

ROBERT F. SAWYER

BS, MS, MA, PhD, PE, NAE

Education—Dr. Sawyer studied at Stanford University in the Department of Mechanical Engineering (B.S. 1957, M.S. 1958). His later graduate and doctoral degree work was at the Guggenheim Aerospace Propulsion Laboratories of the Department of Aerospace Sciences at Princeton University (M.A. 1963, Ph.D. 1966).

Academic appointments—He was an instructor physics and mathematics at Antelope Valley College (1959-1960). He joined the faculty of the Mechanical Engineering Department of the University of California at Berkeley as an assistant professor in 1966 and served through the rank of full professor (1991). He held a joint appointment as a Senior Faculty Scientist at the Lawrence Berkeley Laboratory. At Berkeley he was Vice Chairperson for Graduate Studies of the Department of Mechanical Engineering (1980-1983) and Chairperson of the Energy and Resources Group (1984-1988), an interdisciplinary graduate department addressing energy, resource, and environmental policy. He was selected the first Class of 1935 Professor of Energy (1988). Visiting appointments included: Visiting Research Scientist at the Johns Hopkins University Applied Physics Laboratory (1971), Visiting Researcher at Imperial College (1978-1979), Visiting Professor at Hokkaido University (1984), Visiting Professor at the Toyohashi University of Technology (1984), Visiting Scientist at the Sandia National Laboratory Combustion Research Facility (1988-1989), and Honorary Research Fellow at University College London (1991). He is a Visiting Professor of Energy and Environment at University College London (1995-) and the Class of 1935 Professor of Energy Emeritus at the University of California at Berkeley.

Research—Dr. Sawyer's research focused on combustion chemistry but spanned a wide range of related topics and applications. Included were the chemical kinetics of combustion (H_2 , CH_4 , NH_3 , N_2H_4 , chlorinated hydrocarbons), diagnostics (NO , NO_2 , NH_3 , chlorinated hydrocarbons, metals, nanoparticles, and flow imaging), heat transfer (rocket and internal combustion engines), pollutant formation (NO , NO_2 , HONO, particulate, chlorinated compounds), fluid mechanics (reacting rocket nozzle flow, reaction in shedding vortices, spouted bed combustion), and fuels (smoke suppressing additives, alternative engine fuels, reformulated gasoline, MTBE additive). In addition to the formation and control of air pollutants in combustion process, other air quality related research included the toxicity of diesel exhaust, emissions inventory assessment, in-use mobile source emissions, photochemical modeling, and regulatory policy. He is the author or co-author of more than 360 publications and the co-author of two books, *The Chemistry of Propellants and Combustion Sources of Air Pollution and Their Control*.

Professional activities—Dr. Sawyer was a Rocket Test Engineer, Rocket Propulsion Research Engineer, and Chief of the Liquid Systems Analysis Section at the Air Force Rocket Propulsion Laboratory, Edwards AFB, California (1958-1961). He served on the President's Council on Environmental Quality Advisory Committee on Alternative Automotive Power Systems (1971-1976), headed the Technology Panel of the National Academy of Sciences Committee on Motor Vehicle Emissions (1973-1974), chaired the State of California ad hoc Committee on Atmospheric Carcinogens (1978-1979), chaired the National Academy of Sciences Committee on Diesel Engine Technology (1979-1982), served as a member of the National Research Council Committee on Army Basic Research (1987-1988), a member of the California Air Resources Board (1975-1976), a director of KVB, Inc. (1975-1978), a director of the Center for Emissions Research and Analysis (1991-1994), a member of the External Advisory Panel to the World Bank Mexico City Transport Air Quality Management Program (1992-1996), a Senior Policy Advisor to the Office of Air and Radiation of the U.S. Environmental Protection Agency (1994-1995), a member of the Distinguished Advisory Panel to the Joint Auto/Oil Air Quality Improvement Research Program (1988-1996), a member of the U.S. EPA Blue Ribbon Panel on MTBE, and a member of the National Research Council Committee to Review the MOBILE Model, the Committee on Congestion Mitigation and Air Quality (CMAQ), the Committee on Light Duty Vehicle Fuel Economy, and the National Research Council Board on Environmental Science and Toxicology. He chaired the Health Effects Institute Special Committee on Emerging Technologies, the Bay Area Air Quality Management District Advisory Council (2003), and was co-chair of the USEPA Mobile Sources Technical Advisory Sub-committee (1996-2003). In 2005 Dr. Sawyer accepted the appointment by Governor Schwarzenegger to head the California Air Resources Board, a position he held until 2007. This agency, with 1200 employees and a budget of more than 750 million dollars, oversees California's air quality and climate change programs. As Chair of the Air Resources Board, he oversaw implementation of the California Global

