Midgley Award Recipients

STANFORD OVSHINSKY, 2009 MIDGLEY AWARD RECIPIENT

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Stanford R. Ovshinsky (born November 24, 1922, in Akron, Ohio) is an American inventor and scientist who has been granted approximately 400 patents over the last fifty years, mostly in the areas of energy or information. Many of his inventions have had wide ranging applications. Among the most prominent are: an environmentally friendly nickel-metal hydride battery, which has been widely used in laptop computers, digital cameras, cell phones, and electric and hybrid cars; continuous web multi-junction flexible thin-film solar energy laminates and panels; flat screen liquid crystal displays; rewritable CD and DVD computer memories; hydrogen fuel cells; and nonvolatile phase-change electronic memories. Ovshinsky opened the scientific field of amorphous and disordered materials in he course of his research in the 1940s and 50s in neurophysiology, neural disease, the nature of intelligence in mammals and machines, and cybernetics. Amorphous silicon semiconductors have become the basis of many technologies and industries. Ovshinsky is also distinguished in being self-taught, without formal college or graduate training. Throughout his life, his love for science and his social convictions were the primary engines for his inventive work.

In 1960, his Energy Conversion Laboratory was founded in a storefront in Detroit, dedicating the laboratory to the solution of important societal problems using science and technology.[6] Focusing on the critical areas of energy and information, their new company, reconstituted in 1964 as Energy Conversion Devices (ECD), went on to become a forefront invention and development laboratory whose products have built new industries, many of them aimed at making fossil fuel obsolete. ECD continues (through joint ventures and license partners) to be a leading solar energy and battery production firm.[7]

In August 2006, Ovshinsky left ECD and established a new company, Ovshinsky Innovation LLC, devoted to developing the scientific basis for highly innovative and revolutionary energy and information technologies.

R. GALEN B. FISHER, 2004 MIDGLEY AWARD RECIPIENT

Over the past 30 years emission standards for automobiles have been adopted in all industrialized countries. The US has experienced an aggressive lowering of the hydrocarbon (HC), CO, and NOx standards (e.g., a factor of a hundred reduction for HC by the end of this decade). This has driven substantial innovation in automotive aftertreatment devices, both in achieving catalytic activity and materials durability. Surface chemistry has played an active role in providing a more comprehensive understanding of the reaction mechanisms involving HC, NO, CO, O2, and H2 over automotive catalysts -- for example, explaining why rhodium is a better CO oxidation catalyst than platinum. Many of the reactions of these species are also important in the operation of exhaust gas sensors and fuel cells.

As automotive exhaust catalysts have matured, metal-support interactions have played a greater role in the operation of the catalyst (e.g., oxygen storage materials). Hence, the model systems that still capture the key attributes of operational catalysts have also grown more complex. To meet the future emissions regulations for lean-burn gasoline and diesel engines, even more complex aftertreatment systems are being developed which encompass a broader spectrum of catalytic processes. Similarly, a broader blend of tools, including many from surface science, is being developed to explain not only the steady-state, but also the transient performance of these catalysts.

The awardee is Principle Research at Delphi Research Labs. He obtained his B.S. in Physics from Pomona College in California in 1966 and a Ph.D. in Solid State Physics from Stanford.
After beginning work in the surface science field during a post doctoral appointment at Brown University, he continued work in that area at NIST. .He joined GM Research in 1978 and in 1999, Dr. Fisher and his surface chemistry group transferred to Delphi in 1999. He is recognized for his many contributions to understanding of the surface chemistry of automotive exhaust catalysts. In the 1980's and 1990's, he and colleagues elucidated the kinetics of surface reactions critical in three-way catalysis, most significantly establishing the connection between reactivity on model single crystal surfaces and real-world catalysts. He has coauthored more than 70 publications in the field, five of which have been cited over 200 times and two over 500 times are amongst the most cited in the surface science literature. He is a highly regarded and active advocate for surface chemistry and its role in industrial catalysis.

