Postdoctoral Work, Mathematics Institute of the Polish Academy of Sciences, Warsaw, Poland  
1976-1978 Doctorate Fellowship from 'Studienstiftung des Deutschen Volkes', Germany  
1974-1976 Instructor, University of Oldenburg, Germany

### **1.3 Visiting Positions**

Summer 1985	Dipartimento di Matematica, Universita degli Studi di Roma 'La Sapienza', Rome, Italy
Summer 1986	Institut für Dynamische Systeme, Universität Bremen, Germany, and and Instituto de Matematica, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil
Summer 1987	Institut für Dynamische Systeme, Universität Bremen, Germany
Summer 1988	Dipartimento di Matematica, Universita degli Studi di Roma 'La Sapienza', Rome, Italy
Spring 1989	Institut für Dynamische Systeme, Universität Bremen, Germany
Summer 1989	Centro de Matematicas and PEDECIBA, Universidad de la Republica, Montevideo, Uruguay
Fall 1989	Dipartimento di Matematica, Universita degli Studi di Roma 'La Sapienza', Rome, Italy, and Departamento de Fisica Fundamental, UNED, Madrid, Spain
Summer 1991	Institut für Mathematik, Universität Augsburg, Germany
Summer 1992	Institut für Mathematik, Universität Augsburg, Germany
Summer 1993	Departamento de Fisica Fundamental, UNED, Madrid, Spain
Fall 1996	Departamento de Ingenieria Matematica, Universidad de Chile, Santiago, Chile
Fall 2007	Facultad de Matemáticas, Pontificia Universidad Católica de Chile, Santiago, Chile
Spring 2008	Facultad de Matemáticas, Pontificia Universidad Católica de Chile, Santiago, Chile

### **1.4 Professional Societies**

Member of SIAM, AMS, IMS, DMV, and AAAS.

### **1.5 Awards and Honors**

Iowa State University Teaching Excellence Award (1990)  
Iowa State University College of Liberal Arts and Sciences Award for Excellence in Research (1998)  
Iowa State University Honors Program Recognition for Contributions Made to the Program (1998)  
Iowa State University College of Liberal Arts and Sciences Master Teacher (1999)  
State of Iowa Board of Regents Award for Faculty Excellence (2000)  
Member of Sigma Xi

### **1.6 Research Interests**

Deterministic and stochastic nonlinear systems theory, in particular dynamical systems, skew product flows, stochastic systems, control systems and their interconnections, with applications in engineering and the natural sciences

## 2. Teaching

### 2.1 Classroom Teaching

Numbers in brackets indicate no. of students responding to Instructor Evaluation Questionnaire and average score on question no. 12 (Overall performance of instructor). Scores are 1 - 5, with 1 being high.

Year	Semester	Courses Taught
1983-84	Fall Spring	M165 (35:1.94)      M267 (36:1.47) M166 (31:1.68)
1984-85	Fall Spring	M514 M555
1985-86	Fall Spring	(none) M165, 3 Sections (18:1.39, 27:1.44, 26:1.65)
1986-87	Fall Spring	M514 (18:1.17) M690T
1987-88	Fall Spring	M266                      M690 M267 (36:1.47)        M562
1988-89	Fall	M150                      M554 (8:1.13)
1989-90	Spring	M166
1990-91	Fall Spring	M150                      M175H (10:1.00) M166 (26:1.38)        M562 (6:1.00)
1991-92	Fall Spring	M515 (10:1.20) M516X (9:1.11)
1992-93	Fall	M514 (21:1.19)
1993-94	Fall Spring	M577 (co-listed with EE, Aer E, ME) (22:1.18)    M610 M554                      M690W                      M610
1994-95	Fall Spring	M150                      M690W (5:1.00)        M610 (5:1.00) M562 (8:1.00)        M610
1995-96	Fall Spring	M165H (20:1.00)        Stat333 (52:4.46/5.00)*    M610 (2 students) M166H (24:1.11)        M590 (2)
1997-98	Fall Spring	M104 (157:1.81)        M514 (16:1.13) M265H (10:1.10)        HON290H (2)
1998-99	Fall Spring	M166 (30:1.24)        Stat101 (57:4.25/5.00)* M561 (5:1.00)        HON290H (1)
1999-2000	Fall	M166 (104:4.39)*

\*These evaluations rank from 1 - 5, with "5" being the high score.

Classroom Teaching - continued

Academic Year	Semester	Course Number	Evaluation*	No. students responding
2006-2007	Fall	Math 265H	4.39	18
		Math 307	4.19	21
	Spring	Math 166 (LL)	4.47	74
		Math 266	4.88	25

\* These evaluations rank from 1 - 5, with "5" being the high score.

'Logik und Mathematik für Sozialwissenschaftler' (with N. Müller), Universität Bielefeld, Germany (1972-1974).

'Mathematisches Vorsemester', a TV-guided course for High School seniors, Universität Bielefeld, Germany (Summer 1973 and 1974).

'Lehrerfortbildung Mathematik', a continuing education course for High School teachers in mathematics (linear algebra, numerical methods), Universität Bielefeld, Germany (1973).

'Graphentheorie und ihre Anwendungen', a TV-course for use in High School teaching (with K. Kiesewetter), Universität Bielefeld, Germany (1973-1974).

'Modellierung in der Mathematik', education of High School teachers, (with I. Pieper), Universität Oldenburg, Germany (1974-1975).

'Pädagogische Theorien', education of High School teachers, (with I. Pieper), Universität Oldenburg, Germany (1975-1976).

'Spectral theory of skew product flows', Universität Bremen, Germany (1989).

'Numerics of differential equations', Facultad de Matemáticas, Pontificia Universidad Católica de Chile, Santiago, Chile (2008)

**2.2 Mentor for Undergraduate Students**

Allen, Erik	P CHE	Spring 1998	
Keyte, Anna	LAS	Spring 1998	
Skutnik, Steve	Phys	Spring 1999	
Vujosevic, Milena	Math	Summer 2000	
Hartman, Lindsay	Math	Summer 2003	
Veit, Anna	Math	Summer 2003	
Anderson, Michael	Math	Summer 2004	
Carayol, Denrol	Math	Summer 2004	
Beal, Rien	Math	Summer 2005	
Corbin, Patrick	Math	Summer 2005	
McConville, Kelly	Math	Summer 2005	
Monford, Christina	Math	Summer 2005	
Newton, Danielle	Math	Summer 2005	
Ayala, José Manuel	Math	2004-2005	Supervisor thesis for Licenciatura, Universidad Catolica del Norte, Antofagsta, Chile
James Kalafus	Math	Summer 2006	
Laura Zuchlewski	Math	Summer 2006	

### 2.3 Supervisor for M. S. Students

- Volfovicz, Roberto      Math              2002  
Creative Component: Topics in mathematical biology
- Baldwin, Morgan C.      Math              2007  
Thesis: Stochastic analysis of the Marotzke and Stone climate model
- Ayala, Jose Manuel      Math              2008  
Thesis: Global behavior of graph dynamics with applications to Markov chains

### 2.4 Supervisor for Ph.D. Students

- Homblé, Patrick              Stat              1989      (co-advisor with K.B. Athreya)  
Thesis: On the stability of linear stochastic difference equations
- Fan, Kaisheng              Math              1992  
Thesis: Topics in nonlinear filtering
- Joseph, Elizabeth              Math              1993  
Thesis: Stability radii of two dimensional bilinear systems: Lyapunov exponent approach
- O'Donnell, Brian              Math              1994      (co-advisor with Eimear Goggin)  
Thesis: Nonlinear filtering of stochastic dynamical systems
- Lin, Shan                      Math/E.E.        1996  
Thesis: Analysis and synthesis of nonlinear control systems  
Recipient of 1994 ISU Mathematics Department Lambert Award
- Lai, Ruey-Gang              Math.              1996  
Thesis: Practical feedback stabilization of nonlinear control systems and applications  
Recipient of 1996 SIAM Student Paper Award
- Ou, Chung-Ming              Math              1996  
Thesis: Global aspects of control systems - Perspectives from control Lyapunov functions
- Wang, Hualin              Math              1998  
Thesis: Feedback stabilization of bilinear control systems  
Recipient of 1996 ISU Mathematics Department Lambert Award  
Recipient of Spring 1998 ISU Research Excellence Award
- Hawkins, Richard E.        Econ / Stat        1999  
Thesis: Numerical methods for optimization of recursive systems
- Majumdar, Ruchira              Math              2001  
Thesis: The Lyapunov and Morse spectrum of dynamical systems
- Camaño-Garcia, Gabriel      Stat              2006      (co-advisor with Alicia Carriquiry)  
Thesis: Statistics on Stiefel manifolds
- Li, Wen                      Stat              2009      (co-advisor with Alicia Carriquiry and Cindy Yu)  
Thesis: Memory indicators and their incorporation into dynamic models
- Cruz, Efrain              Math (Chile)      2009      (co-advisor with Victor Ayala, UCN, Chile)  
Thesis: Controlabilidad y Estabilidad de Sistemas de Control Bilineales de Dimensión 2

## 2.5 Supervisor for Postdoctoral Associates / Visiting Scholars

Budhiraja, Amarjit	Math	Fall 1995, Spring 1996, Summer 1996 and 1997
Balaji, Srinivasan	Math.	Spring 1998, Fall 1998, Spring 1999
Femat, Ricardo	Math.	Summer 2000
Efrain Cruz	Math.	Fall 2006, Spring 2007

## 2.6 Member of M. S. Committee

Homblé, Patrick	Stat	1984
Zakaria, Rahmat S.	Stat	1985
Kim, Joo-Hwan	Stat	1986
Grondona, Martin	Stat	1987
Karim, Saqib Saleem-Ul	E.E.	1988
Kruger, Gayle Ruth	Math	1989
Lin, Kuo-Chin	Stat	1991
Papadopoulos, Savas	Stat	1992
Wilmarth, Steven	Stat	1992
Olson, Susan	Math	1993
Kurzahls, Reiner	Stat	1993
Schröder, Jürgen	Stat	1993
Ou, Chung-Ming	Math	1993
Venkataraman, Sunder	E.E.	1993
Lai, Ruey-Gang	Math	1993
Huang, Hsin-Cheng	Stat	1994
Yu, Namkyu	Stat	1994
Baltrum, Robert John	Aero. E., E.M.	1995
Thapar, Jyotika	E.E.	1996
Shah, Jatan	E.E.	1996
Wang, Hualin	E.E.	1998
Sinharay, Sandip	Stat	1998
Hui, Wai-Leung	E.E.	1998
Flemisch, Bernd	Math	2001
Yang, Zhong	E.E.	2001
Solanki, Aparna	Econ	2002
Liu, Jialing	E.E.	2002
Solanki, Aparna	Stat	2004
Ament, Diane	MPA	2006
Wimmer, Maximilian	Math	2006
Padmasola, Prashanth	E.E.	2006
Cofré Torres, Rodrigo	I.M.	2009

Ingeniería Matemática, Universidad Católica  
de Chile, Santiago

## 2.7 Member of Ph.D. Committee

Cho, Yun-Ok	E.E.	1985
Mehailia, Abdelghani	Math	1988
Andrews, Douglas	Stat	1989
Amin, Wael	Math	1989
Fuh, Cheng-Der	Math	1989
Li, Seung-Chun	Stat	1990
Sarkar, Sahadeb	Stat	1990
Lin, Chiou-Hua	Stat	1990

