



# Summary Biography

(Updated to July 1, 2004)

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## Education

Ph.D. Aerospace and Mechanical Sciences - Princeton University, 1972  
Bachelor of Aeronautical Engineering - Rensselaer Polytechnic Institute, 1966

## Professional History

1983 - present Professor, Mechanical and Aerospace Engineering, Princeton University  
Fall 2001 Consulting Engineer (Sabbatical)  
1996 - 1997 Consulting Engineer (Sabbatical)  
1991 - 1992 Consulting Engineer (Sabbatical)  
1987 - 1990 Associate Dean of Academic Affairs, School of Engineering and Applied Science  
1984 - 1987 Undergraduate Departmental Representative, Mechanical and Aerospace Engineering  
1982 - 1983 Consulting Scientist, Mobil Research and Development Corporation (Sabbatical)  
1982 - 1983 Associate Professor, Mechanical and Aerospace Engineering, Princeton University  
1977 - 1982 Lecturer, Mechanical and Aerospace Engineering, Princeton University  
1976 - 1981 Research Engineer, Mechanical and Aerospace Engineering, Princeton University  
1972 - 1976 Professional Research Staff Member of Guggenheim Laboratories for the Aerospace Propulsion Sciences, Princeton University  
1971 - 1972 Research Associate, Princeton University

## Professional Activities and Honors:

Society of Automotive Engineers Fellow, October, 2003  
Member National Materials Advisory Board/National Research Council Committee to Identify Needs to Foster Improved Fire Safety in the United States 2002-2003.  
Editorial Board Member, Progress in Energy and Combustion Science, 2002-present.  
Co-organizer, of the Droplets and Sprays Colloquium for the 29<sup>th</sup> international Symposium on Combustion, Sapporo, Japan, July 21-26, 2002.  
Invited Lecturer, 20<sup>th</sup> Italian National Heat Transfer Conference, Maratea, Italy. June 25 – 27, 2002.  
Silver Medal, 28<sup>th</sup> International Combustion Symposium, August, 2000.  
Co-editor (and Co-chair, Publication Committee) 27<sup>th</sup> International Combustion Symposium Proceedings, Boulder CO, July 1998.  
Editorial Board, International Journal of Chemical Kinetics, 1997 - 2002.  
Member, Committee on Fire Safe Fuels for Aircraft, National Materials Advisory Board, Commission on Engineering and Technical Systems, National Research Council, 1996 - 1997.  
Co-editor (and Co-chair, Publication Committee) 26<sup>th</sup> International Combustion Symposium, The Combustion Institute, Pittsburgh, PA, 1996.  
Member, Committee on Fire and Smoke Resistant Materials for Commercial Aircraft Interiors, National Materials Advisory Board, Commission on Engineering and Technical Systems, National Research Council, 1993 - 1995.  
Member, NASA Scientific Advisory Panel on Atmospheric Effects of Aviation Project (AEAP), Earth Sciences and Applications Divisions, 1993 - 1995.  
Selection Panel, 1993 DLR Science Award, Deutsche Forschungsanstalt für Luft-und Raumfahrt e.V., 1993.

Chair, Engine Emissions Trace Chemistry Sub-Committee, NASA Atmospheric Advisory Panel on Atmospheric Effects of Stratospheric Aircraft (AESAs), Earth Sciences and Applications Divisions, Office of Space Science and Applications, 1992- present.

Selection Panel Member, SADI CARNOT Award in Energy Conservation and Renewable Resources, United States Department of Energy Awards Program, 1991.

Committee Member, Committee on Energy Conservation in the Processing of Industrial Materials, National Materials Advisory Board, Commission on Engineering and Technical Systems, National Research Council, 1990-1993.

Hottel Lecturer, Hottel Lecture Series on Energy and Combustion, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 1991.

Gordon Conference Speaker, 1991 Gordon Research Conference on Gravitational Effects in Physico-Chemical Systems, Plymouth State College, Plymouth, NH, 1991.

Gordon Conference Speaker, Second Gordon Research Conference on Chemistry of Energetic Materials, New Hampton School, NH, 1990.

Associate Editor, Combustion Science and Technology, 1977-1986.

Editorial Board, Combustion Science and Technology, 1986 - 1991.

Member, National Academy of Sciences NRC Panel on Impacts of Diesel Powered Light Duty Vehicles, 1979-1980.

Member, National Academy of Sciences NRC Carbon Monoxide Control Assessment Panel, 1980.

Reviewer, ACS, ARO, DOE, NASA, NSF, ONR, NIST Technical Proposals.

Reviewer, Combust. and Flame, Int. J. Chem. Kin., J. Phys. Chem., Combust. Sci. and Tech., Int. J. Heat Transfer, AIAA, SAE, AICHE.

