CURRICULUM VITAE OF PROFESSOR CHRISTOS GEORGAKIS

PRESENT ADDRESS:

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EDUCATION:

Ch.E.	Diploma	National Technical University, Athens, Greece, 1970
M.S.	University of Illinois, 1972	
Ph.D.	University of Minnesota, 1975	

PROFESSIONAL POSITIONS:

2004 -	Professor of Chemical and Biological Engineering and Director, Systems Research Institute for Chemical and Biological Processes, Tufts University
2004 - 2007	Chairman, Chemical and Biological Engineering, Tufts University
2005 -	Fellow of the American Association for the Advancement of Science (AAAS)
2002 - 2004	Head, Othmer Department of Chemical and Biological Sciences and Engineering (formerly called Department of Chemical Engineering, Chemistry, and Martial Science) and Director, Systems Research Institute for Chemical and Biological Processes; Polytechnic University
2002 - 2004	Othmer Distinguished Professor of Chemical Engineering; Polytechnic University
2001	Iacocca Professor, Lehigh University
2002 -2003	President, American Automatic Control Council
1987 - 2001	Professor of Chemical Engineering, Lehigh University
1999 - 2001	Vice-President, American Automatic Control Council
1985 - 2001	Founder and Director, Chemical Process Modeling and Control Research Center, Lehigh University
1995 -	Affiliate Fellow, Foundation for Research and Technology - Hellas (FORTH)
1993-1996	OSPT Visiting Professor, Delft University of Technology, The Netherlands
1991	Visiting Professor, Rhône Poulenc, Lyon, France, (January - June)
1983 -1987	Associate Professor of Chemical Engineering, Lehigh University
1980 -1983	Professor of Measurement and Control and Initiator of the Chemical Process Engineering Institute, University of Thessaloniki, Greece
1979 -1983	Associate Professor of Chemical Engineering, Massachusetts Institute of Technology
1978 -1980	Edgerton Professor, Massachusetts Institute of Technology
1975 -1979	Assistant Professor of Chemical Engineering, Massachusetts Institute of Technology
1975 -1976	du Pont Assistant Professor, Massachusetts Institute of Technology

RESEARCH INTERESTS:

- Modeling, Optimization, and Control of Batch Processes

- Model Predictive and Nonlinear Control
- Identification and Model Reduction
- Statistical Process and Controller Monitoring
- Integration of Process Design and Plant-Wide Control
- Applied Mathematics

AWARDS:

- Fellow of the International Federation of Automatic Control, 2007
- Bernard Gordon Senior Fellow in Systems Engineering, *Tufts University*, 2006
- Fellow of the American Association for the Advancement of Science (AAAS) 2005
- Othmer Distinguished Professor of Chemical Engineering; *Polytechnic University*, 2002
- Iacocca Professor, *Lehigh University*, 2001
- Computing Award, CAST Division of the American Institute of Chemical Engineers, 2001
- Fellow, American Institute of Chemical Engineers, 1998
- O. Hugo Schuck Best Paper Award of the American Automatic Control Council, 1998
- Dreyfus Foundation Teacher-Scholar Award, 1979
- Edgerton Professorship, 1977-79 MIT
- du Pont Professorship, 1975-76, MIT
- Phi Lambda Upsilon, 1970; Sigma Xi, 1988
- Second Prize, Greek Mathematical Society, 1965

LISTED IN:

Who's Who in America
Who's Who in Technology Today
International Who's Who in Engineering
Who's Who in the East
Strathmore's Who's Who Directories
Who's Who in Science and Engineering
International Who's Who of Intellectuals
International Leaders in Achievement
Industry's Directory of Technical Consultants
Dictionary of International Biography

SCHOLARSHIPS:

- Greek Government Scholarships (1966-1970)
- National Technical University Industrial Scholarship (1967)
- Texaco Company Research Fellowship (1969-1970)
- University of Illinois Research Assistantship (1970-1972)
- University of Minnesota Research Assistantship (1972-1975)

CONSULTING:

Extensive number of assignments with US and international companies in areas such as process modeling, process dynamics and controller design, and chemical and biochemical reactor engineering.

SOCIETY MEMBERSHIPS:

- American Institute of Chemical Engineers
- Society of Industrial and Applied Mathematics
- American Association for the Advancement of Science
- American Chemical Society
- New York Academy of Sciences

ADMINISTRATIVE DUTIES:

2004 - 2007	Professor and Chairman, Chemical and Biological Engineering and Director, Systems Research Institute for Chemical and Biological Processes, Tufts University
2002 - 2004	Head, Othmer Department of Chemical and Biological Sciences and Engineering (formerly called Department of Chemical Engineering, Chemistry, and Martial Science) and Director, Systems Research Institute for Chemical and Biological Processes; Polytechnic University.
1984 - 2001	Center Director of the NSF-funded Industry-University Co-Operative Research Center in Chemical Process Modeling and Control at Lehigh University; The Center reported to the Dean of Engineering and Applied Science.
1996 - 2001	Chairman of Departmental Faculty Search Committee
1991 - 96	Chairman of the Graduate Affairs Committee for Chemical Engineering: In this capacity, Professor Georgakis was responsible for all policy and administrative duties related to more than 80 full-time and about 30 part-time graduate students of the Department. Professor Georgakis was responsible for running the Ph.D. Qualifying Examination.
1984 - 96	Member of Departmental Committee on Graduate Affairs.
1991 - 96	Member and Past Chairman (1991-92) of Departmental Committee on Graduate Student Recruiting.
1991 - 92	Chairman of a Departmental Committee to review the graduate course requirements in Chemical Engineering.
1988 - 92	Member of the College Promotions Committee.
1989 - 90	Member of the Search Committee for a new Chair of Chemical Engineering.
1983 - 85	Initiator and Coordinator of the development effort to establish the Industry-University Co-operative Research Center in Process Modeling and Control funded by NSF in 1985.
1984 - 85	Chairman of a college-wide committee to review, update and coordinate all undergraduate and graduate courses in Control.
1984 - 89	Member of the college-wide executive committee for Manufacturing Systems Engineering.
1982 - 83	Initiator and chairman of a group of faculty that proposed to the Minister of Research and Technology the establishment of the Chemical Process Engineering Institute (University of Thessaloniki, Greece).
1975 - 80	Departmental Faculty Search Committee (MIT)
1975 - 77	Dean's Committee for new Chair in Chemical Engineering (MIT)
1978 - 80	Departmental Seminar Coordinator (MIT)
1977 - 78	Graduate Student Admissions Committee (MIT)
1977 - 80	Freshman Advisor, (MIT)
1975 - 78	Design and Production of the Departmental Booklet on Graduate Education (MIT)
1975 - 78	Design and Production of Departmental Posters on Graduate Education (MIT)
1976	Dean's Committee on an Institute-wide undergraduate subject on computer models of physical and engineering systems.

RESEARCH FUNDING[1]

2002 – '03 "Workshop for Research Needs in the Modeling, Dynamics, Control, and Monitoring of Complex Eng. Systems" National Science Foundation $54,000 (to Polytechnic University)

2002 – '03 "Travel Grant to 15th IFAC World Congress, July 21-26, 2002 in Barcelona" National Science Foundation $33,000 (to Polytechnic University)

1999 – '03 "An Integrated Chemical Microplant for Fuel Cell Applications" National Science Foundation, approximately $600,000 for three years (in collaboration with M. Kothare, M. H. White, M. K. Hatalis, I. E. Wachs and J. K. Robertson)

1985 - Industrial Consortium on Chemical Process Modeling and Control. Approximately $350,000 *per year* (with the help of the Center Faculty).

1985-90 "An Industry-University Co-operative Research Center in Chemical Process Modeling and Control," NSF Center grant, $250,000, (with the help of the Center Faculty, William L. Luyben, co-PI).

1990-93 "An Industry-University Co-operative Research Center in Chemical Process Modeling and Control," NSF's self-sufficiency Center grant, $75,000, (with the help of the Center Faculty).

1993-96 "An Industry-University Co-operative Research Center in Chemical Process Modeling and Control," NSF's renewed self-sufficiency Center grant, $90,000, (with the help of the Center Faculty).

1988-93 "Involvement of Female and Minority Students in Research," NSF, 5,000 *per year.*

1991-93 "A Prototype Emulsion Polymerization Reactor Facility," NSF Equipment Grant, $90,000, including $30,000 contributed by Lehigh University, (with Yiannis Dimitratos, Mohamed S. El-Aasser, G. Elicabe, and C. Silebi).

1989-91 Tie grant for collaboration with the Center of Process Analytical Chemistry at the University of Washington on the Modeling and Monitoring of Bioreactors, NSF, $50,000, (with J. A. Phillips).

1988-90 "Intelligent Control and Operation of Spray Etching Processes," IBM, $144,000, (with H.G. Stenger, Jr.).

1987-89 Tie grant for collaboration with the Measurement and Control Research Center at the University of Tennessee on Plant-wide Control; NSF, $50,000, (with W.L. Luyben).

1988-89 "Process Modeling, Simulation and Control of the Super-Conducting Super-Collider," The Pennsylvania Ben Franklin Program and Air Products and Chemicals Inc., $107,000 (with W.L. Luyben and W.E. Schiesser).

1989 "Supplement to Process Modeling, Simulation and Control of the Super-Conducting Super-Collider," Air Products and Chemicals Inc., $30,000, (with W.E. Schiesser).

1987-88 "Batch Reactor Facility," NSF Equipment Grant, $75,000, including $25,000 contributed by Lehigh University, (with H.G. Stenger, Jr.).

1985-87 "Center of Excellence Grant," the State of Pennsylvania Ben Franklin Program, $100,000.

