# Review of the Research Program of the U.S. DRIVE Partnership, Phase 5

## Committee

## John H. Johnson

**Chair**

John H. Johnson is a presidential professor emeritus in the Department of Mechanical Engineering-Engineering Mechanics at Michigan Technological University (MTU) and fellow of the Society of Automotive Engineers (SAE) and the American Society of Mechanical Engineers (ASME). His experience spans a wide range of analysis and experimental work related to advanced engine concepts, diesel and other internal engine emissions studies, fuel systems, and engine simulation. He was previously project engineer at the U.S. Army Tank Automotive Center and chief engineer in applied engine research at the International Harvester Company before joining the MTU mechanical engineering faculty. He served as chairman of the MTU mechanical engineering and engineering mechanics department from 1986 to 1993. He has served on many committees related to engine technology, engine emissions, and health effects—e.g., committees of the SAE, the National Research Council (NRC), the Combustion Institute, the Health Effects Institute, and the Environmental Protection Agency—and consults to a number of government and private sector institutions. In particular, he served on many NRC committees including the Committee on Fuel Economy of Automobiles and Light Trucks, the Committee on Advanced Automotive Technologies Plan, the Committee on the Impact and Effectiveness of Corporate Average Fuel Economy (CAFE) Standards, and the Committee to Assess Fuel Economy for Medium and Heavy-Duty Vehicles. He has served as chair of several committees, most recently for the NRC Committee on Review of the 21st Century Truck Partnership, Phase 3. Dr. Johnson received from SAE the Horning Memorial Award, Colwell Merit Award (two), McFarland Award, Myers Award for Outstanding Student Paper, the Franz Pischinger Powertrain Innovation Award, and from ASME the Honda Medal and the Internal Combustion Engine Award. He received his Ph.D. in mechanical engineering from the University of Wisconsin.

## Alexis T. Bell

**Member**

Alexis T. Bell (NAE/NAS) is professor of chemical and biomolecular engineering, University of California, Berkeley. He has also held the positions of dean, College of Chemistry, and chairman, Department of Chemical Engineering. The emphasis of his research is on heterogeneous catalysis and the relationship between catalyst composition and structure and catalyst performance on the molecular level. He has developed and applied experimental and theoretical methods to understanding catalysts and catalyzed reactions at the molecular level. His insights can be used to improve catalyst activity and selectivity for applications such as air-pollution control and the synthesis of fuels and chemicals. He is a recipient of the Curtis W. McGraw Award for Research, American Association of Engineering Education; the Professional Progress, R. H. Wilhelm, and William H. Walker Awards, American Institute of Chemical Engineers; the Paul H. Emmett Award in Fundamental Catalysis and the Michel Boudart Award, Catalysis Society; and the ACS Award for Creative Research in Homogeneous or Heterogeneous Catalysis and the George Olah Award in Petroleum or Hydrocarbon Chemistry, American Chemical Society. He has served on a number of Academies boards and committees, and is a member of the National Academy of Engineering (NAE), a member of the National Academy of Sciences (NAS), and a fellow of the American Association for the Advancement of Science. He received his Sc.D. in chemical engineering from the Massachusetts Institute of Technology (MIT).

## David L. Bodde

**Member**

David L. Bodde serves as a professor and senior fellow at Clemson University. There, he directs innovation and policy at the International Center for Automotive Research. Prior to joining Clemson University, Dr. Bodde held the Charles N. Kimball Chair in Technology and Innovation at the University of Missouri in Kansas City. Dr. Bodde serves on the Board of Directors of several energy and technology companies, including Great Plains Energy, the Commerce Funds, and EPRI Solutions. His executive experience includes: vice president, Midwest Research Institute; assistant director of the Congressional Budget Office; and deputy assistant secretary in the U.S. Department of Energy. He has served as a member of a number of Academies' boards and committees including the Board on Energy and Environmental Systems, the Committee on Alternatives and Strategies for Future Hydrogen Production and Use, the Committee on Assessment of Resource Needs for Fuel Cell and Hydrogen Technologies, and the Committee on Review of the U.S. DRIVE Research Program, Phase 4. He was once a soldier and served in the Army in Vietnam. He has a doctorate in business administration from Harvard University, M.S. degrees in nuclear engineering (1972) and management (1973), and a B.S. from the United States Military Academy.