Member, The Societies of Sigma Gamma Tech, Sigma Xi, Tau Beta Pi, American Chemical Society, American Society of Automotive Engineers, American Society of Engineering Educators, American Society of Mechanical Engineers, The Combustion Institute.

#### **Publications, 2001-Present**

(with J. Li, and A. Kazakov), "Experimental And Numerical Studies of Ethanol Decomposition Reactions", J. Phys. Chem., 2004 (submitted, May, 2004).

(with Z. Zhao, and A. Kazakov), "Measurements of DME/Air Mixture Burning Velocities by Using Particle Image Velocimetry", Combust. Flame, 2004 (submitted January, 2004).

(with J. Li, Z. Zhao, and A. Kazakov), "An Updated Comprehensive Kinetics Model of H<sub>2</sub> Combustion", Int. J. Chem. Kin. (2004) (In Press).

(with Z. Zhao, A. Kazakov, and J. Li), "The Initial Temperature And N<sub>2</sub> Dilution Effect On The Laminar Flame Speed Of Propane/Air Mixtures", Combust. Sci. and Tech. (2004) (In Press)

(with A. Yozgatligil, S-H. Park, M.Y. Choi, and A. Kazakov), "Burning And Sooting Behavior Of Ethanol Droplet Combustion Under Microgravity Conditions", Combust. Sci. Tech. (2004). (In Press)

(with Z. Zhao, J. Li, A. Kazakov, and S. P. Zeppieri), "Burning Velocities Of N-Decane A High Temperature Skeletal Kinetic Model For N-Decane-Air Mixtures", Combust. Sci. Tech. (2004). (In Press).

(with K. Kroenlein, A. Kazakov, A. Yozgatligil, L. Shor, M. Y. Choi, S. L. Manzello, K-Ook Lee and R. Dobashi), "Initial Observations of Soot Formation During Ethanol Droplet Combustion at Elevated Pressures", J. Microgravity Sci. (2003) (submitted).

(with A. Kazakov, and J. Conley) "Detailed Modeling of an Isolated, Ethanol Droplet Combustion Under Microgravity Conditions, Combust. Flame, 134, 301-314 (2003).

(with J. Vican, B.F. Gajdeczko, D. L. Milius, I. A. Aksay, and R.A. Yetter), "Development of a Microreactor as a Thermal Source for MEMS Power Generation", Proc Int. Comb. Ins. 29, 909-916 (2002).

(with T. Carriere, P.R. Westmoreland, A. Kazakov, and Y.S. Stein), "Modeling Ethylene Combustion From Low To High Pressure", Proc. Int. Comb. Ins. 29, 1257-1266 (2002).

(with J.J. Scire and R.A. Yetter), "Comparison of Global and Local Sensitivity Techniques for Rate Constants Determined using Complex Reaction Mechanisms", Int. J. Chem. Kin., 33, 780 (2001).

(with J. Li and A. Kazakov), "Ethanol Pyrolysis Experiments in a Variable Pressure Flow Reactor", *Int. J. Chem. Kin.* 33, 859 (2001).

(with M.Y. Choi), "Microgravity Droplet Combustion" *Microgravity Combustion, Fire in Free-Fall*, H.D. Ross, ed., Academic Press, NY, NY. pp. 183-298.

(with R.A. Yetter), "Metal Particle Combustion and Classification" *Microgravity Combustion, Fire in Free-Fall*, H.D. Ross, ed., Academic Press, NY, NY. pp. 419-478.

(with J. J. Scire, Jr. and S. D. Klotz), "Initial Observations of Ketene in Flow Reactor Kinetic Studies", *Zeitschrift für Physikalische Chemie*, 215 pp. 1011-1023 (2001).

(with J. J. Scire, Jr. and R. A. Yetter), "Flow Reactor Studies of Methyl Radical Oxidation Reactions in Methane Perturbed Moist Carbon Monoxide Oxidation at High Pressure with Model Sensitivity Analysis", *Int. J. Chem. Kin.*, 39, 75 (2001).

#### Other Selected Recent Publications

(with Z. Zhao, J. P. Conley, and A. Kazakov), "Burning Velocities of Real Gasoline Fuel at 353 K and 500 K", SAE Paper No. 2003-01-3265.

(with J. Li, and A. Kazakov) "Experimental and Numerical Studies of Ethanol Oxidation", Western States Section/Combustion Institute 2003 Fall Meeting, University of California, Los Angeles, Oct. 20, 21, 2003 Paper No. 03F-60

(With P. U. Ricklin, A. Kazakov, S. C. Kong, and R. D. Reitz), "The Effects of NO<sub>x</sub> Addition on the Auto Ignition Behavior of Natural Gas under HCCI Conditions" SAE Paper No. 02SFL-93, 2002.