Warming Solutions Act. He was a member of the United Nations International Civil Aviation Organization Independent Experts Panel on Fuel Burn Reduction Technology (2009-2010). He served on the National Academy of Engineering/National Research Council Committee on Analysis of Causes of the Deepwater Horizon Explosion, Fire, and Oil Spill to Identify Measures to Prevent Similar Accidents in the Future (2010-2011), the USAF Study Panel on Alternative Sources of Energy for US Air Force Bases, the National Research Council Committee on Transition to Alternative Vehicles and Fuels (2010-2012), and was a member of the International Council for Clean Transportation (2005-2008). He was a director of the American Lung Association in California (2009-16), chairing their Advocacy Committee.

Current activities—He is a member of the Advisory Committee to the College of Engineering Center for Environmental Research and Technology at the University of California at Riverside, the International Advisory Board of the Center for Combustion Energy, Tsinghua University, and an advisor to the South Coast Air Quality Management District. Oversight and Review Committee California Council on Science and Technology Natural Gas Storage Study. Advisor to the Hong Kong Environmental Protection Department. Honorary director of the Combustion Institute. He is a partner of Sawyer Associates, an engineering consulting firm.

Memberships, honors, and awards—Dr. Sawyer served as President of the International Combustion Institute (1992-1996), is a Fellow of the Society of Automotive Engineers, a Fellow of the British Interplanetary Society, Associate Fellow of the American Institute of Aeronautics and Astronautics, and a life member of American Society of Mechanical Engineers, the American Association of University Professors, Sigma Xi, and Pi Tau Sigma. He is a Registered Professional Engineer (Mechanical Engineering and Fire Protection Engineering) in the State of California. He is a recipient of the Berkeley Citation, the Yunchuan Aisinjiro-soo Distinguished Lectureship at the University of Illinois, the Sechiro Honda Medal of the Society of Mechanical Engineers, and the Air Force Flight Test Center Meritorious Citation. Dr. Sawyer is a Senior Fellow of the California Council for Science and Technology and a member of the National Academy of Engineering.

Teaching—At Antelope Valley College (Lancaster, California) Dr. Sawyer was a part-time instructor of physics and mathematics (1959-1961). At the University of California at Berkeley, he taught undergraduate and graduate courses in combustion, propulsion, thermodynamics, energy conversion, engines, experimental methods, air pollution, and fire safety (1966-1991). As Professor of the Graduate School, the Class of 1935 Professor of Energy Emeritus, Professor of the Graduate School, and Senior Research Engineer at the Lawrence Berkeley Laboratory (1991-2005) he conducted research and advised undergraduate and graduate research students in motor vehicle emissions and control, toxic waste incineration, and regulatory policy. He continued teaching at Berkeley during this period including the undergraduate courses, *Energy and Society* and *The Automobile, Energy, and The Environment* and the graduate courses, *Interdisciplinary Energy Analysis* and *Critical Issues in Air Pollution for the 1990s*. He directed the University of California Study Abroad Center in London, England (2003-2005). Following his service in the California state government, he resumed his work at Berkeley where taught a seminar for freshman students, *The Science, Technology, Policy, and Politics of California Air Pollution*.

Biographical—Dr. Sawyer was born in Santa Barbara, California in 1935. He served in the U.S. Air Force (active duty, 1958-1961), reaching the rank of captain (USAFRes). He lives in Sacramento, California and Incline Village, Nevada with his wife, Barbara Sawyer, who was a faculty member and past Chair of the Academic Senate at Diablo Valley College. Their daughters, Allison Shaffer, a finance analyst, and Lisa Sawyer, an architect, live in Davis, California. They have four grandchildren: Kimberly Shaffer (DVM, University of Wisconsin), Justine Lescroart (JD, University of California Davis), Robyn Shaffer (MS, Stanford University), and Jack Lescroart (JD, Georgetown University). Dr. Sawyer is an avid hiker, backpacker, skier, fly fisher, wildflower photographer, and theatre-goer.

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