Member of Ph.D. Committee – continued

Ho, Chao-Pao	Math	1991	
Hsieh, Wei-Hua	Math	1991	
Medepalli, Anand	Math	1992	
Croos, Joseph	Stat	1992	
Chakak, Abderrahmane	Stat	1993	
Wang, Lih-Chyun	Math	1993	
Treinen, Roger	E.E.	1993	
Chadalavada, Vamsi	E.E.	1993	
Coffin, Marie	Stat	1993	
Vidyashankar, Anand	Stat/Math	1994	
Starrett, Shelly	E.E.	1994	
Wang, Rong	Math	1995	
Lin, Chih-Ming	E.E.	1995	
Lee, Kye-Don	Stat	1995	
Kang, Hye-Jeong	Math	1995	
Saha, Swapan	E.E.	1995	minor representative
Deo, Rohit Siddheshwar	Stat	1995	
Irizarry-Rivera, Agustin	E.E.	1996	
An, Anthony B.	Stat	1996	
Kumar, Jayant	E.E.	1996	minor representative
Häckl, Gerhard	Math	1996	University of Augsburg, Germany, external referee
Grüne, Lars	Math	1996	University of Augsburg, Germany, external referee
Huang, Hsin-Cheng	Stat	1997	
Jang, Gilsoo	E.E.	1997	minor representative
Sarkar, Pradipta	Stat	1997	
Balaji, Srinivasan	Math	1997	Indian Statistical Institute, Bangalore, India, external referee
Brabec, Marek	Stat	1997	
Jorgenson, Joel Avrin	E.E.	1997	
Melkonian, Tigran A.	Econ	1998	
Rong, Qi	E.E.	1999	
Mortezapour, Siamak	E.E.	1999	
Yu, Xuechun	E.E.	2000	
Zhu, Songzhe	E.E.	2000	
Yu, Baiying	E.E.	2000	
Wu, Lin	E.E.	2000	
Lee, Jaehyung	Stat	2001	
Liu, Xiaohu	Stat	2001	
Fernandez, Soledad	Stat	2001	
Wang, Qin	E.E.	2001	
Zhou, Yuan	E.E.	2001	
Zhu, Chuanjiang	E.E.	2001	
Qi, Xin	E.E.	2002	
You, Haibo	E.E.	2002	
Dietz, Zach	Stat	2002	
Solis, Gualberto	Math/Mexico	2002	
You, Haibo	E.E.	2003	
Malonza, David	Math	2003	
Qiu, Wen Zheng	E.E.	2004	
Sebastian, Abu	E.E.	2004	
Furukawa, Kyoji	Stat	2004	
Bhatt, Ghan Shyam	Math	2004	
Aydinyan, Ruben	Math	2004	
Wen, Xiaoyu	E.E.	2005	

### Member of Ph.D. Committee – continued

Liu, Jialing	E.E.	2005	minor representative
Sahoo, Deepak R	E.E.	2006	minor representative
Liu, Qian	E.E.	2006	
Shao, Wei	E.E.	2006	
Liu, Shu	E.E.	2006	minor representative
Wu, Yu	Stat	2006	
Yadav, Vikas	E.E.	2007	minor representative
De, Tathagata	E.E.	2007	minor representative
Sehgal, Hullas	E.E.		minor representative
Agarwal, Pranav	E.E.		minor representative
Pryporova, Olga	Math	2009	
Vera, Fernando	Math	2009	UCN Antofagasta, Chile
Diwadkar, Amit	E.E.		
Andalam, Vamsi	E.E.		

### **2.8 Curriculum Development**

'Logic and Mathematics for Social Scientists' (Logik und Mathematik für Sozialwissenschaftler, with N. Müller, University of Bielefeld, Germany, 1972-1974) a two semester graduate course covering logic, set theory, calculus, probability theory, graph theory, linear algebra, linear systems theory. The material was published in 1973, 1974 (see below).

'Graph theory and its applications' (Graphentheorie und ihre Anwendungen, with K. Kiesewetter, University of Bielefeld, Germany, 1973-1974), a TV course on the basic concepts and applications in graph theory, used in High School teaching in Germany.

'Lie groups and Lie algebras in systems theory' (ISU, Spring 1987), and "Deterministic and stochastic systems" (ISU, Fall 1987) a graduate course on geometric nonlinear systems theory, taught for the first time as a two semester M690 course in Spring/Fall 1987. The course material has been used also at University of Augsburg (Germany), Catholic University of Santiago (Chile), and Colorado State University.

'Spectral theory of skew product flows' (Bremen, Germany, 1989), a graduate course on spectral theory of dynamical, control, and stochastic systems, with applications to stability and stabilization of systems, basic material for a monograph (jointly with F. Colonius).

'Applications of Hilbert space theory in statistics' (ISU, 1994) a graduate course on Hilbert space theory and its applications to estimation, optimization, linear models, signal processing and filtering. Taught for the first time Spring 1994 as Stat 517X, Math 517X (jointly with P. Sherman, Department of Statistics).

### **2.9 Member of Graduate Faculty**

I am a member of the Graduate Faculty in the Department of Mathematics and the Department of Statistics at Iowa State University. As such, I can direct M. S. and Ph.D. students in both departments.

## 2.10 Education Grants

- 2000-02      *Redesign of the Course Discrete Mathematics*, The Pew Grant Program in Course Redesign, Max Gunzburger PI, \$200,000
- 2008          Linear Algebra and Applications, IMA Summer Workshop, Co-PI (with L. Hogben and Y.T. Poon), Institute for Mathematics and its Applications, \$50,000.
- 2008          Linear Algebra and Applications, IMA Summer Workshop, Co-PI (with L. Hogben and Y.T. Poon), NSF, \$25,000.

### **3. Research**

#### **3.1 Publications**

##### **3.1.1 Books, Authored and Edited**

1. Kliemann, W. and N. Müller, *Logik und Mathematik für Sozialwissenschaftler Vol. I*, Wilhelm Fink Verlag, München, 1973, 307 pp.
2. Kliemann, W. and N. Müller, *Logik und Mathematik für Sozialwissenschaftler Vol. II*, Wilhelm Fink Verlag, München, 1974, 668 pp.
3. Fink, A.M., R.K. Miller, and W. Kliemann (eds.), *Delay and Differential Equations*, World Scientific, Singapore, 1992, 166 pp.
4. Kliemann, W. and N.S. Namachchivaya (eds.), *Nonlinear Dynamics and Stochastic Mechanics*, CRC Press, Boca Raton, 1995, 530 pp.
5. Kliemann, W., W.F. Lanford, and N.S. Namachchivaya (eds.), *Nonlinear Dynamics and Stochastic Mechanics*, AMS Press, Fields Institute Communication Vol. 9, 1996, 238 pp.
6. Colonius, F. and W. Kliemann, *The Dynamics of Control*, Birkhäuser, Boston, 2000, 629 pp.

##### **3.1.2 Chapters in Books, Invited**

1. Arnold, L. and W. Kliemann, *Qualitative Theory of Stochastic Systems*, in: Probabilistic Analysis and Related Topics, Vol. 3 (Bharucha-Reid, A.T., ed.), Academic Press, New York (1983), 1-79.
2. Kliemann, W., *Analysis of Nonlinear Stochastic Systems*, in: Analysis and Estimation of Stochastic Mechanical Systems, (Schiehlen, W. and W. Wedig, eds.), CISM Courses and Lecture, No. 303, Springer, New York (1988), 43-102.
3. Colonius, F. and W. Kliemann, *Control Theory and Dynamical Systems*, in: Six Lectures on Dynamical Systems, (Aulbach, B. and F. Colonius, eds.), World Scientific, (1996), 121-161.
4. Colonius, F., W. Kliemann, and L.A.B. San Martin, *Asymptotic Problems - From Control Systems to Semi Groups*, in: Positivity in Lie Theory: Open Problems, (Hilgert, J., D. Lawson, K.-H. Neeb, and E.B. Vinberg, eds.), De Gruyter Expositions in Mathematics, Vol. 26, Berlin (1998), 21-43.
5. Colonius, F. and W. Kliemann, *Topological, Smooth, and Control Techniques for Stochastic Systems*, in: Stochastic Systems, (Crauel, H. and M.V. Gundlach, eds.), Springer-Verlag, (1999), 181-208.
6. Colonius, F. and W. Kliemann, *An Invariance Radius for Nonlinear Systems*, in: Advances in Mathematical Systems Theory, (F. Colonius, U. Helmke, D. Prätzel-Wolters, and F. Wirth, eds.), Birkhäuser (2000), 77-91.
7. Colonius, F. and W. Kliemann, *Collision of Control Sets*, in: Ergodic Theory, Analysis, and Efficient Simulation of Dynamical Systems, (B. Fiedler, ed.), Springer-Verlag, Berlin (2001), 131—144.

### Chapters in Books, Invited – continued

8. Colonius, F. and W. Kliemann, *Bifurcations of Control Systems: A View from Control Flows*, in: *New Trends in Nonlinear Dynamics and Control, and Their Applications* (W. Kang, C. Borges, and M. Xiao, eds.), *Lecture Notes in Control and Information Sciences* 295, Springer-Verlag (2004), 19-36.
9. Colonius, F. and W. Kliemann, *Dynamical systems and linear algebra*, in: *Handbook of Linear Algebra* (L. Hogben, ed.), CRC Press (2006), 56.1 – 56.31.

### **3.1.3 Articles in Refereed Journals**

1. Kliemann, W., *Stabilität und Wachstum linearer, parametererregter Systeme*, *ZAMM* 61 (1981), T 339-341.
2. Ehrhardt, M. and W. Kliemann, *Controllability of linear stochastic systems*, *Systems and Control Letters* 2 (1982), 145-153.
3. Kliemann, W., *Qualitative theory of stochastic dynamical systems: Applications to life sciences*, *Bull. Math. Biol.* 45 (1983), 483-506.
4. Kliemann, W., *Recurrence and invariant measures for degenerate diffusions*, *Ann. Prob.* 15 (1987), 690-707.
5. Kliemann, W., *A stochastic dynamical model for the characterization of the geometrical structure of dendritic processes*, *Bull. Math. Biol.* 49, (1987), 135-152.
6. Arnold, L. and W. Kliemann, *On unique ergodicity for degenerate diffusions*, *Stochastics* 21 (1987), 41-61.
7. Athreya, K.B., W. Kliemann, and G. Koch, *On sequential construction of solutions of stochastic differential equations with jump terms*, *Systems and Control Letters* 10 (1988), 141-146.
8. Colonius, F. and W. Kliemann, *Infinite time optimal control and periodicity*, *Appl. Math. and Opt.* 20 (1989), 113-130.
9. Kliemann, W., G. Koch, and F. Marchetti, *On the unnormalized solution of the filtering problem with counting process observations*, *IEEE Trans. IT* 36 (1990), 1415-1425.
10. Carriquiry, A., W.P. Ireland, W. Kliemann, and E. Uemura, *Statistical evaluation of dendritic growth models*, *Bull. Math. Biology* 53 (1991), 579-589.
11. Colonius, F. and W. Kliemann, *Minimal and maximal Lyapunov exponents of bilinear control systems*, *J. Diff. Equations* 101 (1993), 232-275.
12. Colonius, F. and W. Kliemann, *Control properties of linear semigroups on projective spaces*, *J. Dynamics and Differential Equations* 5 (1993), 495-528.
13. Colonius, F. and W. Kliemann, *Some aspects of control systems as dynamical systems*, *J. Dynamics and Differential Equations* 5 (1993), 469-494.
14. Colonius, F. and W. Kliemann, *Limit behavior and genericity for nonlinear control systems*, *J. Diff. Equations* 109 (1994), 8-41.

Articles in Refereed Journals – continued

15. Colonius, F. and W. Kliemann, *Random perturbations of bifurcation diagrams*, Nonlinear Dynamics 5 (1994), 353-373.
16. Colonius, F. and W. Kliemann, *Local robust stabilization of nonlinear oscillators under parametric excitation*, Stochastic Dynamics and Reliability of Nonlinear Ocean Systems, ASME DE-Vol. 77 (1994), 1-5.
17. Colonius, F. and W. Kliemann, *Controllability and stabilization of one dimensional systems near bifurcation points*, Systems and Control Letters 24 (1995), 87-95.
18. Uemura, E., A. Carriquiry, W. Kliemann, and J. Goodwin, *Mathematical modeling of dendritic growth in vitro*, Brain Research 671 (1995), 187-194.
19. Colonius, F., G. Häckl, and W. Kliemann, *Dynamic reliability of nonlinear systems under random excitation*, Vibrations of Nonlinear, Random, and Time-Varying Systems, ASME DE-Vol. 84-1 (1995), 1007-1024.
20. Colonius, F. and W. Kliemann, *Stability of time varying systems*, Vibrations of Nonlinear, Random, and Time-Varying Systems, ASME DE-Vol. 84-1 (1995), 365-373.
21. Colonius, F. and W. Kliemann, *The Morse spectrum of linear flows on vector bundles*, Transa. AMS. 348 (1996), 4355-4388.
22. Colonius, F. and W. Kliemann, *The Lyapunov spectrum of families of time-varying matrices*, Transa. AMS. 348 (1996), 4389-4408.
23. Colonius, F., F.J. de la Rubia, and W. Kliemann, *Stochastic models with multistability and extinction levels*, SIAM J. Applied Mathematics 56 (1996), 919-945.
24. Lin, C.-M., V. Vittal, W. Kliemann, and A.A. Fouad, *Investigation of modal interaction and its effects on control performance in stressed power systems using normal forms of vector fields*, IEEE Transactions on PWRS 11 (1996), 781-787.
25. Treinen, R., V. Vittal, and W. Kliemann, *An improved technique to determine the controlling unstable equilibrium point in a power system*, IEEE Transactions on CS 43 (1996), 313-323.
26. Ni, Y.-X., V. Vittal, W. Kliemann, and A.A. Fouad, *Nonlinear modal interaction in HVDC/AC power systems with DC power modulation*, IEEE Transactions on PWRS 11 (1996), 2011-2017.
27. Saha, S., A.A. Fouad, W. Kliemann, and V. Vittal, *Stability boundary approximation of a power system using the real norm of vector fields*, IEEE Transactions on PWRS 12 (1997), 797-802.
28. Thapar, J., V. Vittal, W. Kliemann, and A.A. Fouad, *Application of the normal form of vector fields to predict interarea separation in power systems*, IEEE Transactions on PWRS 12 (1997), 844-850.
29. Colonius, F. and W. Kliemann, *Robustness of time varying systems*, ASME DETC (1997), No. 4025, 10pp (CD-ROM).
30. Colonius, F. and W. Kliemann, *Nonlinear systems with multiplicative and additive perturbation under state space constraints*, ASME DE-Vol. 95 (1997), 131-142.