1986-87 Two industrial collaboration projects funded by the Pennsylvania Ben Franklin Program, $98,000.

[1] To Lehigh University Unless otherwise stated

1985-86 "Bioreactor Control Project," the State of Pennsylvania Ben Franklin Program, $25,000 (with J. A. Phillips).

TEACHING DUTIES:

- **ChBE 101: Applied Mathematics for Chemical Engineers**, (GR; Fall '04, '05, '06, '07; *at Tufts University*)
- **ChBE 109: Process Dynamics and Control (**UR; Fall '07; *at Tufts University*)
- **ChBE 110: Process Optimization (**UR; Spring '06; *at Tufts University*)
- **ChBE 196: Special Topics – Design of Experiments (**UR & GR; Spring '07; *at Tufts University*)
- **EN 69: Freshmen Seminar – Introduction to Chemical and Biological Engineering** (UG; Fall '05, '06 *at Tufts University*)
- **ChE 211: Chemical Reactor Design**, (UR[2] ; Falls of '84, '85, '86, '87, '88, '89, '90; Spring of '00, '01; at Lehigh).
- **ChE 410: Chemical Reaction Engineering**, (GR[3]; Spring '85, '87; at Lehigh) Professor Georgakis updated this course.
- **ChE 415: Transport Phenomena**, (UR; Fall '83, at Lehigh).
- **ChE 434** (also ECE 434, MEM 434): **Multivariable Process Control**, (GR; Spring of '84, '86, '88, '90, '92, '93, '96, and '99 at Lehigh); Professor Georgakis was the developer of this new course.
- **ChE 436** (Also ECE 437, MEM 436**): System Identification** (GR; Spring '92, '94, '97, '01; at Lehigh); Professor Georgakis was the developer of this new course.
- **ChE 437** (also ECE 437, MEM 437): **Stochastic Control**, (GR; Spring '89, '95, '98; at Lehigh); Professor Georgakis was the developer of this new course.
- **ChE 461: Applied Mathematics for Chemical Engineers**, (GR; Fall '92, '93, '94, '95, '96, '97, '99, '00 and '01; at Lehigh); Professor Georgakis was the developer of this new course.
- **Measurement and Control**, (UR; '80-'81 & '82-'83 Academic Years; University of Thessaloniki); Professor Georgakis was a developer of this new course.
- **10-50: Chemical Reactor Design**, (GR; Spring '82; at MIT)
- **10-351: Advances in Process Control**, (GR; Spring '78, '80; at MIT) Professor Georgakis was a developer of this new course.
- **10-371: Chemical Reactor Analysis**, (GR; Fall '77, '79; at MIT); Professor Georgakis was the developer of this new course.
- **10-35: Process Dynamics and Control**, (UR; Springs '76, '77, '79; MIT)
- **10-37: Chemical Kinetics and Reactor Design**, (UR; Falls '75, '77: MIT)
- **UR-Seminar: Introduction to the Modeling of Chemical Processes**, (UR; Fall '75; MIT).

PH.D. THESES PRESENTLY SUPERVISED:

1. ***MAKRYDAKI, Foteini:* "**Modeling Uncertain Complex Reactions" (December 2009)
2. ***HINES, Daniel:*** "Population Specific Modeling Approaches on Pharmacokinetic and Pharmacodynamics" (December 2010)

M.S. THESES PRESENTLY SUPERVISED:

1. ***SIAMPANIS, Haris:*** "Novel ways to Solve Population Balance Equations" (February 2008)

2UR: Undergraduate Course
3GR: Graduate Course

PH.D. THESES PREVIOUSLY SUPERVISED:

1. ***WONG, Sze Wing:*** "Online Control of Batch Crystallizations" (May 2007)
2. ***LIMA, Fernando*** "Use of Operability Concepts in the Design of Constrained Model-Predictive Controllers" (November 2007)
3. ***HUANG, Lilong:*** "Performance Assessment of Model Predictive Controllers" (December 2004 at Lehigh University)
4. ***LI, Tong:*** "Design of Multivariable Identification Signals for Constrained Systems" (May 2005 at Lehigh University)
5. ***ÖZKAN, Leyla:*** "Optimal Transition of Processes" (January 2003)
6. ***SUBRAMANIAN, Sivakumar:*** "Operability of Reacting Systems" (May 2002)
7. ***UZTÜRK, Derya:*** "Dynamic Operability of Process Designs" (June 2001)
8. ***BEZERGIANNI, Styliani:*** "Assessment of Multivariable Controller Performance" (January 2001)
9. ***OLIVEIRA-LOPES, Luís Cláudio:*** "Reference System Nonlinear Model Predictive Control" (October 2000)
10. ***VALAPPIL, Jaleel:*** "Nonlinear Model Predictive Control of End-use Properties in Batch Reactors under Uncertainty" (September 2000)
11. ***VINSON, David:*** "A New Measure of Process Operability for the Improved Plant-Wide Steady-State Designs of Chemical Processes" (April 2000)
12. ***DOCTER, William:*** "Nonlinear Reduced Order Models for Separation Units" (June 1999)
13. ***LEE, Samson:*** "State Estimation in Bioreactors by Tendency Models" (June 1997) co-supervised with Professor Janice A. Phillips, Department of Chemical Engineering and Bioprocessing Institute.
14. ***KALRA, Lokesh:*** "Nonlinear Reference System Model Predictive Control" (November 1996).
15. ***LIOTTA, Vincenzo:*** "On-line Control of Particle Size Distribution in Emulsion Polymerization Reactors" (October 1996) co-supervised with Professor Mohamed S. El-Aasser, Department of Chemical Engineering and Emulsion Polymers Research Institute.
16. ***FOTOPOULOS, Jake:*** "On-line Optimization and Control of Batch Processes Using Tendency Models" (January 1996) co-supervised with Professor Harvey G. Stenger, Jr., Department of Chemical Engineering.
17. ***BARTEE, James:*** "Nonlinear Identification and Control of SISO Processes" (October 1995).
18. ***HAYNES, Thomas:*** "Transient Behavior of Reverse Flow Reactors" (June 1995) co-supervised with Professor Hugo S. Caram, Department of Chemical Engineering.
19. ***KU, Wenfu:*** "Disturbance Detection and Isolation in Chemical Processes" (October 1994[4]), co-supervised with Professor Robert H. Storer, Department of Industrial Engineering.
20. ***TSOBANAKIS, Paris:*** "Tendency Modeling and Optimization of Fed-batch Fermentations" (January 1994) co-supervised with Professor Janice A. Phillips, Department of Chemical Engineering and Bioprocessing Institute.
21. ***PRICE, Randy:*** "On the Design of Plant-wide Regulatory Control Strategies by the use of a Tiered Framework" (June 1993).

[4]Completion date

22. ***RASTOGI, Alok:*** "Evolutionary Optimization of Batch Processes Using Tendency Models" (at Lehigh University, January 1992) co-supervised with Professor Harvey G. Stenger, Jr., Department of Chemical Engineering.
23. ***KAO, Alan:*** "State Estimation and Control of Spray Etching Processes" (at Lehigh University, September 1991) co-supervised with Professor Harvey G. Stenger, Jr., Department of Chemical Engineering.
24. ***TZOUANAS, Vassilios:*** "Expert Multivariable Control" (at Lehigh University, January 1989) co-supervised with Professor William L. Luyben, Department of Chemical Engineering and Professor Lyle Ungar, University of Pennsylvania.
25. ***DIMITRATOS, Yiannis:*** "Modeling and Control of Semicontinous Emulsion Copolymerization" (at Lehigh University, January 1989) co-supervised with Professor Mohamet S. El-Aasser, Department of Chemical Engineering and Emulsion Polymers Research Institute.
26. ***GEORGIOU, Apostolos:*** "From Process Knowledge to the Design of Practical Multivariable Controllers" (at Lehigh University, May 1988) co-supervised with Professor William L. Luyben, Department of Chemical Engineering.
27. ***BARTUSIAK, R. Donald:*** "On the Design of Model-Based Nonlinear Control Structures: Applications to Chemical Reactors and General Dynamical Systems" (at Lehigh University, January 1988) co-supervised with Professor Matthew J. Reilly, Department of Chemical Engineering.
28. ***FILIPPI-BOSSY, Claire:*** "Command Auto-adaptive de Reacteurs Discontinous" (at L' Institute National Polytechnique de Loraine, France, 1987) co-supervised with Professors J. Villermaux and J. Bordet.
29. ***SUENSON, Martin M.:*** "Dynamics and Control of Gas Absorption Processes" (at MIT, March 1982).
30. ***CONGALIDIS, John P.:*** "Modeling of Fluidized Bed Coal Combustors" (at MIT, August 1981).
31. ***MONGE, J. J.:*** "Dynamics and Control of Conventional Catalytic Cracking Processes" (at MIT, July 1979).
32. ***CHROSTOWSKI, James E.:*** "Kinetics of CaS Regeneration" (November 1979).

Professor Georgakis has also served as a member or as a reader of several Ph.D. thesis committees at Lehigh (C. C. Yu, T. P. Chang, S. M. Ding, M. Finco, E. Eskinat, E. Papastathopoupou, C. Muhrer, T. Bass, S. Cho, V. Grassi, E. Qintero-Marmol Marques) *and for Universities in France and Australia.*

M.S. THESES PREVIOUSLY SUPERVISED:

1. ***SCHUPMANN, Lisa:*** "Rapid Measurement of Compositional Changes in a Multi-reactor System" (May 2007)
2. ***LIN, Rongrong:*** "Stoichio-kinetic Modeling of Complex Pharmaceutical Reactions" (December 2005)
3. ***ZHAN, Qiang:*** "System Identification and Linear Model Predictive Control of the Tennessee Eastman Process" (May 1999).
4. ***STEINMETZ, Thomas D.:*** "Closed-Loop Identification" (December 1996).
5. ***JHA, Hemant:*** "Closed-Loop Sub-Space Identification" (May 1996).
6. ***WATSON, Matthew:*** "Application of Wavelet Transforms to Data Compression" (May 1996) co-supervised with Professor Dragana Brzakovic, Department of Electrical

Engineering and Computer Science, and Professor Antonios Liakopoulos, Department of Mechanical Engineering and Mechanics.