## Nady Boules

**Member**

Nady Boules is president of NB Motors, L.L.C., an engineering and management consulting firm. Prior to this, he held several positions in the automotive industry including Director, Electrical & Control Systems Research Laboratory, General Motor Global R&D; Co-director, GM-Carnegie Mellon University VIT Collaborative Research Laboratory; Director, Innovation & Technology Leadership, and Director, Dynamics Innovation Center and Materials Engineering, Delphi Corporation; Section Manager, Electromechanical Systems, and Group Leader, Electric Machines and Actuators, General Motors Global R&D Operations; and Senior Magnetics Engineer, Simmonds Precision Corporation, Engine Systems Division. He has expertise in a number of areas including vehicle electrification, electric drives and electric propulsion systems, and electrical and electromechanical systems and subsystems. He has been on the Board of Directors, Intelligent Transportation Systems of America, the board of Directors, Electricore, Inc., and the Board of Advisors, Institute for Advanced Vehicle Systems, University of Michigan. He has been awarded the IEEE Nikola Tesla Award (2011), the Delphi Automotive Systems PACE Award (1998), and the GM President's Council Honors Award (1996). He has a B.S.E.E. and M.S.E.E. from Cairo University, and a Ph.D (Dr.-Ing.) in electrical engineering from the University of Braunschweig, Germany.

## Glenn A. Eisman

**Member**

Glenn A. Eisman is the principal partner at Eisman Technology Consultants, LLC; Adjunct Professor of Materials Science, Rensselaer Polytechnic Institute; and Adjunct Professor, Department of Engineering, Union Graduate College. His previous positions include Chief Executive Officer and Chief Technology Officer, H2Pump LLC; Chief Technology Officer, Plug Power, Inc.; Technical Leader, The Advanced Materials Program, The Dow Chemical Company; Project Leader, Discovery Research R&D and Inorganic Chemicals Research, Dow Chemical Company; and a Robert A. Research Fellow, University of Texas-Austin. Dr. Eisman has over 35 years of experience in R&D and product development in fuel cells, hydrogen technologies, electrochemical engineering, physical and inorganic solid state chemistry, and new technology commercialization and business development. He received the Inventor of the Year Award—The Dow Chemical Co. (1993). He received a B.S. in chemistry, Temple University; and a Ph.D. in physical inorganic chemistry, Northeastern University. He holds 22 patents and has published 42 papers.

## David E. Foster

**Member**

David E. Foster, the Phil and Jean Myers Professor Emeritus of Mechanical Engineering, received his B.S. and M.S. degrees in Mechanical Engineering from the University of Wisconsin–Madison in 1973 and 1975 respectively. He received his Ph.D. in Mechanical Engineering in 1979 from MIT. He was a faculty member at the University of Wisconsin from completion of his Ph.D. until he retired in 2012. He is an active member of the Engine Research Center, of which he served as the Director from 1994 through 1999, and from September 2008 through December 2011. He was also the Founding Co-Director of the General Motors – ERC - Collaborative Research Laboratory, from its inception in 2002 until his retirement. Dr. Foster is a registered Professional Engineer in the State of Wisconsin and has won departmental, engineering society, and university awards for his classroom teaching. He was a member of the National Research Council PNGV Review Committee for six years, and has served on: the Committee to Assess Fuel Economy Technologies of Medium and Heavy-Duty Vehicles, the National Research Council committee to review the DOE FreedomCAR and Fuels Partnership Program, the 21st Century Truck Review and USDRIVE program review. He has been the recipient of: the Academic Contribution Award from JSAE, the UW Engineering Byron Bird Excellence in Research Publication Award, the ASME Honda Gold Medal for outstanding contributions in the field of personal transportation, the 2011 SAE Horning Award, and he is a Fellow of SAE.

## Matthew Fronk

**Member**

Matt Fronk is president of Matt Fronk & Associates, LLC. He has more than 37 years of experience leading both research and product development projects in advanced technology, fuel cells and energy storage. He spent 20 years leading General Motors' Fuel Cell Research and Development program in Honeoye Falls, New York (Monroe County). During his tenure at GM, fuel cell systems were developed from lab-scale systems to 100 operating vehicles—the largest of any OEM auto company at the time. Matt also has extensive global supplier development experience. After GM, Matt served as Director of the Center for Sustainable Mobility at Rochester Institute of Technology and was instrumental in developing durability and life cycle analyses for new product designs as they moved from concept to product. He also was a founding member and first board chair for NY BEST—an energy storage consortium in NY State—and continues to this day as a Board member. He led the design/build of the NY BEST Battery Test Center in Rochester, NY, a state-of-the-art facility that opened in April of 2014. He served recently on the National Academies Committee on Fuel Economy Technologies for Light-Duty Vehicles, Phase 2. Matt is an expert consultant to the energy storage and fuel cell fields and co-chairs the Energy Innovation Economic development group in the Finger Lakes region of NY. Matt has a B.S. in mechanical engineering from Union College.