Articles in Refereed Journals – continued

31. Jang, G., V. Vittal, and W. Kliemann, *Effect of nonlinear modal interaction on control performance: Use of normal forms technique in control design, Part I: General theory and procedure*, IEEE Transactions on PWRs 13 (1998), 401-407.
32. Jang, G., V. Vittal, and W. Kliemann, *Effect of nonlinear modal interaction on control performance: Use of normal forms technique in control design, Part II: Case studies*, IEEE Transactions on PWRs 13 (1998), 408-413.
33. Ni, Y.-X., V. Vittal, and W. Kliemann, *A study of system separation mechanisms in the neighborhood of a relevant type-n UEP via normal form of vector fields*, IEE - Proceedings : Generation, Transmission and Distribution 145 (1998), 139-144.
34. Kliemann, W., *Bayesian interpretation and control of process capability indices*, Discussion in TEST 7 (1998), 53-58.
35. Vittal, V., W. Kliemann, Y.-X. Ni, D.G. Chapman, A.D. Silk, and D.J. Sobajic, *Determination of generator groupings for an islanding scheme in the Manitoba Hydro system using the method of normal forms*, IEEE Transactions on PWRs 13, (1998), 1345-1351.
36. Qi, R., D. Cook, W. Kliemann, and V. Vittal, *Visualization of stable manifolds and multidimensional surfaces in the analysis of power system dynamics*, J. Nonlinear Science 10 (2000), 175-195.
37. Zhu, S., V. Vittal, and W. Kliemann, *Analyzing dynamic performance of power systems over parameter space using normal forms of vector fields, Part I: Identification of vulnerable regions*, IEEE Transactions on PWRs 16 (2001), 444-450.
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39. Colonius, F. and W. Kliemann, *Morse decomposition and spectra on flag bundles*, J. Dynamics and Differential Equations 14 (2002), 719-741.
40. Colonius, F. and W. Kliemann, *Limits of input-to-state stability*, Systems and Control Letters 49 (2003), 111-120.
41. Solis-Perales, G., V. Ayala, W. Kliemann, and R. Femat, *Complete synchronizability of chaotic systems: A geometric approach*, Chaos 13 (2003), 495-501.
42. Ayala, V. and W. Kliemann, *A decomposition theorem for singular control systems on Lie groups*, Computers and Mathematics with Applications 45 (2003), 635-646.
43. Ayala, V., W. Kliemann, and L.A.B. San Martin, *Control sets and total positivity*, Semigroup Forum 69 (2004), 113-140.
44. Ayala, V., F. Colonius, and W. Kliemann, *Dynamic characterization of the Lyapunov form of matrices*, Linear Algebra and Its Applications 402 (2005), 272-290.
45. Ayala-Hoffmann, J., P. Corbin, K. McConville, F. Colonius, W. Kliemann, J. Peters, *Morse decompositions, attractors and chain recurrence*, Proyecciones Journal of Mathematics 25 (2006), 79-109.

#### Articles in Refereed Journals – continued

46. Ayala, V., F. Colonius, and W. Kliemann, *On topological equivalence of linear flows with applications to bilinear control systems*, Journal of Dynamical and Control Systems 13 (2007), 337-362.
47. Carriquiry, A. and W. Kliemann, *The modes of posterior distributions for mixed linear models*, Proyecciones Journal of Mathematics 26 (2007), 281-308.
48. Colonius, F., T. Gayer, and W. Kliemann, *Near invariance for Markov diffusion systems*, SIAM J. Applied Dynamical Systems 7 (2008), 79-107.
49. Colonius, F. and W. Kliemann, *Controllability of nonlinear behaviors*, Transactions of the AMS 360, 11 (2008), 5667-5682.
50. Colonius, F. and W. Kliemann, *Spectral theory for perturbed systems*, GAMM Mitteilungen 32, 1 (2009), 26-46.
51. Colonius, F., A.J. Homburg, and W. Kliemann, *Near invariance and local transience for random diffeomorphisms*, to appear in Journal of Difference Equations and Applications.

#### **3.1.4 Articles in Refereed Collections and Proceedings**

1. Kliemann, W., *Some exact results on stability and growth of linear, parameter excited stochastic systems*, Springer Lecture Notes in Control and Information Sciences No. 16 (1979), 457-471.
2. Kliemann, W., *Transience, recurrence and invariant measures for diffusions*, in: Nonlinear Stochastic Problems (Bucy, R.S. and J.M.F. Moura, eds.), Reidel Publ., Dordrecht (1983), 437-454.
3. Arnold, L., W. Kliemann, and E. Oeljeklaus, *Lyapunov exponents of linear stochastic systems*, Springer Lecture Notes in Mathematics No. 1186 (1986), 85-125.
4. Arnold, L. and W. Kliemann, *Large deviations of linear stochastic differential equations*, Springer Lecture Notes in Control and Information Sciences No. 96 (1987), 117-151.
5. De la Rubia, F.J. and W. Kliemann, *Stochastic bifurcations in a generic dynamical system: A qualitative analysis*, in: Noise and Nonlinear Phenomena in Nuclear Systems (J.L. Muñoz-Cobo and F.C. Difilippo, eds.), Plenum Press, New York (1989), 19-28.
6. Colonius, F. and W. Kliemann, *Stability radii and Lyapunov exponents*, in: Control of Uncertain Systems (D. Hinrichsen and B. Martensson, eds.), Birkhäuser (1990), 19-56.
7. Colonius, F. and W. Kliemann, *Lyapunov exponents of control flows*, Springer Lecture Notes in Mathematics No. 1486 (1991), 331-365.
8. Colonius, F. and W. Kliemann, *Stabilization of linear uncertain systems*, in: Modeling, Estimation and Control of Systems with Uncertainty (A.B. DiMasi, A. Gombani, A.B. Kurzhansky, eds.), Birkhäuser (1991), 76-90.
9. Colonius, F. and W. Kliemann, *Stabilization of uncertain linear systems via Lyapunov exponents*, in: Proceedings of IEEE Conference on Decision and Control 1991, Brighton, England (1991), Vol. I. 887-893.

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10. Colonius, F. and W. Kliemann, *Remarks on ergodic theory of stochastic flows and control flows*, in: Diffusion Processes and Related Problems in Analysis, Vol. II, (M. Pinsky and V. Wihstutz, eds.), Birkhäuser (1992), 203-240.
11. Colonius, F. and W. Kliemann, *Controlling the dynamics of a random system*, in: Nonlinear Stochastic Mechanics (N. Bellomo, F. Casciati, eds.), Springer (1992), 333-346.
12. Colonius, F. and W. Kliemann, *On control sets and feedback for nonlinear systems*, in: Proceedings of IFAC NOLCOS '92, Bordeaux, France (1992), 49-56.
13. Colonius, F. and W. Kliemann, *A Dynamical Systems Approach to Control*, in: Proceedings of IFAC NOLCOS '92, Bordeaux, France (1992), 361-367.
14. Colonius, F., G. Häckl, and W. Kliemann, *Controllability near a Hopf bifurcation*, in: Proceedings of IEEE Conference and Decision and Control 1992, Tucson (1992), 2113-2118.
15. Vittal, V., W. Kliemann, S.K. Starrett, and A.A. Fouad, *Analysis of stressed power systems using normal forms*, in: Proceedings of the International Symposium on Circuits and Systems (ISCAS 92), San Diego (1992), 2553-2556.
16. Colonius, F. and W. Kliemann, *Feedback stabilization of one dimensional systems near bifurcation points*, in: Proceedings of 2. European Control Conference 1993, Groningen, The Netherlands (1993), 45-49.
17. Colonius, F. and W. Kliemann, *Reliability assessment of dynamical systems with random excitation*, in: Proceedings of 32nd IEEE Conference on Decision and Control 1993, San Antonio (1993), 3879-3884.
18. Starrett, S.K., W. Kliemann, V. Vittal, and A.A. Fouad, *Power system modal behavior: Significance of second and third order nonlinear terms*, in: Proceedings of the 25th North American Power Symposium, Washington D. C. (1993), 246-255.
19. Starrett, S.K., V. Vittal, W. Kliemann, and A.A. Fouad, *A methodology for the analysis of nonlinear interarea interactions between power system natural modes of oscillation utilizing normal forms of vector fields*, in: Proceedings of the 1993 International Symposium on Nonlinear Theory and its Applications, Hawaii (1993), 523-538.
20. Lin, C.-M., W. Kliemann, V. Vittal, and A.A. Fouad, *Interaction between excitation control modes and inertial modes in stressed power systems*, in: Proceedings of the 26th North American Power Symposium (1994), 669-678.
21. Starrett, S.K., V. Vittal, W. Kliemann, and A.A. Fouad, *Excitation of second-order normal forms and first-order Jordan forms modes of oscillation*, in: Proceedings of the 26th North American Power Symposium (1994), 27-36.
22. Saha, S., V. Vittal, W. Kliemann, and A.A. Fouad, *Local approximation of stability boundary of a power system using the real normal form of vector fields*, in: Proceedings of the International Symposium on Circuits and Systems (ISCAS 95) (1995) 2330-2333.
23. Colonius, F. and W. Kliemann, *Asymptotic null-controllability of bilinear systems*, in: Geometry in Nonlinear Control and Differential Inclusions, Banach Center Publications Vol. 32, Warsaw (1995), 139-148.

Articles in Refereed Collections and Proceedings – continued

24. Ni, Y.-X., V. Vittal, W. Kliemann, and A.A. Fouad, *Application of normal form of vector fields to AC/DC power systems*, in: Proceedings of the 27th North American Power Symposium (1995), 6-12.
25. Saha, S., W. Kliemann, V. Vittal, and A.A. Fouad, *Effect of stress on the boundary of stability of a power system*, in: Proceedings of the 27th North American Power Symposium (1995), 257-262.
26. Colonius, F. and W. Kliemann, *A stability radius for nonlinear differential equations subject to time varying perturbations*, in: Proceedings of IFAC NOLCOS '95 (1995) 44-46.
27. Kliemann, W., *Nonlinear time series - bifurcation, chaos, and stationarity*, in: Modeling and Prediction Honoring Seymour Geisser (J.C. Lee, W.O. Johnson, and A. Zellner, eds), Springer (1996), 389-401.
28. Ni, Y.-X., V. Vittal, and W. Kliemann, *System trajectory in the neighborhood of the controlling UEP viewed from decoupled modal space via normal form of vector fields*, in: Proceedings of the 28th North American Power Symposium (1996), 551-558.
29. Colonius, F. and W. Kliemann, *On the global controllability structure of nonlinear systems*, in: Proceedings of ECC '97, Paper No. 529, 6pp (CD-ROM).
30. Ni, Y.-X., V. Vittal, and W. Kliemann, *Investigation of nonlinear modal behavior of HVDC/AC power systems through a scanning tool via normal form technique*, Proceedings of IEEE International Symposium on Circuits and Systems, Paper no. 2P1-16, Hong Kong (1997), 945-948.
31. Colonius, F. and W. Kliemann, *Exponential growth behavior of bilinear control systems*, in: Proceedings of 36th IEEE Conference on Decision and Control 1997, San Diego (1997), 4425-4430 (CD-ROM).
32. Colonius, F. and W. Kliemann, *Spectral theory for perturbed systems*, ECC '99 (1999).
33. Colonius, F. and W. Kliemann, *Mergers of control sets*, in: Proceedings of the Fourteenth International Symposium on Mathematical Theory of Networks and Systems, Perpignan, France (2000), (El Jai, A. and M. Fliess, eds.), 7pp.
34. Colonius, F. and W. Kliemann, *Invariance under bounded time-varying perturbations*, in: Proceedings of the 11<sup>th</sup> IFAC International Workshop on Control Applications of Optimization, St. Petersburg, Russia (2000), 82-85.
35. Colonius, F. and W. Kliemann, *Computation of almost invariant sets for perturbed systems*, in: Proceedings of CDC 2000, Sidney, Australia (2000), 4pp.
36. Zhu, S., W. Kliemann, and V. Vittal, *Analyzing dynamic performance of power systems over parameter space using the method of normal forms*, in: Proceedings of the National Power Systems Conference, Bangalore, India (2000), 100-105.
37. Colonius, F. and W. Kliemann, *On dynamic bifurcations in control systems*, in: Proceedings of the IFAC Symposium on Nonlinear Control systems (NOLCOS 2001), St. Petersburg, Russia, (2001), 140-143.