7. ***HIMES, Dave:*** "Statistical Quality Control of Highly Dimensional Chemical Processes" (October 1995).
8. ***LYMAN, Philip:*** "Plant-Wide Control of the Tennessee Eastman Process" (at Lehigh University, January 1993).
9. ***OZDEGER, Esser:*** "Modeling of an Emulsion Ter-polymerization System for Control Purposes" (at Lehigh University, June 1992), co-supervised with Dr. Guillermo Eliçabe and Professor Mohamed S. El-Aasser, Department of Chemical Engineering and Emulsion Polymers Research Institute.
10. ***CARRA, Stephano:*** "Optimization of Emulsion Co-Polymerization Processes," (at Lehigh University, May 1992), co-supervised with Professor Mohamed S. El-Aasser, Department of Chemical Engineering and Emulsion Polymers Research Institute.
11. ***SOOD, Aswini:*** "Modeling Particle Size Distribution in Emulsion Polymerization Reactors" (at Lehigh University, October 1992), co-supervised with Professor Mohamed S. El-Aasser, Department of Chemical Engineering and Emulsion Polymers Research Institute.
12. ***CLAUDE, Alain:*** "Statistical Control Techniques in Continuous Processes" (at Lehigh University, June 1990), co-supervised with Professor Robert Storer, Department of Industrial Engineering.
13. ***BLOSS, Karl:*** "On the Design of Reference Synthesis Controllers: Application to Chemical Reactors and Time Delayed Systems" (at Lehigh University, October 1990).
14. ***STERN, Larry:*** "Dynamical Characteristics of Fluidized Bed Coal Combustors," (at MIT, May 1991).
15. ***TSAMOPOULOS, John:*** "The Effect of Design on the Dynamics of a System of Staged Fluidized Bed Dryers" (at MIT, September 1980).
16. ***STOEVER, Matthew R.:*** "Uniform and Non-Uniform Lumping for Dynamic Models of Staged Processes with Linear Equilibrium Characteristics," (at MIT, May 1980).
17. ***WORTHEY, David J.:*** "Dynamics of Heat Pumps in Distillation Columns" (at MIT, August 1979).
18. ***LEE, David C.:*** "Modeling Desulfurization Phenomena in Fluidized Bed Coal Combustors" (at MIT, June 1979).
19. ***SCHICK, Irvin:*** "Analysis of Multistage Buffer Line with Unreliable Components and Interstate Buffer Storage, with Applications to Chemical Engineering Problems" (at MIT, June 1978).
20. ***FETTER, Robert:*** "Parametric Study of a Methanation Reactor" (at MIT, June 1978).
21. ***BAUER, Roberto F.:*** "Order of Magnitude Design of Modal Controllers" (at MIT, June 1977).

ENGINEER'S THESES PREVIOUSLY SUPERVISED:

1. ***TRINH, Tung:*** "Modeling of SO_2 Adsorption in Calcines," (at MIT, January 1978).

B.S. THESES PREVIOUSLY SUPERVISED:

1. ***MAHN, Bernd:*** "Assessing the Economical Benefits of Advanced Controllers using Approximate Linear Models derived from Normal Operating Data," (at Lehigh University, 1998).

2. ***HANISCH, Felix:*** "A Comparison of Tuning Characteristics Between Linear Model Predictive Control and Reference System Model Predictive Control," (at Lehigh University, 1997).
3. ***THEOKAS, A., A. KRETSOVALIS and T. MOUTZIARIS:*** "The Effect of the Separation Factor S as a Controlled Variable and the Measure of the Classical Distillation Control Schemes," (at the University of Thessaloniki, 1982).
4. ***GLINOS, Kostantinos:*** "The Physical Modes of Multiple Effect Evaporators" (at the University of Thessaloniki, 1981).
5. ***PAPADOURAKIS, Antonis:*** "The Effect of Design Characteristics on the Control of Distillation Columns," (at the University of Thessaloniki, 1982).
6. ***LYMBERATOS, Gerassimos:*** "On the Reaction Rate Maximum with Temperature, of Limestone Desulfurization" (at MIT, 1980).
7. ***TSIKOYIANNIS, John:*** "Steady State and Dynamic Characteristics of Fluidized Bed Reactors for the Production of Ethylene Oxide" (at MIT, 1980).
8. ***PARNAS, Richard S.:*** "Diethanolamine Promoter for the Absorption of Carbon Dioxide into Potash Solutions" (at MIT, 1979).
9. ***ROOT, Thatcher W.:*** "Semi-analytical Solutions of Nonlinear Reaction and Diffusion Problems," (at MIT, 1979).
10. ***DELLORTO, Joseph A.:*** "Steady State Control of Carbon Dioxide Absorption in a Combined Absorber Stripper System," (at MIT, 1979).
11. ***YUNG, Alan:*** "Mathematical Modeling of a Fluidized Catalytic Cracking Reactor at Steady State," (at MIT, 1978).
12. ***CRUPM, James C.:*** "Dynamic Stability of a Sequential Reaction in a Continuous Stirred Tank Reactor," (at MIT, 1978).
13. ***TEMPLETON, Michael K.:*** "Energy Re-normalization as an Approach to Process Dynamics," (at MIT, 1978).
14. ***PHILLIPS, Michael:*** "Dynamics of Stirred Tank Heat Exchangers," (at MIT, 1977).
15. ***TAO, Bernard Y.:*** "Steady State Multiplicity in Lumped Parameter Systems in which Consecutive Irreversible and Reversible Reactions Occur," (at MIT, 1976).