## Robert J. Nowak

**Member**

Robert J. Nowak is a consultant and former program manager at the Defense Advanced Research Projects Agency and the Office of Naval Research and a Staff Scientist and Section Head at the Naval Research Laboratory. He has directed and supported research in fuel cells, batteries, capacitors, energy harvesting, fuel processing, thermal energy conversion, micro-engines, hydrogen storage, biofuel cells, sonoluminescence, and biomolecular motors. He has served on eight National Academy committees, which utilized his expertise in energy related topics. He was selected for this committee because of his experience in fuel cells, fuel processing, batteries and hydrogen production and storage. He received his B.A. and M.S. degrees in chemistry from Oakland University and his Ph.D. degree in chemistry from the University of Cincinnati. He performed postdoctoral work at the University of North Carolina, Chapel Hill and the Naval Research Laboratory, where he was selected through the National Research Council Postdoctoral Program.

## Bernard I. Robertson

**Member**

Bernard Robertson (NAE) is retired from DaimlerChrysler Corporation. During the latter part of his 38-year career in the automotive industry, he was elected an officer of Chrysler Corporation in February 1992. He was appointed senior vice president coincident with the merger of Chrysler Corporation and Daimler-Benz AG in November 1998, and was named Senior Vice President of Engineering Technologies and Regulatory Affairs in January 2001. In his last position, he led the Liberty and Technical Affairs Research group, Advanced Technology Management and FreedomCAR activities, and hybrid electric, battery electric, fuel cell and military vehicle development. In addition, he was responsible for regulatory analysis and compliance for safety and emissions. He has served on a number of Academies committees, most recently on the Committee on Review of the 21st Century Truck Partnership, Phase 3, and the Committee on Review of the U.S. DRIVE Research Program, Phase 4. Mr. Robertson holds an M.B.A. degree from Michigan State University, a master's degree in automotive engineering from the Chrysler Institute, and a master's degree in mechanical sciences from Cambridge University, England. He is a member of the National Academy of Engineering, a Fellow of the Institute of Mechanical Engineers (UK), a Chartered Engineer (UK), and a Fellow of the Society of Automotive Engineers.

## James A. Spearot

**Member**

James A. (Jim) Spearot is currently president of his own consulting company, Mountain Ridgeline Consulting, LLC. His consulting efforts focus on transportation energy and automotive fuel and lubricant issues as they affect emissions and fuel efficiency. In 2009, Dr. Spearot retired from General Motors Research and Development Center, where he was director of the Chemical and Environmental Sciences Laboratory, whose mission was to develop cost-effective environmental strategies and systems for GM's products and processes. Additionally, Dr. Spearot served as chief scientist for GM's Public Policy Center, lead executive for research programs in Russia and CIS countries, and manager of GM's Hydrogen Storage Innovation Program. Dr. Spearot began his GM career in 1972 as an assistant senior research engineer in the Fuels and Lubricants Department. He was appointed department head of Fuels and Lubricants in 1992 and director of the Chemical and Environmental Sciences Laboratory in 1998. He is a member of several organizations: SAE, the Society of Rheology, the Society of Tribologists and Lubrication Engineers, and the American Institute of Chemical Engineers. He is a former chairman of the SAE Fuels and Lubricants Division and a former chairman of the Coordinating Research Council (CRC). He has served as chairman of the Fuels Working Group of the U.S. Council for Automotive Research (USCAR) and the USCAR Environmental and Hydrogen Technical Leadership Councils. His professional honors include an ASTM Award for Excellence in 1990; the Arch T. Colwell Merit Award from SAE in 1987; and the Award for Research on Automotive Lubricants, also from the SAE, in 1987. He is a fellow member of the SAE and has received a Lifetime Achievement award from USCAR. He recently served on the National Academies Committee on Review of the 21st Century Truck Partnership, Phase 3. He holds a B.S. in chemical engineering from Syracuse University and master's and doctorate degrees, also in chemical engineering, from the University of Delaware.