#### Articles in Refereed Collections and Proceedings – continued

38. Colonius, F. and W. Kliemann, *Attractors, input-to-state stability, and control sets*, in: Electronic Proceedings of the 15<sup>th</sup> Conference on Mathematical Theory of Networks and Systems (MTNS), University of Notre Dame, Southbend, Indiana, August 12-16 2002, (D.S. Gilliam, J. Rosenthal, eds.), 11 pp.
39. Colonius, F. and W. Kliemann, *Behaviors and controllability*, in: Electronic Proceedings of the 16<sup>th</sup> Conference on Mathematical Theory of Networks and Systems (MTNS), July 5-9, 2004, Leuven (Belgium), 10 pp.
40. Ayala, V., F. Colonius, and W. Kliemann, *Towards a topological classification of bilinear control systems*, Electronic Proceedings of the 17<sup>th</sup> Conference on Mathematical Theory of Networks and Systems (MTNS), July 24-28, 2006, Kyoto (Japan), 5 pp.
41. Vargas, L.S., H. Verdejo, and W. Kliemann, *A stochastic methodology for modeling PSS in small signal stability analysis*, accepted by North American Power Symposium 2008, Calgary.

#### **3.1.5 Articles, not Refereed, and Technical Reports**

1. Kliemann, W., *Qualitative Theorie nichtlinearer stochastischer Systeme*, Ph.D.-Thesis, Report No. 32 of Institute for Dynamical Systems, Bremen (1980), 384 pp.
2. Kliemann, W. and W. Rümelin, *On the Growth of Linear Systems Parametrically Disturbed by a Diffusion Process*, Report No. 27 of Institute for Dynamical Systems, Bremen (1981), 31 pp.
3. Colonius, F. and W. Kliemann, *Extremal exponential growth rates of bilinear control systems*, in: Differential Equations and Applications (R.A. Aftabizadeh, ed.), Ohio University Press (1989), 186-190.
4. Colonius, F., W. Kliemann, and S. Krull, *Stability and stabilization of linear, uncertain systems -A Lyapunov exponents approach*, Report No. 372 of the Schwerpunktprogramm der Deutschen Forschungsgemeinschaft 'Anwendungsbezogene Optimierung und Steuerung' (1992), 38 pp.
5. Fouad, A.A., V. Vittal, and W. Kliemann, *Analysis of Stressed Interconnected Power Networks*, EPRI Report TR-103704 (1994), 95 pp.
6. Lin, S., V. Ajjarapu, B. Lee, V. Vittal, and W. Kliemann, *Control of voltage collapse in an electrical power system using center manifold theory*, in: Proceedings of the Midwest Power Symposium 95 (1995) 4 pp.
7. Colonius, F. and W. Kliemann, *Lyapunov exponents in nonlinear stochastic dynamics*, in: Proceedings of 32nd Annual Technical Meeting of the Society of Engineering Science, New Orleans, Oct. 1995 (1995), 273-275.
8. Pradlwarter, H.J. and W. Kliemann, *First exit times in nonlinear dynamical systems by advanced Monte Carlo simulation*, in: Proceedings of the 11th Conference on Engineering Mechanics, ASCE, Fort Lauderdale, May 1996 (1996), Vol. I, 523-526.
9. Fouad, A.A., W. Kliemann, and V. Vittal, *Nonlinear Power System Behavior using Normal Forms: Extension of Linear System Analysis via Higher Order Correction*, EPRI Report TR-107798 (1997), 189 pp.
10. Vittal, V., W. Kliemann, and Y.-X. Ni, *Testing Methods for Prediction of Onset of Interarea Split in a Full-Scale Real World Context*, EPRI Report TR-108533 (1998).

### Articles, not refereed, and Technical Reports – continued

11. Kliemann, W., *Dynamics and Linear Algebra*, Lecture Notes for Sociedad de Matemática de Chile (2007), 28 pp.
12. Kliemann, W., *Risk and reliability in stochastic systems*, Proceedings of the Simposio 2007 of the Sociedad de Matemática de Chile (2007), 4 pp.
13. Kliemann, W., *Calculo Científico II – Métodos numéricos para ecuaciones diferenciales*, Lecture Notes for Pontificia Universidad Católica de Chile (2008), 125 pp.

### **3.1.6 Articles, Submitted**

1. Ayala, V., W. Kliemann, and L. San Martin, *Pontryagin Maximum Principle on homogeneous spaces*, submitted to Computers and Mathematics with Applications.
2. Ayala, V., F. Colonius, C. Kawan, and W. Kliemann, *Projective conjugacies of linear differential equations*, submitted to Dynamical Systems.

### **3.1.7 Book Reviews**

1. *Stochastic Integration and Differential Equations*, by P. Protter, Springer (1990), Jahresberichte der Deutschen Mathematiker Vereinigung, 94, 2 (1992), 7-11.
2. *Stability of Stochastic Differential Equations with Respect to Semimartingales*, by X.R. Mao, Wiley (1991), for Mathematical Reviews.
3. *Stochastic Differential Equations*, by B. Øksendal, Springer (3<sup>rd</sup> edition, 1992), for Zentralblatt.
4. *The Fokker-Planck Equation for Stochastic Dynamical Systems and Its Explicit Steady State Solutions*, by C. Soize, World Scientific (1994), for Zentralblatt and for Mathematical Reviews.
5. *Exponential Stability of Stochastic Differential Equations*, by X.R. Mao, Marcel Dekker (1994), for Mathematical Reviews.
6. *Stochastic Dynamical Systems*, by J. Honerkamp, VCH Publishers (1994), for Mathematical Reviews.
5. *Analyse und Simulation stochastischer Schwingungssysteme*, by J. vom Scheidt, B. Fellenberg, and U. Wöhrli, B.G. Teubner (1994), for Mathematical Reviews.
6. *Introduction to the Theory of Diffusion Processes*, by N.V. Krylov, AMS (1995), for Zentralblatt.
7. *Frequency-Domain Methods for Nonlinear Analysis*, by G.A. Leonov, D.V. Ponomarenko, and V.B. Smirnova (1996), for Mathematical Reviews.
8. *Partially Observable Linear Systems Under Dependent Noises*, by A.E. Bashirov (2004), IEEE Transactions on Automatic Control 49 (2004), 1417-1418.
9. *Stochastic Differential Equations*, by B. Øksendal, Springer (6<sup>th</sup> edition, 2003), IEEE Transactions on Automatic Control 51 (2006), 1731-1732.
10. *Applied Linear Algebra*, by P.J. Olver and C. Shakiban, Pearson Prentice Hall (2006), with L. Hogben, MAA The American Mathematical Monthly 115 (2008), 373-378.

## Book Reviews – continued

11. *Dynamic Stability of Structures*, by W.-C. Xie, Cambridge University Press (2006), SIAM Review 50 (2008), 176-179.

### **3.1.8 Publications on Mathematics Education**

1. Froelich, A.G., W. Kliemann and H. Thompson, *Changing the statistics curriculum for future and current high school mathematics teachers: a case study*, in: International Commission on Mathematical Instruction / International Association for Statistical Education (ICMI-IASE) Study Conference on Teaching Statistics in School Mathematics 2008, 6pp, on the web at [http://www.ugr.es/~icmi/iase\\_study/Files/Topic6/T6P5\\_Froelich.pdf](http://www.ugr.es/~icmi/iase_study/Files/Topic6/T6P5_Froelich.pdf).

### **3.1.9 Popular Scientific Articles**

1. *Umweltschutz, Umweltschutzbewegung und "Die Grünen"*, Schatzkammer 12 (1986), 10-26.
2. *Prinzip der gefederten Hochhäuser* (with F.M. Rudel), Weser Kurier (May 3, 1997), (Bremen, Germany), 48.
3. *Die Dynamik des Zufalls: Zufallsforschung an der Universität Bremen*, Impulse 23 (1997), (Bremen, Germany), 52-55.

### **3.2 External Research Grants**

- |           |  |
|-----------|--|
| 1984-1986 | Grant Kl 513/1-1 from Deutsche Forschungsgemeinschaft, DM 84,523.  |
| 1989-1991 | <i>Lyapunov Exponents of Bilinear Control Systems: Stability and Stabilization</i> , NSF Grant No. DMS-8813976 (with F. Colonius), \$49,500.                         |
| 1989-1992 | <i>Nonlinear Real Time Filtering: Theory and Numerics</i> , NSF Grant No. DMS-8913222 (with E. Goggin (PI)), \$28,830.   |
| 1990-1991 | <i>Lyapunov Exponenten bilinearer Kontrollsysteme: Stabilität and Stabilisierung</i> , DFG Grant No. Co 124/6-1 (with F. Colonius (PI)), DM 68,000.                  |
| 1990-1991 | <i>Stabilität und Stabilisierung nichtlinearer Kontrollsysteme</i> , DFG Grant No. Co 124/8-1 (with F. Colonius (PI)), DM 9,500.                                     |
| 1991      | <i>Mixed Linear Models in Quantitative Genetics</i> , (with A. Carriquiry (PI), Statistics), Iowa Agriculture Experiment Station Innovative Research Grant, \$3,810. |
| 1991-1994 | <i>Mathematical Approach to Modeling Dendritic Growth</i> , NIH N528416 (with E. Uemura (PI), (Veterinary Anatomy) and A. Carriquiry (Statistics)), \$299,317.       |
| 1992-1993 | <i>Analysis of Stressed Interconnected Power Networks</i> , EPRI RP8010-28 (with A.A. Fouad (PI) and V. Vittal, E.E.), \$176,085.                                    |
| 1992-1994 | <i>Nichtlineare Kontrollsysteme</i> , DFG grant No. Co 124/8-2 (with F. Colonius (PI)), DM 106,000.  |

Research Grants - continued

- 1993            *International Symposium on Nonlinear Dynamics and Stochastic Mechanics*, NSF (with N.S. Namachchivaya (PI), Aero. E., University of Illinois, Urbana-Champaign), \$15,000.
- 1993-1996      *Reliability of Nonlinear Stochastic Dynamical Systems*, ONR grant No. N00014-93-1-0868, \$345,000.
- 1994-1995      *Nonlinear Power System Behavior Using Normal Forms*, NSF grant No. ECS-9314453 (with A.A. Fouad (PI) and V. Vittal, E.E.), \$139,995.
- 1994-1997      *Nonlinear Power System Behavior Using Normal Forms*, EPRI grant No. RP8050-08 (with A.A. Fouad (PI) and V. Vittal, E.E.), \$171,630.
- 1996-1998      *Nonlinear Filtering Approaches to Multi Target Tracking*, ONR grant no. N00014-96-1-0279 (with J. Breidt (Statistics), A. Budhiraja, A. Carriquiry (Statistics), D. Mirkovic, and B. O'Donnell (Grandview College)), \$604,340.
- 1996            *Nonlinear Filtering Approaches to Multi Target Tracking*, ONR grant no. N00014-96-1-0279 MP1, \$23,006.
- 1996            *Dynamic Reliability*, ONR Conference Grant (with A. Heinricher (PI), WPI), \$17,000.
- 1996            *Stochastic Analysis of Dynamical Systems*, Fundacion Andes (Chile) grant no. C12999/1 (with J. San Martin (PI), UChile), \$5,500.
- 1997            *Random Dynamical Systems*, DFG Conference Grant (with F. Colonius (PI)), DM 25,000.
- 1998 – 1999    *Nonlinear Filtering Approaches to Multi Target Tracking*, ONR (with J. Breidt and A. Carriquiry, Statistics), \$50,000.
- 1998 – 2003    *Innovative Technologies for Defense Against Catastrophic Failures of Complex, Interactive Power Networks*, EPRI and DOD (with V. Vittal (PI), V. Ajjarapu, M.H. Khammash, J.D. McCalley, G.B. Sheble, L. Tesfation, S.S. Venkata, all EE), ISU part \$1,481,234.