(with J.A. Eng, W.R. Leppard, and P.M. Najt), "The Interaction Between Nitric Oxide and Hydrocarbon Oxidation chemistry in a spark Ignition Engine", SAE Transactions, 1998.

(with J.A. Eng, W.R. Leppard, and P.M. Najt), "Experimental Hydrocarbon Reaction Rate Correlations from a Spark Ignition Engine", SAE Transactions, 1998.

(with T. Amano), "Effect of Dimethyl Ether, NO<sub>x</sub>, and Ethane on CH<sub>4</sub> Oxidation; High Pressure, Intermediate Temperature Experiments and Modeling", 27<sup>th</sup> Symposium (Int'l) on Combustion, The Combustion Institute, Pittsburgh, PA., 1998. p. 397.

(with P. Bucher, R.A. Yetter, T.P. Parr, and D.M. Hanson-Parr), "Flame Structure of Aluminum Particle Combustion in O<sub>2</sub>, CO<sub>2</sub> and N<sub>2</sub>O Oxidizers", 27<sup>th</sup> Symposium (Int'l) on Combustion, The Combustion Institute, Pittsburgh, PA., 1998. P. 2421.

(with H.J. Curran, W.J. Pitz, C.K. Westbrook, and C.V. Callahan) "Oxidation of Automotive Primary Reference Fuels in a High Pressure Flow Reactor", 27<sup>th</sup> Symposium (Int'l) on Combustion, The Combustion Institute, Pittsburgh, PA., 1998. p. 379.

(with M. A. Mueller and R.A. Yetter), "Measurement of the Rate Constant of H+O<sub>2</sub>+M=HO<sub>2</sub>+M (M=N<sub>2</sub>, Ar) Using Kinetic Modeling of the High Pressure H<sub>2</sub>/O<sub>2</sub>/NO<sub>x</sub> Reaction", 27<sup>th</sup> Symposium (Int'l) on Combustion, The Combustion Institute, Pittsburgh, PA., 1998. p. 177.

(with T.J. Held), "A Comprehensive Mechanism for Methanol Oxidation", *Int. J. Chem. Kin.* 30, 805 (1998).

(with V. Nayagam, J. Haggard, R. Colantonio, A.J. Marchese, B.L. Zhang, and F.A. Williams), "N-Heptane Droplet Combustion in Oxygen Helium Mixtures at Atmospheric Pressure", *AIAA Journal Proceedings*, 36, 1369 (1998).

(with M.T. Allen and R.A. Yetter), "Hydrogen/Nitrous Oxide Kinetics - Implications of the N<sub>x</sub>H<sub>y</sub> Species", *Combust. And Flame*, 112, 302, (1998).

(with R.A. Yetter, H. Rabitz, R.C. Brown and C.E. Kolb), "Effect of Fluorine on the Gasification Rate of Liquid Boron Oxide Droplets", *Combust. and Flame*, 112, 387 (1998).

(with J.J. Wise, J. Day, P. Givi, R. Hall, S. Qutubuddin, and E. Weckman), "Aviation Fuels with Improved Fire Safety: A Proceedings" National Academy Press, Washington, DC, 1997. NMAB 490.

(with R.A. Yetter and M.T. Allen), "Gas-Phase Reaction Mechanisms for Nitramine Combustion: On the Development of a Comprehensive Reaction Mechanism for Hydrogen/Nitrous Oxide Kinetics", in *Challenges in Propellants and Combustion 100 Years after Nobel*, (K. Kuo, ed.) Begell House, Inc. (1997).

(with T.J. Held and A.J. Marchese), "A Semi-Empirical Reaction Mechanism for N-Heptane Oxidation and Pyrolysis", *Combust. Sci. and Tech.*, 123, 107 (1997).

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(with C.V. Callahan, T.J. Held, R. Minetti, M. Ribaucour, L.R. Sochet, T. Faravelli, P. Gaffuri and E. Ranzi), "Experimental Data and Kinetic Modeling of Primary Reference Fuel Mixtures", 26<sup>th</sup> Symposium (Intn'l) on Combustion (1997). pp. 739.

(with M.T. Allen and R.A. Yetter), "High Pressure Studies of Moist Carbon Monoxide/Nitrous Oxide Kinetics", Combust. and Flame (1997). 109, 449 (1997).

(with J.F. Roesler, and R.A. Yetter), "Inhibition and Oxidation Characteristics of Chloromethanes in the Presence of Moist Carbon Monoxide Oxidation", Combust. Sci. and Tech., 120, 11 (1997).

(with J.C. Lee and R.A. Yetter), "Numerical Simulation of Laser Ignition of an Isolated Carbon Particle in Quiescent Environment", Combust. and Flame, 105, 591 (1996).