SEMINAR PRESENTATIONS:

1. June 1978, "An Order of Magnitude Approach to Process Dynamics," University of Trondheim, Norway.
2. October 1978, "An Order of Magnitude Approach to Process Dynamics," Department of Chemical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania.
3. April 1979, "Mathematical Challenges in Fluidized Bed Combustion," Courant Institute of Mathematics and New York University.
4. July 1979, "An Order of Magnitude Approach to Process Dynamics," Technical Center, Celanese Chemical Company, Corpus Christi, TX.
5. July 1980, "An Order to Magnitude Approach to Process Dynamics and Control," Stauffer Chemical Company.
6. September 1980, "The Present State of Process Modeling and Process Control," Instituto Donegani, Montedison Co., Novara, Italy.
7. September 1980, "Fluidized Bed Coal Combustion," Istituto Donegani, Montedison Co., Novara, Italy.

8. September 1980, "Steady State Multiplicity Characteristics of Fluidized Bed Coal Combustors," University of Naples, Naples, Italy.
9. January 1981, "Towards a Physical Theory of Process Control," impromptu presentation at the Second Process Control Conference, Sea Island, GA.
10. January 1981, "Modeling Fluidized Bed Coal Combustors," Union Carbide Company, South Charleston, WV
11. January 1981, "Modeling Fluidized Bed Coal Combustors," Amoco Research Center, Naperville, IL.
12. October 1981, "Modeling and Control of Gas Absorption Plants," Union Carbide, Tarrytown, NY.
13. November 1981, "Towards a Physical Theory of Process Control," Exxon Research and Engineering, Florham Park, NJ.
14. November 1981, "Towards a Physical Theory of Process Control," Rhône-Poulenc Company, Research Center, Paris, France.
15. October 1982, "The Use of Extensive Variables in Process Dynamics and Control," University of Rochester, Rochester, NY.
16. February 1983, "The Use of Extensive Variables in Process Dynamics and Control," Laboratorie des Sciences du Genie Chimique et Ecole Nationale Superieure des Industries Chemiques, Nancy, France.
17. May 1983, "Mathematical Modeling and Fluidized Bed Reactors," University of Pittsburgh, Pittsburgh, PA.
18. May 1983, "The Use of Extensive Variables in Process Dynamics and Control," North Carolina State University, Raleigh, NC.
19. January 1984, "Modeling of Polymerization Processes," Engineering Research Station, E.I. du Pont de Nemours & Co., Wilmington, Delaware.
20. May 1984, "The Use of Extensive Variables in Process Dynamics and Control," Union Carbide Corporation, Bound Brook, NJ.
21. July 1984, "Research Challenges and Opportunities in Process Modeling and Control," Process Control Panel, E. I. du Pont de Nemours & Co., Wilmington, Delaware.
22. December 1984, "Research Challenges and Opportunities in Process Modeling and Control," Hershey Corporation, Hershey, Pennsylvania.
23. February 1985, "Challenges and Opportunities in Process Modeling and Control," FMC Corporation Research Center, Princeton, NJ.
24. February 1985, "On the Use of Extensive Variables in Process Dynamics and Control," University of Pennsylvania, Philadelphia, Pennsylvania.
25. July 1985, "Research Challenges in Process Modeling and Control," Applied Automation Inc., Bartlesville, Oklahoma.
26. October 1985, "The Use Of Models in Process Control - A Polymerization Example," Dravo Engineers Co., Pittsburgh, Pennsylvania.
27. October 1985, "The Use Of Extensive Variables in Process Control," Presented at the Pittsburgh AIChE Chapter Meeting on Modern Industrial Process Control, Pittsburgh, Pennsylvania.
28. November 1985, "The Process Modeling and Control Research Center at Lehigh University," Control Data Corporation's Engineering Centers Network Meeting, Minneapolis, Minnesota.
29. December 1985, "Research Challenges in Process Modeling and Control," Reichold Chemical Co. Phenolic Division, Warren, NJ.