ISU Sciences and Humanities Research Institute (SHRI) grants: Fall 1984 and Fall 1985.

### **3.3 Lectures and Papers at Conferences**

#### **3.3.1 Plenary Lectures at International Conferences**

- 1979 'Some exact results on the growth of linear stochastic systems', Conference on Stochastic Differential Systems, Bad Godesberg, Germany.
- 1980 'Controllability of linear, white noise systems', Workshop on Linear and Nonlinear Control Theory, Edzell, Scotland.
- 'Stochastic processes in life sciences', Conference on Stochastic Processes in Life Sciences, Trento, Italy.
- 1981 'Control sets and the recurrence-transience dichotomy', Conference on Stochastic Systems in Physics, Chemistry, and Biology, Bielefeld, Germany.
- 'Control theoretic approach to the qualitative behavior of diffusion processes', Workshop on Stochastik, Oberwolfach, Germany (series of 3 lectures).
- 1982 'Transience, recurrence and invariant measures for diffusions', NATO ASI on Nonlinear Stochastic Problems, Algarve, Portugal.
- 1984 'Lyapunov exponents of linear stochastic systems', Workshop on Lyapunov Exponents, Bremen, Germany.
- 1985 'On stability results for linear stochastic systems', Conference on Mathematische Stochastik, Oberwolfach, Germany.
- Large deviations for linear stochastic systems', Workshop on Large Deviations, IMA, Minneapolis, USA.
- 1986 'Are a.s. exponentially stable stochastic systems `stable'?', Conference on Nonlinear Random Vibrations, Oberwolfach, Germany.
- 1987 'Analysis of Nonlinear Stochastic Systems', CISM Conference on Analysis and Estimation of Stochastic Mechanical Systems, Udine, Italy, (series of 5 60-min. lectures).
- 1988 'Limit theorems for random dynamical systems', Third Latin American Congress on Probability and Mathematical Statistics, Montevideo, Uruguay.
- 1989 'Stability radii and Lyapunov exponents', Workshop on Control of Uncertain Systems, Bremen, Germany.
- 'Ergodic theory of stochastic flows', EIPES VIII (8th Winter School of Probability and Statistics), SCIENES, Santiago, Chile (series of 6 90-min. lectures).
- 1990 'Stochastic and control flows: General principles', Conference on Stochastic Flows, UNCC, Charlotte NC.
- 'The Lyapunov spectrum of control systems', Conference on Lyapunov Exponents, Oberwolfach, Germany.
- 'Stabilization of uncertain linear systems: A Lyapunov exponents approach', Conference on Modeling and Control of Uncertain Systems, IIASA, Sopron, Hungary.

Plenary Lectures at International Conferences - continued

- A dynamical systems approach to control', 3. Escuela Internacional de Sistemas Dinamicos, Santiago, Chile.
- 1991 'Nonlinear real time filtering', Conference on Analytical and Numerical Methods in Recursive Filtering, Torino, Italy.
- 'Stabilization of random vibrations and its relation to control and chaos', IUTAM Symposium on Nonlinear Stochastic Mechanics, Torino, Italy.
- 'A dynamical systems approach to nonlinear control', IIASA Workshop on Geometric Methods in Nonlinear Optimal Control, Sopron, Hungary.
- 'On two perturbation theorems for ordinary differential equations', Conference on Nonlinear and Random Vibrations, Oberwolfach, Germany.
- 1992 'Numerical computation of exact stability regions for uncertain systems', International Workshop on Numerics for Stochastic Systems, Charlotte NC.
- 'A dynamical systems approach to control', IFAC NOLCOS '92, Bordeaux, France (with F. Colonius).
- 'Complexity and chaos in control systems', International Workshop on Dynamical Measures of Complexity and Chaos II, Bryn Mawr, PA.
- 'Hypoellipticity and invariant measures for stochastic systems', International Workshop on Stochastic Control, Centre de Recherches Mathématique, Montreal, Canada (2 60-min. presentations).
- 1993 'One dimensional control systems: Bifurcations, robustness, stochastic perturbations', DFG Workshop on Nonlinear Control Theory, Augsburg, Germany .
- 'Geometric control - topological dynamics - random perturbations', Banach Center Workshop on Geometry and Control, Warsaw, Poland.
- 'Response theory for nonlinear stochastic dynamical systems', ONR Workshop on Reliability of Nonlinear Ocean Structures under Stochastic Excitation, Washington D.C.
- 1994 'Random dynamical systems: Global analysis and control', Workshop on Control Techniques for Nonlinear Systems, Bremen, Germany.
- 'The influence of parametric vibrations on nonlinear oscillations and their control', 5th Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures, VPI Blacksburg, VA.
- 'Response and response control in nonlinear stochastic systems', ONR Workshop on Reliability of Nonlinear Ocean Structures under Stochastic Excitation, Washington, D. C.
- 'Some remarks on nonlinear robustness', WIAS Workshop on Nonlinear Control Theory, Berlin, Germany.
- 1995 'Flows on vector bundles and linearization of dynamical systems over function spaces', Workshop on Random Dynamical Systems, Urbana, IL.

Plenary Lectures at International Conferences - continued

- 'Random nonlinear oscillators: Qualitative behavior and stabilization under non-Gaussian excitation', IUTAM Symposium on Advances in Nonlinear Stochastic Mechanics', Trondheim, Norway, July 1995.
- 'Some remarks on robust stability', Institute for Dynamical Systems, Third Day Full of Randomness, University of Bremen, July 1995.
- 'Dynamic reliability of nonlinear systems under random excitation', ONR Workshop on Reliability of Nonlinear Ocean Structures under Stochastic Excitation, Renaissance Hotel, Arlington, VA, July 1995.
- 'Dynamic reliability theory', Conference on Nonlinear and Stochastic Systems, Oberwolfach, Germany, September 1995.
- 1996 'Nonlinear filtering - exact and approximate approaches', ONR/NRaD Workshop on Multitarget Tracking, San Diego, California, February 1996.
- 'Some remarks on Lyapunov exponents and their computation', NSF-INRIA Workshop on Weak Convergence and Applications, INRIA Sophia Antipolis, France, March 1996.
- 'Problems in nonlinear stochastic dynamics and numerical approaches', Workshop on Numerics in Stochastic Dynamical Systems, Oberwolfach, Germany, July 1996.
- 'Persistence of attractors', Tercer Coloquio Nacional de Sistemas Dinamicos, Osorno, Chile, November 1996.
- 'Spectral theory of nonlinear semi-groups', Conference on Positivity in Lie Theory, Oberwolfach, Germany, December 1996.
- 1997 'Dynamic reliability of systems under random excitation', Workshop on Response and Reliability of Stochastic Dynamical Systems, University of Notre Dame, IN, May 1997.
- 'Characterization of stabilizability in nonlinear systems', AMS - SRI on Differential Geometry and Control, Boulder, CO, July 1997.
- 'Dynamic reliability of stochastic systems', COMCA '97, Antofagasta, Chile, July 1997.
- 'Towards a bifurcation theory of control systems', COTA '97, Antofagasta, Chile, August 1997.
- 'Global analysis of Markov diffusion processes', Workshop on Nonlinear Noisy Systems, Graduate College of the University of Augsburg, Germany, September 1997 (2 lectures).
- 1998 'Approximation of attractors via control theory', DFG Workshop on Numerical Methods for Perturbed and Controlled Dynamical Systems, Kloster Irsee, Germany, March 1998.
- 'Towards a bifurcation theory of nonlinear control systems', IMA Workshop on Nonlinear Identification and Control, Institute for Mathematics and Its Applications, Minneapolis, May 1998.
- 1999 'Lie semigroups in control theory', International Workshop on Advances in Mathematical Systems Theory, Borkum, Germany, April 1999.
- 2003 'Skew product flows: The control case', International Workshop on the Foundations of Nonautonomous Dynamical Systems, Friedrichsdorf, Germany, September 2003.

### Plenary Lectures at International Conferences - continued

- 2008 'Stability Radii', International Conference on Stochastic Analysis and Mathematical Physics VI, Santiago, Chile, January 2008.
- 2008 'Filosofía y Matemáticas, pilares de la educación integral del ciudadano', Décimas Jornadas Rolando Chuaqui de Matemáticas y Filosofía, Santiago, Chile, August 2008.

### **3.3.2 Invited Presentations at International Conferences**

- 1985 'Qualitative theory for diffusion processes', AMS Spring Meeting, Chicago, Illinois, USA.
- 1988 'Bifurcations in stochastic systems', 17th Conference on Stochastic Processes and their Applications, Rome, Italy.
- 1990 'Common techniques in dynamical and stochastic systems', SIAM Conference on Dynamical Systems, Orlando (Minisymposium: Dynamical Systems and Stochastic Processes).
- 1991 'A dynamical systems approach to control', AMS-MAA Annual Meeting, San Francisco (Special Session: Deterministic Nonlinear Control Theory).
- 'Dynamical systems and control systems: An introduction', ICIAM '91, Washington, D.C. (Minisymposium: Chaos, Control, and Noise)
- 1992 'Invariant manifolds for control flows', SIAM Conference on Control and its Applications, Minneapolis, MN (Special Session: Control, Chaos, and Dynamical Systems).
- 1993 'Exact regions of asymptotic null-controllability for bilinear systems', Conference on Mathematical Theory of Networks and Systems, MTNS '93, Regensburg, Germany (Special Session: Dynamical Aspects of Nonlinear Control).
- 'Reliability assessment of dynamical systems with random excitation', 32nd IEEE Conference on Decision and Control, San Antonio, Texas (Special Session: Nonlinear Dynamics in Control Systems).
- 1994 'Response behavior of dynamical systems with stochastic excitation', AMS-MAA Joint Mathematical Meetings, Cincinnati (Special Session: Stochastic Analysis).
- 'Robust stabilization of nonlinear systems with random excitation', 1994 ASME Winter Annual Meeting, Chicago (Special Symposium: Stochastic Dynamics and Reliability of Nonlinear Ocean Systems).
- 'Nonlinear time series-bifurcation, chaos, and stationarity', Conference on Forecasting, Prediction and Modeling in Statistics and Econometrics, CFPMSSE '94, Hsinchu, Taiwan.
- 1995 'Global analysis of perturbed dynamical systems', 3rd SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 1995.
- 'Multistability for stochastic models and control sets', ICIAM '95, Congress Center, Hamburg, July 1995 (presented by F. Colonius).
- 'Stability of time-varying systems', ASME 1995 Design Engineering Conferences, Boston, MA, September 1995 (Special Conference: Time Varying Systems and Structures).