(with N.R. Purzer, R.A. Yetter and R.J. Lawson), "Fluidized Bed Studies of Carbon Particle Oxidation: Gas Phase Surface Products and Surface Area Evolution", Combust. Sci. and Tech. 110-111, 147 (1996).

(with J.F. Roesler and R.A. Yetter), "Kinetic Interactions of CO, NO<sub>x</sub>, and HCl Emission in Post-Combustion Gases", Combust. and Flame, 100, 495-504 (1995).

(with J.F. Roesler and R.A. Yetter), "Perturbation of Moist CO Oxidation by Trace Quantities of CH<sub>3</sub>Cl", Comb. Sci. and Tech, V101, 1-6, p. 197 (1994).

(with S. Hochgreb), "A Comprehensive Study on CH<sub>2</sub>O Oxidation Kinetics", Comb. and Flame, 91, 257 (1992).

(with D.L. Urban and S.P. Huey), "Evaluation of the Coke Formation Potential of Residual Oils", Twenty Fourth Symposium (Int.) on Combustion, The Combustion Institute, Pittsburgh, PA, 1992. p. 1357.

(with S.Y. Cho, and R.A. Yetter), "A Computer Model for One Dimensional Mass and Energy Transport in and around Chemically Reacting Particles, Including Complex Gas-Phase Chemistry, Multi-component Molecular Diffusion, Surface Evaporation, and Heterogeneous Reaction", Journal of Computational Physics. 101, 160 (1992).

### Graduate Students Advised Since 1990

T. Amano, present, in abstensia; J. Conley, present in abstensia; K. Kroenlein, present; B. Urban, present, in abstensia; L. Zheng, present; Z-W Zhou, present; J. Li, Ph.D., 2004; P. Ricklin, M.S.E., 2002; J. Scire, Ph.D., 2002; Z-W Zhou, M.S.E. 2002; L. Ernst, M.S.E., 2001; M. Mueller, Ph.D., 2000; S. Fischer, M.S.E., 1998; P. Bucher, Ph.D., 1998; J. Eng, Ph.D., 1998; W. Zhou, Ph.D., 1998; J. Gatto, M.S.E., 1997; D. Zarubiack, M.S.E., 1997; J.M. Fielding, M.S.E., 1997; A.J. Marchese, Ph.D., 1996; J.C.Y. Lee, Ph.D., 1996; C. Callahan, MSE, 1995; M. Allen, Ph.D., 1995; N. Ilincic, M.S.E., 1995; J. Roesler, Ph.D., 1994; T. Kim, M.S.E., 1994; T. Held, Ph.D., 1993; S. Kowalski, MSE, 1993; S. Huey, M.S.E., 1991; M.Y. Choi, Ph.D., 1991; M.L. Vermeersch, Ph.D., 1991; S. Hochgreb, Ph.D., 1991; G.T. Linteris, Ph.D., 1990; T.S. Norton, Ph.D., 1990.

### Postdoctoral Scholars Sponsored Since 1990

M. Angioletti, Ph.D.; A. Kozakov, Ph.D.; S. Klotz, Ph.D.; S. Gurin, Ph.D.; K. Southerland, Ph.D.; D. Urban, Ph.D.; S.Y. Cho, Ph.D; C. Corre, Ph.D.

### Thesis Degreed Graduate Students and Postdoctoral Fellows

Since 1981: 35 Graduate Students, 11 Post Doctoral

Co-advised (with I. Glassman) Prior to 1981: 8

### Patents

(with G.J. Green, and D.E. Walsh), "Droplet Generation Apparatus", European Patent No. 85302157.4-, May 20, 1985; U.S. Patent No. 4,819,831 April 11, 1989. Assigned to Mobil Oil Corporation, N.Y. NY.

### Consulting, Current and Past

Arco Petroleum Products Co., Harvey, IL; Battelle Columbus Laboratories, Columbus, OH; Cabot Corporation, Billerica MA, Celanese Corporation, Summit, NJ; Electric Power Technologies, Inc., Berkeley, CA; Exxon Research and Engineering Co., Florham Park, NJ; Gaulin Industries, Everett, MA; General Motors Corporation (Division of Manufacturing Development), Warren, MI; KVB, Inc., Irvine, CA; Lawrence Livermore Laboratories (T Division), Livermore, CA; Mobil Research and Development Corporation, Pennington, NJ; Ontario Research Foundation, Mississauga, Ontario; Oakridge National Laboratories, Oakridge TN, Princeton Sensors, Inc., Princeton, NJ; Public Service Electric and Gas Co, Inc. Newark, NJ; the Singer Corporation (American Meter Division), Philadelphia, PA; and TRW Systems, Redondo Beach, CA.

Dr. Dryer has also served as a technical expert in various litigations involving fire safety of liquid and gaseous flammables, light aircraft accidents, consumer products, and industrial accidents. References on request.