30. March 1986, "Research Challenges in the Use of Models in Process Control," presented at the Lehigh Valley AIChE Chapter Meeting on Process Control, Bethlehem, Pennsylvania.
31. August 1986, "Tendency Modeling of Batch Reactors for Optimization and Control," Istituto Donegani, Montedison Co, Novara, Italy.
32. August 1986, "The Use of Simple Models in Process Dynamics and Control," Federal Institute of Technology, Zurich, Switzerland.
33. October 1986, "Challenges and Progress in Chemical Process Modeling and Control," Control Data Corporation's Engineering Center Network Meeting, Minneapolis, Minnesota.
34. October 1986, "On the Use of Simple Models in Process Dynamics and Control," University of Maryland, College Park, Maryland.
35. April 1987, "The Use of Models in Process Dynamics and Control," Carnegie Mellon University, Pittsburgh, Pennsylvania.
36. April 1987, "Issues and Challenges in Process Control," Columbia University, New York.
37. April 1987, "Computer Aided Control Strategies for the Chemical Industry. Status and Future Challenges," CEF 87: The Use of Computers in Chemical Engineering, Taormina, Italy.
38. July 1987, "Tendency Modeling Optimization and Control of Batch Reactors," Smith Kline & French Laboratories, King of Prussia, PA.
39. July 1987, "Challenges and Opportunities in Process Modeling and Control," Union Camp, Princeton, NJ.
40. February 1988, "Advances In Process Control," Dow Chemical USA., Baton Rouge, LA.
41. April 1988, "Issues and Challenges in Process Modeling and Control," West Virginia University, Morgantown, WV.
42. October 1988, "Research Challenges and Opportunities in Process Modeling and Control," North Jersey Section of the AIChE.
43. November 1988, "Tendency Modeling and Optimization in Batch Processes," Process Technologies Laboratory, 3M Corporate Research, St. Paul, MN.
44. December 1988, "Intelligent Modeling and Control of Chemical Processes," Laboratory for Intelligent Systems in Process Engineering, MIT.
45. February 1989, "Tendency Modeling and Control of Batch Processes," Chemical Engineering Department, Purdue University, West Lafayette, IN.
46. October 1989, "Research Challenges and Opportunities in Process Modeling and Control," Presentation made at the 1989 Chemical Engineering Convocation, Lehigh University, Bethlehem, PA.
47. October 1989, "Process Control: The Confluence of Many Types of Expertise," to Journees Scientifiques, Rhône-Poulenc Company, Lyon, France.
48. May 1990, "Tendency Modeling, Optimization and Control for Specialty Chemicals and Biochemicals," to Roche Vitamins and Fine Chemicals, Nutley, NJ.
49. September 1990, "Challenges in the Quality Control of Polymer Products," University of Gainesville, FL.
50. September 1990, "Tendency Modeling, Optimization, and Control of Chemical Reactors," BP America, Cleveland, OH.
51. September 1990, "Nonlinear Control by use of the Reference System Synthesis Approach," BP America, Cleveland, OH.

52. October 1990, "Challenges in the Quality Control of Polymer Products: The Case of Composition Control in Emulsion Copolymerization," University of Massachusetts, Amherst, MA.
53. April 1991, "Tendency Modeling Optimization and Control in Batch Processes," Imperial College of Science and Technology.
54. September 1991, "Model-Based Process Optimization and Control by Approximate Fundamental Models," E. I. Du Pont de Nemours, Inc., Wilmington, DE.
55. September 1991, "Challenges on Modeling and Control of Emulsion Co-Polymerization Reactors," Princeton University, Princeton, NJ.
56. July 1992, "Model Based Optimization and Control by use of Tendency Models," Instituto Donegani, EniChem, Novara, Italy.
57. December 1992, "Tendency Modeling, Optimization, and Control of Batch Processes," Lonza, Inc., Annadale, NJ.
58. December 1992, "Modern Chemical Process Control," Air Products and Chemicals, Inc., Allentown, PA.
59. January 1993, "The Evolutionary Optimization of Specialty Chemical Batch Reactors Using Tendency Models," ENSIGC, Toulouse, France.
60. April 1993, "Model Predictive Control: A Tutorial Introduction to the Control Algorithm and its Process Models," BOC Cryoplants, Murray Hill, NJ.
61. April 1993, "Statistical Engineering Process Control for Continuous Processes," Industrial Engineering Department, Lehigh University, Bethlehem, PA.
62. January 1994, "Modern Tools for Process Control: Black, White, and Gray Models," SON Conference on Chemical Engineering, Lunteren, Netherlands.
63. January 1994, "The Conflict between Statistical and Feedback Process Control," Delft University of Technology, Delft, Netherlands.
64. March 1994, "Use of Singular Value Decomposition in Identification of Stoichiometric Models for Batch Reactors," Drexel University, Philadelphia, PA.
65. June 1994, "Modern Tools for Process Control: Black, White, and Gray Models," University of Amsterdam, Amsterdam, Netherlands.
66. June 1994, "Modern Tools for Process Control: Black, White, and Gray Models," Dow Chemical, Tearnuzsen, Netherlands.
67. December 1994, "Multivariate Process Control: Disturbance Detection and Isolation" Imperial College, London, England.
68. January 1995, "Modern Tools of Process Control: The case of... Black, Gray, and White Models!" University of Thessaloniki, Thessaloniki, Greece.
69. June 1995, "Batch Reactor Control via Tendency Models; The Nancy-Lehigh Connection," Laboratiore des Sciences du Genie Chimique, Nancy, France.
70. May 1996, "Control Structures for Preliminary Plant Designs," Delft University Symposium on Dynamics and Control in Process Design, Rotterdam, the Netherlands.
71. October 1996, "Modern Vistas of Process Control," University of Seoul, Korea.
72. October 1996, "A Panorama of Process Control Research at Lehigh University," Mitsubishi Chemical Corporation, Kurashiki, Japan.
73. April 1997, "Modern Vistas of Process Control," Lehigh University, Department of Mechanical Engineering and Mechanics.