### Invited Presentations at International Conferences - continued

- 'Dynamic reliability of nonlinear systems under random excitation', ASME 1995 Design Engineering Conferences, Boston, MA, September 1995 (Special Conference: Random Vibration and Stochastic Dynamics).
- 1995 'Lyapunov exponents in nonlinear stochastic dynamics', SES 32nd Annual Technical Meeting, New Orleans, LA, October 1995 (Special Meeting: Nonlinear Vibration and Chaos).
- 1996 'On the spectrum of control and stochastic systems', MTNS '96, St. Louis, June 1996 (Special Session: Spectral Theory for Time-Varying Linear Systems and Stabilization).
- 'Dynamic reliability of systems under random excitation: analysis and numerics', 2nd World Congress of Nonlinear Analysts, Athens, Greece, July 1996 (Special Session: Stochastic Analysis).
- 'Dynamic reliability and exit statistics', 7th ASCE Specialty Conference on Probabilistic Mechanics and Structural Reliability, WPI Worcester, MA, August 1996.
- 1997 'Global theory of control systems', Annual GAMM Meeting 1997, Regensburg, Germany, March 1997 (Special Session: Nonlinear Control Theory).
- 'Persistence of attractors and spectra in nonlinear flows with applications to stability and bifurcations', McNU '97, Evanston, IL, July 1997 (Symposium: Stability and Bifurcation of Nonlinear Stochastic Systems).
- 'Nonlinear analysis of power systems using normal forms of vector fields', COMCA '97, Antofagasta, Chile, July 1997 (Special Session: Power Systems).
- 'Robustness of time-varying systems', ASME 1997 Design Engineering Technical Conferences, Sacramento, CA, September 1997 (Symposium: Time-Varying Systems and Structures).
- 'Towards a bifurcation theory for control systems', CDC 1997, San Diego, CA, December 1997 (Special Session: Spectral Theory of Control Systems)
- 1998 'Towards a bifurcation theory for control systems', ISCAS 1998, Monterey, CA, May/June 1998 (Special Invited Session: Control of Bifurcation and Chaos).
- 'Smooth dynamics of nonlinear control systems', MTNS '98, Padova, Italy, July 1998, (Special Invited Session: Numerical Methods for Stability and Stabilization of Control Systems).
- 1999 'Basics of dynamic reliability theory', 10<sup>th</sup> INFORMS Applied Probability Conference, Ulm, Germany, July 1999, (Special Invited Session: Probabilistic Aspects of Reliability Theory).
- 2000 'Applications of dynamic reliability theory', World Congress of Nonlinear Analysts, Catania, Italy, July 2000.
- 'Computation of almost invariant sets', CDC 2000, Sydney, Australia, December 2000.
- 'Nonlinear analysis of large power systems', Uruguay Workshop on Electric Power Systems, Montevideo, Uruguay, December 2000.
- 2001 'Computation of almost invariant sets', Congreso Latino Americano de Probabilidad y Estadística Matemática, La Habana, Cuba, November 2001.

### Invited Presentations at International Conferences - continued

- 2003 'Bifurcation theory for control systems', Semester on Mathematical Control and Systems Theory, Institut Mittag-Leffler, Royal Swedish Academy of Sciences, Stockholm, Sweden, May 2003.
- 'Local bifurcations in control systems', Workshop on Geometric Nonlinear Control, Campinas, Brazil, July 2003.
- 2003 'Almost invariance', COMCA '03, Antofagasta, Chile, August 2003.
- 'Chain recurrence and spectra on flag manifolds' COMCA '03, Antofagasta, Chile, August 2003 (Special Invited Session: Geometric Control Theory).
- 2005 'Almost invariance', EuroMech 2005, Eindhoven, The Netherlands, August 6, 2005 (Special Invited Session: Nonlinear and Stochastic Dynamics).
- 2007 'Issues in mathematical modeling and design of power systems', First Workshop on Renewable Energy, Energy Efficiency and Stochastic Modeling, Concepcion, Chile, July 3-6, 2007.
- 2007 'Risk and reliability in stochastic systems', Meeting of the Sociedad de Matemática de Chile, Punta de Tralca, Chile, November 7 – 10, 2007 (Special Invited Session: Stochastic Analysis).
- 2007 'Some mathematical issues in analysis and design of power systems', Workshop on Power Systems Stability, Universidad de Chile, Santiago, Chile, December 6, 2007.
- 2008 'Mathematics Education: Discovering, Sharing and Applying Mathematics', XXII Jornada de Matemática de la Zona Sur, Universidad de Valdivia, Valdivia, Chile, April 23 – 25, 2008.

### **3.3.3 Contributed Papers at Conferences**

- 1979 'Stabilität und Wachstum linear, parametererregter Systeme', GAMM Conference, Berlin, Germany.
- 'The qualitative behavior of stochastic dynamical systems', 9th Conference on Stochastic Processes and their Applications, Evanston, Ill. USA.
- 1982 'Stability of parameterexcited linear stochastic systems', Equadiff. '82, Würzburg, Germany.
- 1983 'Control theory for stochastic systems', 12th Conference on Stochastic Processes and their Applications, Ithaca, N.Y., USA.
- 'On the magnitude of Lyapunov exponents for linear stochastic systems', 5th Symposium on Multivariate Analysis, Pittsburgh, USA.
- 1987 'Stability and large deviations in stochastic systems', ICIAM '87, Paris, France.
- 1988 'Extremal exponential growth rates of bilinear control systems', International Conference on Theory and Application of Differential Equations, Columbus, Ohio (presented by F. Colonius).
- 'Stochastic bifurcations in a generic dynamical system: A qualitative analysis', Conference on Noise and Nonlinear Phenomena in Nuclear Systems, Valencia, Spain (presented by J. F. de la Rubia).
- 1989 'The spectrum of nonlinear control systems', SIAM Conference on Control in the 90's, San Francisco, USA (presented by F. Colonius).

Contributed Papers at Conferences - continued

- 1990 'The Lyapunov spectrum of bilinear control systems', SIAM Conference on Dynamical Systems, Orlando FL.
- 1992 'On control sets and feedback for nonlinear systems', IFAC NOLCOS '92, Bordeaux, France.
- 1995 'A stability radius for nonlinear differential equations subject to time varying perturbation', IFAC Nonlinear Control Systems Design Symposium NOLCOS '95, Granlibakken Conference Center, Lake Tahoe, June 1995.
- 1998 'Capsizing a ship in rough sea', Annual MAA / ASA Meeting, Iowa Section, Decorah, IA, April 1998.
- 2006 'Global dynamics and chaos', Annual MAA Meeting, Iowa Section, Ames, IA, April 2006.
- 2007 'Linear differential equations', Annual MAA Meeting, Iowa Section, Des Moines, IA, April 2007.

### **3.4 Lectures Series, Colloquia, and Seminars**

#### **3.4.1 Invited Series of Lectures**

- 06-07/1985 'Stochastic systems theory', series of four lectures, Instituto 'Guido Castelnuovo', Università degli Studi 'La Sapienza', Rome, Italy.
- 08/1986 'Stochastic dynamical systems', series of four lectures, Instituto de Matematica, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil.
- 10/1987 'Nonlinear filtering with point process observations', series of three lectures, Boeing Lecture Series, Wichita State University.
- 06/1988 'Lyapunov exponents of control systems', series of four lectures, Instituto 'Guido Castelnuovo', Università degli Studi 'La Sapienza', Rome, Italy.
- 07-08/1989 'Linearization techniques for Markovian systems', series of eight lectures, Centro de Matematicas and PEDECIBA, Universidad de la Republica, Montevideo, Uruguay.
- 11/1989 'Stochastic bifurcations of dynamical systems: An introduction', series of three lectures, Departamento de Fisica Fundamental, UNED, Madrid, Spain.
- 04/1991 'Stabilization of control systems', series of three lectures, Department of Electrical Engineering, Iowa State University.
- 11/1993 'Bifurcations from invariant measures of skew product flows', series of 6 lectures, Departamento de Matematicas, Universidad de Santiago de Chile, Santiago, Chile.
- 09-11/1996 'Stochastic analysis of dynamical systems', series of 12 lectures, Departamento de Ingenieria Matematica, Universidad de Chile, Santiago, Chile.
- 06/1997 'Nonautonomous dynamical systems', series of 3 lectures, Fachbereich Mathematik, Universität Bremen, Germany.
- 08/1999 'Stochastic dynamical systems', series of 4 lectures, Institute for Informatics and Automation Problems, Armenian National Academy of Sciences, Yerevan, Armenia.
- 07/2007 'Transient behavior of stochastic systems', series of 3 lectures, V Escuela de Invierno de Análisis Estocástico y Aplicaciones, Valparaiso, Chile.
- 09/2007 'Dynamics and Linear Algebra', series of 3 lectures, Meeting of the Sociedad de Matemática de Chile, Punta de Tralca, Chile.

### 3.4.2 Talks at Colloquia and Seminars

- 03/1984 'Stability of linear stochastic systems', Mathematics Research Center, Madison, USA.  
'Controllability of stochastic systems', Mathematics Department, University of Wisconsin, Madison, USA.
- 04/1984 'Phase transitions in biological systems', Department of Statistics, Iowa State University, Ames, USA.
- 10/1984 'The stochastic geometry of dendritic processes', Netherlands Institute for Brain Research, Amsterdam, Holland.
- 11/1984 'Mathematical modeling in biology: dendritic growth', Colloquium between Mathematicians and Biologists, Iowa State University, Ames, Iowa, USA.
- 05/1985 'Geometric systems theory and applications to stochastic processes', Division of Applied Mathematics, Brown University, Providence, USA.
- 07/1985 'Uniqueness of solutions for certain hypoelliptic partial differential equations', Universita di Povo, Trento, Italy.
- 01/1986 'Periodic solutions of infinite time optimal control problems', Institute for Dynamical Systems, Universität Bremen, Germany.
- 06/1986 'Über die Kunst, kleine Wahrscheinlichkeiten zu schätzen', Fachbereich Mathematik, Universität, Bremen, Germany.  
'Level-1 and level-2 large deviations of linear stochastic systems', Institute for Dynamical Systems, Universität Bremen, Germany.
- 07/1986 'Unified treatment of external and internal noise in chemical reactions', Colloquium of the Departamento de Fisica Fundamental, Universidad Nacional de Education a Distancia, Madrid, Spain.
- 08/1986 'The qualitative behavior of stochastic systems', two talks at the Laboratorio Nacionao de Computação Cientifica, Rio de Janeiro, Brazil.
- 02/1987 'Stabilität und grosse Abweichungen in stochastischen Systemen', Fachbereich Mathematik, University of Kaiserslautern, Germany.  
'Large Deviations in Linear Stochastic Systems', Department of Mathematics, Northwestern University, Evanston, IL.
- 03/1987 'Large Deviations for Stochastic Flows', Department of Mathematics, University of Southern California, Los Angeles, and Case Western Reserve University, Cleveland, Ohio.
- 06/1987 'Nonlinear Filtering with Counting Observations', Institute for Dynamical Systems, Universität Bremen, Germany.
- 12/1987 'Stability and Bifurcation in Vehicle Dynamics', Department of Mechanical Engineering, Iowa State University.

### Talks at Colloquiums and Seminars - continued

- 01/1988 'Ergodentheorie stochastischer Systeme' and 'Lyapunov Exponenten und Bifurkation in stochastischen Systemen', Universität Erlangen/Nürnberg, Germany.
- 06/1988 'Stochastic Stability and Bifurcation', Department of Mathematics, University of Genoa, Italy.  
'Stability and Large Deviations in Stochastic Linear Systems', Department of Mathematics, Politecnico, Torino, Italy.
- 09/1988 'Exact Stabilization of Control Systems', Department of Mathematics, University of North Carolina, Charlotte.
- 02/1989 'Spektren stochastischer Flüsse', Fakultät für Mathematik, Universität Bochum, Germany.
- 03/1989 'Stabilization by Noise', Dipartimento di Matematica, Politecnico, Torino, Italy.  
'Approximation of Nonlinear Filters', Dipartimento di Matematica, Università degli Studi 'La Sapienza', Roma, Italy.
- 04/1989 'Spektraltheorie für Kontrollsysteme', Institut für Dynamische Systeme, Universität Bremen, Germany (with F. Colonius).
- 06/1989 'Qualitatives Verhalten gewöhnlicher und stochastischer Differentialgleichungen', Fachbereich Mathematik, Universität Augsburg, Germany.  
'Nonlinear Filtering with Point Process Observations', Department of Applied Mathematics, Technical University of Twente, Enschede, Holland.
- 07/1989 'Towards a Unified Theory of Dynamical Systems, Control Systems, and Stochastic Systems?', PEDECIBA, Montevideo, Uruguay.
- 09/1989 'Lyapunov Exponents of Dynamical and Stochastic Systems', Facultad de Ingeniería, Universidad de la República, Montevideo, Uruguay.  
'Stochastic and Feedback Principles in Biology', INTA Castelar, Buenos Aires, Argentina.
- 10/1989 'Robust Design of Linear Systems', Dipartimento di Matematica, Università degli Studi 'La Sapienza', Roma, Italy.  
'Ergodic Theory of Flows on Vector Bundles', Dipartimento di Matematica, Università degli Studi, Genova, Italy.
- 11/1989 'Control Theoretic Aspects in the Theory of Stochastic Systems', Mathematics Institute of the Polish Academy of Sciences, Warsaw, Poland.
- 12/1989 'Algunos Aspectos de Sistemas de Control como Sistemas Dinámicos', Centro de Matemática, Universidad de la República, Montevideo, Uruguay.
- 04/1990 'Ergodic theory of stochastic flows', Department of Mathematics, University of Wisconsin, Madison.  
'Robustness of linear systems via Lyapunov and Bohl exponents', Department of Electrical Engineering, University of Wisconsin, Madison.