## Satish Tamhankar

**Member**

Satish Tamhankar retired as a technology expert, Linde LLC, Technology and Innovation. Prior to joining Linde in 2007, he held several positions at BOC Gases, Process Gas Solutions Technology including section director & technology manager; technology Fellow; principal scientist; and senior lead scientist. Prior to BOC Gases he was also a research faculty member at the California Institute of Technology. His expertise covers a wide range of energy technology areas including waste and biomass conversion to energy and fuels; energy storage; hydrogen production, storage, dispensing and fuel cell applications; selective oxidation processes; and a variety of chemical process improvement technologies. He has extensive expertise in applied catalysis and chemical reaction engineering; extensive R&D experience from concept to pilot-scale, including commercial and business development support; and holds more than 30 U.S. patents and has more 40 technical publications. He received the 2007 Patent Award from the Linde Group Inventors Club: the 2003 BOC Innovation Achievement Award for catalytic partial oxidation process development; and the 1994 Airco Technology Innovation Award for inert gas purifier development. He has a B.Sc., chemistry, and a M.Sc. and Ph.D., physical chemistry, Pune University, India. He conducted postdoctoral research m chemical engineering at West Virginia University, Morgantown.

## Alan I. Taub

**Member**

Alan Taub (NAE) is professor of materials science and engineering, College of Engineering, University of Michigan and Chief Technology Officer of LIFT (Lightweight Innovations for Tomorrow). Formerly, he was vice president, global R&D, General Motors Company. He has focused on automotive technology innovation. Areas of particular interest have been lightweight materials for structural applications, active and passive safety for vehicles, advanced propulsion systems and simulation of vehicle performance. Within lightweight materials, emphasis has been on processing and joining of high-strength steel, aluminum, and magnesium alloys. Activities in vehicle safety have concentrated on mechanical properties of vehicle body structure, especially high strain rate deformation and, more recently, sensors and controls for accident avoidance. He has been broadly involved in propulsion systems ranging from improving efficiency of internal combustion engines to PEM fuel cells and hydrogen storage. He has a strong technical interest in computer-aided engineering tools to simulate structural performance. Earlier technical work in his career centered on interaction of microstructure and mechanical deformation with electrical properties of amorphous alloys and superconductors. He was elected to the National Academy of Engineering for contributions to the development of innovative electrical materials and automotive technologies, and leadership in the globalization of automotive research. He has a BSc in materials engineering, Brown University, and an MS and Ph.D. in physics from Harvard University.

## Kathleen C. Taylor

**Member**

Kathleen C. Taylor (NAE) is retired from the General Motors Research Laboratories in Warren, Michigan where she worked for 31 years. Her last assignment was Director of the Materials and Processes Laboratory and simultaneously Chief Scientist for General Motors of Canada, Ltd., in Oshawa Ontario. Earlier she was Department Head for Physics and Physical Chemistry and Department Head for Environmental Sciences. She recently served on the Department of Energy Hydrogen Technology Advisory Committee and the NRC review of the 21st Century Truck Partnership. She has expertise in research and development management, fuel cells, batteries, catalysis, exhaust emission control, and automotive materials. Dr. Taylor was awarded the Garvan Medal from the American Chemical Society. She is a member of the National Academy of Engineering, a fellow of SAE International, the American Academy of Arts and Sciences, and the Indian National Academy of Engineering. She was president of the Materials Research Society and chair of the board of directors of the Gordon Research Conferences. She received an A.B. in chemistry from Douglass College and a Ph.D. in physical chemistry from Northwestern University.

# Brijesh Vyas

**Member**

Brijesh Vyas retired as a distinguished member of the technical staff at Bell Laboratories, research division of AT&T, Lucent Technologies, Alcatel-Lucent and LGS Innovations, LLC. He was the technical manager of the energy conversion technology group responsible for research and development of advanced materials and technologies for energy storage systems. He has led efforts to develop various rechargeable batteries and related energy conversion technologies for a variety of telecommunications applications. He was formerly at the Brookhaven National Laboratory and has been a guest professor at the Technical University of Denmark in Copenhagen investigating corrosion and erosion of metals. He received the Sam Tour Award from the American Society of Materials and Testing. His areas of expertise include materials science, electrochemistry, energy storage and corrosion. He served on the NRC Committee to Review the U.S. Advanced Battery Consortium's Electric Vehicle Battery R&D Project Selection process. He received a bachelor's degree in metallurgical engineering from the Indian Institute of Technology in Bombay and a Ph.D. in materials science from the State University of New York, Stony Brook.