74. September 1997, "Process Identification and Model Predictive Control," invited presentation at the Research and Engineering Center of Mitsubishi Chemicals, Kurashiki, Japan.
75. September 1997, "Tendency Modeling and Model Predictive Control of Batch Processes," invited presentation at the Research and Engineering Center of Mitsubishi Chemicals, Kurashiki, Japan.
76. September 1997, "Statistical Process and Controller Monitoring," invited presentation at the Research and Engineering Center of Mitsubishi Chemicals, Kurashiki, Japan.
77. September 1997, "Interaction of Design and Control of Chemical Processes," invited presentation at the Research and Engineering Center of Mitsubishi Chemicals, Kurashiki, Japan.
78. October 1997, "Process Operability: A New Prospective on an Important Challenge," invited presentation at ASPEN World, Boston MA, October 1997.
79. October 1998, "Process Operability – A Steady State and Dynamic Approach," invited presentation at Aspentech, Texas, October 1998.
80. October 1998, "Low Order Dynamic Models for Separations Processes," invited presentation at Exxon Chemical, Texas, October 1998.
81. November 1998, "A Controller Performance Index Based on Minimum and Open-loop Output Variance," AIChE Annual Meeting (with Stella Bezergianni), November 1998.
82. November 1998, "An Optimal Control Perspective on the Inherent Dynamic Operability of Processes," AIChE Annual Meeting (with Derya Uztürk), November 1998.
83. "System Identification and Linear Model Predictive Control of Large Scale Systems with Application to the Tennessee Eastman Process," AIChE Annual Meeting (with Qiang Zhan), November 1998.
84. November 1998, "A New Approach to the Operability of Chemical Processes," invited seminar at Lehigh University, Bethlehem, Pennsylvania, November 11th, 1998.
85. November 1998, "On-line Control of Emulsion Polymerization Reactors," invited presentation at Rhodia SA, Sao Paulo, Brazil, November 19th, 1998.
86. November 1998, "On the Operability of Chemical Processes," invited presentation at the University of Florida, Gainesville, Florida, November 23rd, 1998.
87. April 1999, "On the Operability of Chemical Processes," invited presentation at Rutgers University, South Brunswick, New Jersey, April 1, 1999.
88. July 1999, "On the Operability of Chemical Processes," invited seminal at Kyoto University, Kyoto, Japan.
89. July 1999, "Low Order Dynamic Models for Separations Processes," invited presentation at Mizushima Corporate Research Center, Mitsubishi Chemical Corporation, Japan.
90. July 1999, "On the Operability of Chemical Processes," invited presentation at Mizushima Corporate Research Center, Mitsubishi Chemical Corporation, Japan.
91. July 1999, "On the Operability of Chemical Processes," invited presentation at a special one-day colloquium on "Challenges in Process Systems Engineering for the 21st Century" at the National University of Science and Technology, Taipei, Taiwan.
92. April 2000, "A New Look at Process Operability", invited seminar at Case Western Reserve University, Cleveland, Ohio, April 11th, 2000.
93. September 2000, "On the Operability of Continuous Processes," invited seminar at Boston University, Boston, Massachusetts, September 8th, 2000.
94. March 2004, "Process Operability" Invited seminar at the Department of Chemical and Biological Engineering, RPI

95. October 2004, "Process Operability" Invited seminar at the Department of Chemical Engineering, U. of South Carolina,
96. April 2005, "A New Look at Process Operability" Invited seminar at the Department of Chemical Engineering, U. of Rhode Island.
97. November 2006, "Process Operability" Rice University, Huston TX