### Talks at Colloquiums and Seminars - continued

- 11/1990 'Algebras de Lie en sistemas de control y sistemas estocasticos', Departamento de Matematicas, Pontificia Universidad Catolica de Chile, Santiago, Chile.
- 04/1991 'A dynamical systems approach to control', Department of Electrical Engineering, University of Minnesota, Minneapolis.
- 'Ergodic theory of stochastic systems', Department of Statistics, University of Georgia, Athens.
- 'Stabilization of linear uncertain systems', Department of Aerospace Engineering, University of Illinois, Urbana.
- 06/1991 'Control and chaos', Institute for Dynamical Systems, University of Bremen, Germany.
- 07/1991 'Control systems and stochastic differential equations', Graduate College, University of Augsburg, Germany.
- 03/1992 'Chaos, control and noise', Center for Applied Stochastic Research and Center for Complex Systems, Florida Atlantic University, Boca Raton, FL.
- 02/1993 'Feedback construction for nonlinear control systems', Department of Mathematics, Arizona State University, Tempe.
- 03/1993 'Global behavior of nonlinear control systems', Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis.
- 04/1993 'Spectral theory for linear flows on vector bundles', The Fields Institute for Research in Mathematical Sciences, Waterloo, Canada.
- 05/1993 'Exact regions of asymptotic null controllability for bilinear systems', Institute for Systems Research, University of Maryland, College Park.
- 'Chaos, noise, and control of dynamical systems', Naval Research Laboratory, Washington D.C.
- 06/1993 'Control of dynamical systems', Departamento de Fisica Fundamental, UNED, Madrid, Spain.
- 11/1993 'Chaos, control and noise in dynamical systems', Departamento de Matematicas, Universidad de Santiago de Chile, Santiago, Chile.
- 04/1994 'Global analysis and multistability for nonlinear stochastic systems', Wayne State University, Detroit.
- 'Control, chaos, and randomness', University of Northern Iowa, Cedar Rapids.
- 02/1995 'Global behavior of nonlinear stochastic dynamical systems', Department of Statistics, University of North Carolina, Chapel Hill.
- 04/1996 'Robust stability of nonlinear stochastic systems', Department of Mathematics, University of North Carolina, Charlotte.
- 05/1996 'Some remarks on feedback stabilization', Mathematics Center, University of Notre Dame.

### Talks at Colloquiums and Seminars - continued

- 06/1996 'Engineering design principles using qualitative theory of differential equations', Department of Mathematics, Maharishi University of Management, Fairfield, Iowa.
- 07/1996 'Qualitative analysis of nonlinear stochastic systems with applications to reliability', Institut für Mathematik, Universität Augsburg, Germany.
- 10/1996 'Spectral theory of control systems and robust stability', Departamento de Matematicas, Universidad de Santiago de Chile, Santiago, Chile.
- 'Dynamical systems over function spaces', Departamento de Matematica, Universidad de Chile, Santiago, Chile.
- 11/1996 'Dynamical systems and control theory', Departamento de Matematicas, Universidad Catolica del Norte, Antofagasta, Chile.
- 'Attractors and chain recurrence in dynamical systems', Departamento de Matematicas, Universidad Tecnica Federico Santa Maria, Valparaiso, Chile.
- 'Linearization theory for time varying differential equations', Departamento de Matematicas, Universidad de la Frontera, Temuco, Chile.
- 12/1996 'Continuous skew product flows', Institute for Dynamical Systems, University of Bremen, Germany.
- 02/1997 'Persistence of attractors and Lyapunov exponents', Instituto de Matematica, Universidade de Sao Paulo, Brazil.
- 'Nonlinear control theory and dynamical systems', UMECC, Universidade Estadual de Campinas, Brazil.
- 04/1997 'The statistics of failure', Seminar on Stochastic Dynamical Systems, Universität Bremen, Germany.
- 06/1998 'Spectral theory for time varying differential equations with applications to control theory', Universität Augsburg, Graduierten Kolleg, Germany.
- 07/1998 'Stabilization techniques in control theory' Politecnico di Milano, Dipartimento di Matematica, Milano, Italy.
- 06/1999 'Confiabilidad de sistemas dinamicos', Pontificia Universidad Catolica de Chile, Departamento de Matematicas, Santiago, Chile.
- 06/1999 'Recurrencia por cadenas y decomposiciones de Morse', Universidad de Concepcion, Departamento de Matematicas, Concepcion, Chile.
- 06/1999 'Dinamica, espectro, y teoria de control', Universidad Catolica del Norte, Departamento de Matematicas, Antofagasta, Chile.
- 10/14/00 'Spectra of linear flows on vector bundles', Nebraska - Iowa Seminar on Functional Analysis, Des Moines, Iowa.
- 10/25/00 'Stochastic dynamical systems', Universidad Catolica del Norte, Departamento de Matematicas, Antofagasta, Chile.

Talks at Colloquiums and Seminars - continued

- 05/11/01 'Spectral properties of skew product flows', North Carolina State University, Department of Mathematics, Raleigh, NC.
- 10/04/01 'A translation mechanism for stochastic and control systems', Universidad Catolica del Norte, Departamento de Matematicas, Antofagasta, Chile.
- 03/14/02 'Current trends in mathematical research', Grandview College, Iowa.
- 11/18/02 'Design of high-speed trains', Cornell College, Iowa.
- 02/26/04 'Design of high-speed trains', University of Wisconsin – Platteville.
- 04/01/04 'Recent trends in mathematical research', University of Western Illinois, Macomb, Illinois.
- 10/28/04 'Control systems on flag bundles', Universidad Catolica del Norte, Antofagasta, Chile.
- 02/27/05 'Design of high speed trains', Coe College, Cedar Rapids, Iowa.
- 09/13/05 'Trends in applied mathematics – the example of control theory', Pontificia Universidad Católica, Facultad de Matemáticas, Santiago, Chile.
- 03/22/06 'Global dynamics and chaos', Universidad Católica del Norte, Departamento de Matemática, Antofagasta, Chile.
- 05/12/08 'Control theory – The mathematics of high tech engineering', Universidad Mayor de San Andrés, Carrera de Matemática, La Paz, Bolivia.
- 06/19/08 'Controllability and stabilizability', Universidad Técnica Santa María, Departamento de Matemática, Valparaíso, Chile.
- 06/26/08 'Constructions of causality', Tertulias Filosóficas, Universidad de Santiago de Chile, Departamento de Filosofía, Santiago, Chile.
- 07/02/08 'Dynamical systems and linear algebra', University of Puerto Rico – Las Piedras, Department of Mathematics, San Juan, Puerto Rico.

## **4. Service**

### **4.1 Mathematics Community**

#### **4.1.1 Offices in Professional Societies**

Liaison between IEEE Control Systems Society and SIAM SIAG on Control and Systems Theory, 1996 - 1997.

#### **4.1.2 Editorships**

Associate editor of 'Random and Computational Dynamics', 1991 - 1997.  
Advisory editor of CRC Press 'Mathematical Modeling Handbook Series', 1994 - 1997.  
Associate editor of 'Mathematical Models & Methods in Applied Sciences', 1996 - 2000.  
Advisory editor of Birkhäuser book series 'Modeling and Simulation in Science, Engineering and Technology', 1996 – 2000, 2002 -  
Comite Editorial 'Proyecciones, Revista de Matematica', 1997 -  
Comite Editorial 'Ars Dilemmae Mathematicae', 1997 – 2002  
Associate Editor 'Revista Boliviana de Matematica', 2002 –  
Editorial Board of 'Boletim da Sociedade Paranaense de Matematica', 2003 -

#### **4.1.3 Refereeing**

Refereed Papers for:

Advances in Applied Probability  
Annals of Applied Probability  
Annals of Probability  
Applied Mathematics and Optimization  
Applied Mathematics Letters  
Automatika  
Banach Center Publications  
Bulletin of Mathematical Biology and Applications  
Computers & Mathematics with Applications  
Discrete and Continuous Dynamical Systems  
Dynamics and Stability of Systems  
ESAIM : Control, Optimization, and Calculus of Variations  
IEEE CDC '92 - '99, CDC 2008  
IEEE Transactions on Automatic Control  
IEEE Transactions on Circuits and Systems  
International Journal of Nonlinear Dynamics  
International Journal of Robust and Nonlinear Control  
Journal of Applied Mathematics and Computing  
Journal of Applied Mechanics  
Journal of Applied Probability  
Journal of Differential Equations  
Journal of Dynamical and Control Systems  
Journal of Dynamics and Differential Equations  
Journal of Mathematical Analysis  
Journal of Mathematical Analysis and Applications  
Journal of Mathematical Systems, Estimation, and Control  
Journal of Neuroscience Methods  
Journal of Nonlinear Mechanics

Refereed Papers for - continued

Journal of the Australian Mathematical Society  
Journal of Vibration and Acoustics  
Journal of Vibration and Control  
Matematica Contemporanea  
Mathematical Biosciences  
Mathematical Models & Methods in Applied Sciences  
Mathematics of Control, Signals, and Systems  
Nonlinear Dynamics  
Physica D  
Proceedings of the American Mathematical Society  
PSCC '96  
Random & Computational Dynamics  
Revista Proyecciones  
SIAM Journal of Applied Mathematics  
SIAM Journal of Control and Optimization  
Springer Lecture Notes in Mathematics  
Statistics and Probability Letters  
Stochastic Structural Dynamics  
Stochastic Processes and Applications  
Stochastics  
Stochastics and Stochastics Reports  
Transactions of the American Mathematical Society  
Systems and Control Letters  
Journal of Zhejiang University SCIENCE (A&B)

Refereed Proposals for:

National Science Foundation  
Deutsche Forschungsgemeinschaft (Germany)  
FONDECYT (Chile)  
CONICYT (Chile)  
ISF (Russia)  
NSERC (Canada)  
National Academy of Sciences of the USA  
Fulbright Visiting Scholars Program  
Research Grants Council, Hong Kong  
Foundation for Research Development, South Africa

Reviewed Papers for:

Mathematical Reviews  
Zentralblatt für Mathematik

Refereed and Reviewed Books for:

Mathematical Reviews  
Zentralblatt für Mathematik  
Springer-Verlag  
Saunders College Publishing  
American Mathematical Society  
Academic Press

Refereed and review books for - continued

IEEE Transactions on Automatic Control  
SIAM Review  
MAA American Mathematical Monthly

**4.1.4 Other Professional Service and Organization of Conferences**

Co-organizer of the 17th Midwest Differential Equations Conference, 1988.

Organizer of the Minisymposium on Chaos, Control and Noise, ICIAM 1991.

Co-organizer of the International Conference on Differential and Delay Equations, Iowa State University, October 1991.

Member of the Organizing Committee of the 13th Midwest Probability Colloquium, Northwestern University, Evanston, October 1991.

Co-organizer of the International Workshop on Nonlinear Dynamics and Stochastic Mechanics, Fields Institute, Waterloo, Canada, August 1993.

Co-organizer of the Special Session on Dynamical Aspects of Nonlinear Control, MTNS '93, Regensburg, Germany, August 1993.

Organizer of the International Workshop on Numerics for Perturbed Dynamical Systems, Iowa State University, March 1994.

Co-organizer of 'Systems and Control Week', Iowa State University, April 26 - May 3, 1994.

Co-organizer of the Minisymposium on Perturbations of Dynamical Systems, 3rd SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 1995.

Co-organizer of the Minisymposium on Control of Complex Systems, ICIAM 1995, Hamburg, Germany, July 1995.

Organizer of the Second International ISU Workshop on Numerics for Dynamical Systems, Ames, Iowa, April 1996.

Co-organizer of the Special Session on Spectral Theory for Time-Varying Linear Systems and Stabilization at MTNS '96, St. Louis, June 1996.

Co-organizer of the Oberwolfach RiP-Workshop on Numerics in Stochastic Dynamical Systems, Oberwolfach, Germany, July 1996.

Co-organizer of the Special Symposium on Dynamic Reliability at 7th ASCE EMD/STD Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability, Worcester Polytechnic Institute, August 1996.

Co-organizer of the International Conference on Random Dynamical Systems, Bremen, Germany, April 1997.

Co-organizer of the Workshop on Response and Reliability of Stochastic Dynamical Systems, University of Notre Dame, May 1997.

Scientific Committee of COMCA '97, Antofagasta, Chile, July 1997.

Other Professional Service and Organization of Conferences - continued

Scientific Committee of COTA '97, Antofagasta, Chile, August 1997.

Scientific Committee of the Fourth International Conference on Stochastic Structural Dynamics, University of Notre Dame, August 1998.

Organizer of Special Invited Session at MTNS '98, Padova, Italy.

Co-organizer of the Oberwolfach conference series on 'Nonlinear and Stochastic Systems' 1998 –

Member of NSF Review Panel Probability 2000 (December 1999).

Scientific Committee of the 8<sup>th</sup> ASCE Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability, University of Notre Dame, July 2000.

Co-organizer of the International Conference on Monte Carlo Simulation (MCS 2000), Monte Carlo, June 2000.

Co-organizer of the Oberwolfach Conference on Nonlinear and Stochastic Systems and Their Numerics, 2002.

Scientific Committee of MTNS 2002, Notre Dame University, 2002.

Scientific Committee of IUTAM Conference on Nonlinear Random Vibrations, Urbana, Illinois, 2002.

Scientific Committee of COMCA 2003, Antofagasta, Chile, 2003.

International Scientific Committee for Advances in Engineering Structures, Mechanics & Construction, Waterloo, Canada, 2006.

Scientific Committee of COMCA 2006, La Serena, Chile, 2006.

Member of the DFG (Deutsche Forschungsgemeinschaft, Germany) panel on 'Regelungstheorie digital vernetzter dynamischer Systeme', 2006 –

Co-organizer of LACOST 2007 (Latin American Conference on Systems Theory), San Pedro de Atacama, Chile, 2007.

Co-organizer of the Conference on Stochastic Analysis and Mathematical Physics VI, Santiago, Chile, 2008.

Co-organizer of IMA Graduate Summer School 'Linear Algebra and Applications', Iowa State University, 2008.

Scientific Committee of COMCA 2009, Antofagasta, Chile, 2009.

## **4.2 Service at Iowa State University**

### **4.2.1 Departmental**

Member of an ad-hoc Grievance Committee, Department of Mathematics, Spring, 1986.

Member of the Graduate Committee and the Admissions Committee, Department of Mathematics, August 1986 - 1989.

Member of search committees, Department of Mathematics, 1986, 1987, 1990, 1991, 1994, 1995, 1996 (chair), 1997, 1998 - 1999(chair).

Member of the Committee to Review the Graduate Program, Department of Mathematics, 1988 - 90.

Member of the Coordination and Policy Committee, Department of Mathematics, 1990-1992 and 1998 - 1999.

Member of the Individual Review Team for Assistant Professors, Department of Mathematics, 1988, 1990, 1991, and 1992.

Chair of the ad-hoc Committee to Draft a Proposal for a Masters Program in Industrial Mathematics, Department of Mathematics, 1993/94.

Member of the Dean's Search Committee for a DEO, Department of Mathematics, 1994/95.

Member of the Individual Review Team for Associate Professors, Department of Mathematics, 1995/96.

Chair of the Promotion and Tenure Committee for R. Smith, Department of Mathematics, 1997.

Member of the Promotion Committee for M. Smiley, Department of Mathematics, 1997.

Member of the Ad-Hoc Committee to Formulate Guidelines on Evaluation of Teaching for Promotion and Tenure, Department of Mathematics, 1998.

Member of the Promotion and Tenure Committee for B. Keller, Department of Mathematics, 1998.

Member of the Promotion Committee for S. Hou, Department of Mathematics, 1999.

Member (ex officio) of the Advisory Committee, Department of Mathematics, 1999.

Member of the Graduate Committee, Department of Mathematics, 1999 - 2001.

Member of the Dean's Search Committee for a DEO, Department of Mathematics, 2000/01.

Chair of the Promotion and Tenure Committee for Domenico D'Alessandro, 2003.

Member of the Promotion Committee for Leslie Hogben, 2005.

#### **4.2.2 College**

Liberal Arts and Sciences Committee on Promotion and Tenure Review, 1993 - 1996.

Member of the Search Committee 'Integrative Biology', Department of Zoology/Genetics, 1995/96.

Liberal Arts and Sciences Committee on Faculty Development, 1997-1999, Chair of the Committee 1999.

Liberal Arts and Sciences Task Force on Internationalization, 1998 – 1999.

Member of the Search Committee for Associate Dean of LAS, 2001.

Member of the Dean's Budget Advisory Committee, 2001.

International Programs Committee, 2002 – 2004.

Member of the Dean's Ad-Hoc Committee to Review Associate Deans, 2003.

Member of the Dean's Calculus Team, 2006 – 2007.

#### **4.2.3 University**

Faculty mentor for Dragan Mirkovic (Mathematics), 1994 – 1995.

Faculty mentor for Manisha Rohatgi (Industrial and Manufacturing Systems Engineering, College of Engineering), 1998.

Faculty mentor for Sunder Sethuraman (Mathematics), 1998 – 1999.

Faculty advisor of 'Zeitgeist', German student organization at Iowa State University, 1994 -

Participant 3rd Annual Iowa State Faculty Conference 'Visioning International Teaching and Learning', March 1995.

Member of the ISU Faculty Senate Committee on Professional Development, 1999.

Member of the Search Committee for a Director of the Office of Sponsored Programs Administration, 2000.

Member of the Council of University Research Institute Administrators, 2000 – 2005.

Member of the Coordinating Council on Technology Transfer, 2000 – 2005.

Member of the Iowa State University Research Foundation, 2000 - 2001.

Member of the Council for International Programs, 2001 – 2005.

Faculty mentor for Jiyeon Suh (Mathematics), 2005 – 2006.

Faculty mentor for Xifang Xing (Community and Regional Planning, College of Design), 2005 – 2006.

#### Service at Iowa State University, University – continued

Member of the Science Advisory Council of the Center for Excellence in the Arts and Humanities, 2005 –

Member of the AGEF Faculty Council, 2006 –

#### **4.3 International Service**

Investigador Grado 5 at PEDECIBA (Programa de Desarrollo de Ciencias Basicas), Universidad de la Republica, Montevideo, Uruguay, 1989 - 2008.

Departmental Coordinator for the Exchange Program with the Universität Augsburg, Germany, 1993 – 2002.

Departmental Coordinator for the Exchange Program with the Doctorate Program in Mathematical Statistics at the Università di Pavia, Università di Milano, Politecnico di Milano, Politecnico di Torino, and Università Bocconi, Italy, 1997 - .

Departmental Coordinator for the Exchange and Training Program at the Universidad Catolica del Norte, Antofagasta, Chile, 1998 - .

University Coordinator for the Agreement between the National Academy of Sciences of the Republic of Armenia and Iowa State University, 1998 – 2005.

Member of 'Rector's Circle', Universität Bremen, Germany, 2004 – .

#### **4.4 Community Service**

Consultant for Iowa Department of Economic Development and for economic development organizations in Central Iowa (Greater Des Moines Partnership, Ames Economic Development Commission) regarding technology transfer and economic development in Europe, 2005.

## 5. **Administrative Experience at Iowa State University**

Jan 1999 – Dec 1999	Director of Graduate Education, Department of Mathematics, Iowa State University
Jan 2000 – Jun 2001	Associate Dean for Research, College of Liberal Arts and Sciences, Iowa State University
Jul 2001 – Aug 2005	Associate Vice Provost for Research, Iowa State University

### 5.1 **Director of Graduate Education, Department of Mathematics**

- Served as advisor for all incoming graduate students.
- Administered the graduate programs in the department (Mathematics and Applied Mathematics).
- Created targeted recruiting system for new graduate students throughout the Midwest.
- Developed exchange programs with universities in Germany, Italy, Armenia, and Chile.

### 5.2 **Associate Dean for Research, College of Liberal Arts and Sciences**

- First associate dean for research in the college.
- Built research support system for college, including
  - Information about funding sources
  - Consulting on grant proposals for groups of principal investigators and for individual principal investigators
  - Communication with interdisciplinary centers and institutes
  - Training of grant coordinators in departments and units reporting to the college (grant coordinators are responsible for draft budgets, advice for pre- and post-award services concerning grants, contracts, research compliance).
- Led college effort for several large undergraduate and graduate education proposals (including FIPSE, VIGRE, and Pew Foundation).
- Rebuilt evaluation system for performance in research and scholarship.
- Designed assessment system for start-up packages for new faculty.
- Represented the college at the central university level in research matters, such as Council of University Research Institute Administrators, Coordinating Council for Technology Transfer, ISU Research Foundation.
- Participated in Dean's Team discussing major college initiatives and activities, including promotion and tenure, assessment of departmental performance, budget, inter-college activities.
- Worked on 'Roadblock Program', an internet based database that allows undergraduate students to evaluate each of their courses according to its contribution to timely graduation.

### 5.3 Associate Vice Provost for Research

- Participated in formulation of new research related policies, including Indirect Cost Policy, Indirect Cost Distribution Policy, Policy on Shared Equipment, Policy on Export Restrictions (ITARS regulations), Costing Policy (OMB circulars).
- Participated in creation of new interdisciplinary centers and institutes, including five science, agriculture and engineering institutes and the Center for Excellence in the Arts and Humanities, planned internal support structures for these centers and institutes.
- Built research support system for the university, including grant development, grant editing, grant consulting, grant coordination, visits to granting agencies, participation of ISU investigators in workshops of agencies and foundations.
- Designed system for assessment of internal seed funding and grantsmanship support funding.
- Advised institute and center directors on issues related to interdisciplinary and inter-institutional activities, grants, budgets, and personnel.
- Advised individual investigators and groups of investigators on all issues related to grant proposals, including interdisciplinary and inter-institutional activities.
- Represented ISU in negotiations of federal and state contracts.
- Represented ISU in industry contacts and negotiation of industry contracts.
- Created new internal grant program for High Performance Computing.
- Built research compliance unit and increased staff from two ½ time employees to four full-time staff.
- Served as ISU's Research Integrity Officer.
- Nominated faculty for national and international awards.
- Built 'Research News Group' consisting of media experts in the central administration and the colleges, centers, and institutes to promote visibility of research achievements.
- Participated in all decision making processes of the VPR office, including strategic planning, policy decisions, budgets, oversight of all units reporting to the VPR office (twelve central research institutes and centers, Office of Sponsored Programs Administration, Research Compliance Office, Grants Development Office, Laboratory Animal Resources, ISU Research Foundation, Office of Intellectual Property and Technology Transfer, ISU Research Park, Industrial Relations), start-up funds, retention funds, internal seed funding, cost sharing and equipment matching funds for proposals to external sponsors, selection of faculty for research and scholarship awards, technology transfer and economic development, comments on state and federal legislation, representation of the office to the President, Provost, Council of Deans, and the Faculty Senate.
- Had frequent interactions with the Office of the President (including University Counsel, Government Relations, Internal Audit), Office of the Provost, Vice Provosts for Extension and Undergraduate Programs, Office of the Vice President for Business and Finance (including budget unit, Sponsored Programs Administration, Environmental Health and Safety), all colleges and (almost all) departments, ISU Foundation.

Associate Vice Provost for Research - continued

- Served as interim director of the Interdisciplinary Research Institute for Survey Science, served as interim director of the Iowa State Water Resources Research Institute.
- Designed data base for easy access of students to Research Experiences for Undergraduates.
- Gave public presentations on ‘Challenges and opportunities in research administration’, ‘Research policy and institutional change’, ‘Intellectual property and technology transfer at research intensive institutions’, ‘Institutional support systems for principal investigators’, ‘Compliance with human subjects regulations’, ‘Research and technology transfer administration at large land-grant universities’.
- Collaborated with European economic development organizations and companies to promote technology transfer and economic development in Iowa.
- Participated in the Governor’s Delegation to Europe to promote Economic Development as representative of the Iowa universities, 11/05 – 11/12/04, with Governor Tom Vilsack, Director of the Iowa Department of Economic Development, Michael Blouin, and representatives of regional and local economic development groups.
- Worked with the Graduate College at ISU on graduate recruiting, full tuition scholarships, creation of new federally supported training programs (IGERT, VIGRE and RTG), interdisciplinary graduate programs, the ‘Preparing Future Faculty’ program, programs regarding research experiences for undergraduates, AGEP and Alliance programs, and lean electronic office processes.