Galen met his wife Dr. Margherita Zanini while they were both post-doc researchers at Brown University. They have been residents of Bloomfield Township for 26 years where they have raised their two sons, Brian and Keith , both graduates in engineering from Northwestern University.

DAVID P. CHOCK, 2003 MIDGLEY AWARD RECIPIENT

David P. Chock obtained his undergraduate degree in Chemistry from the University of California at Santa Barbara in 1965 and Ph.D. in Chemical Physics from the University of Chicago in 1968. After several postdoctoral positions, including work with the future Nobelist Ilya Prigogine, he joined the General Motors Research Labs in the Environmental Sciences Department. His contributions there and later at Ford Motor Company have been consistently characterized by a clear understanding of the chemical and physical processes that influence the fate of automotive emissions, and he has championed the use of this understanding to enhance the scientific basis of air quality regulations. Early on he studied the impact of the then newly introduced catalytic converters on sulfate in the demonstrating that they would not produce excessive sulfate and in the process developing mathematical models still widely used to describe pollutant dispersion near roadbeds. Together with his colleagues, he simulated an air pollution scenario in Southern California and demonstrated the highly non linear relationship now widely accepted to exist between hydrocarbon and NO emissions and atmospheric ozone, demonstrating the counterintuitive result that under some Conditions decreasing NO emissions would actually increase ozone concentrations.

He later studied extreme-value statistics and was able to convince the EPA to adopt more scientifically sound air quality standards that protect human health without being overly burdensome. Complementing this work has been his development of and involvement in computer algorithms that accurately and efficiently describe transport and chemistry and procedures that allow one to appreciate the problems in modeling chemical and transport processes with wide spatial and temporal scales that characterize air pollution. These tools have received wide praise and have seen extensive use within the atmospheric modeling community.

Most recently Dr. Chock has turned his attention to understanding the influence of automotive emissions on global climate change. He has served on numerous governmental advisory. committees dealing with air quality

Dr. Chock was born in 1943 and raised in Indonesia, and came to the US to pursue undergraduate studies. He met his wife, Lin-Lin, while doing post doctoral work at SUNY Buffalo. They now make their home in Bloomfield Hills, Michigan, where they raised their son, Atley.

DR. DONALD H. STEDMAN, 2002 MIDGLEY AWARD RECIPIENT

Donald Stedman obtained his undergraduate degree from Cambridge University in 1964. Graduate work at the University of East Anglia involved the study of chlorine atoms under Dr. Michael Clyne. At the time, the chemical kinetics of chlorine atoms was thought to be of zero societal importance, but within less than a decade they were found to be central to the chorofluorocarbon-induced destruction of ozone. Post-doctoral work at Kansas State University under Dr. Donald Setser involved studies of metastable states of Argon and Nitrogen, which turned out to be important for excimer lasers and upper atmospheric chemistry, respectively.

From 1968 to 1971, Dr. Stedman worked at Ford Motor Company with Drs. Hiromi Niki and Bernie Weinstock. Dr. Joseph Kummer, the 1981 recipient of the Thomas Midgley award, was an important senior collaborator in the studies of photochemical smog chemistry and developments related to the chemiluminscence method of detection of nitric oxide. Moving to the University of Michigan in 1971, Dr. Stedman continued to investigate nitric oxide ozone, nickel carbonyl, sulfur monoxide, phosphorus and arsenic cherniluminescence. He developed new instruments and applied them to the study of atmospheric photochemistry ranging from photochemical smog to stratospheric ozone. In 1983, Dr. Stedman accepted a position at the University of Denver where these studies continued and a collaboration began with Dr. Gary Bishop. This collaboration resulted in the 1989 development of an on-road remote sensor for automobile exhaust carbon monoxide emissions. Subsequent developments have added the ability to measure hydrocarbons and nitric oxide. Over one hundred reports and publications on this subject can be found at www.feat.hiocbem.du.edu.

FEAT is the Fuel Efficiency Automobile Test, so named because the original source of development funding was not from a state or federal pollution control agency, but rather the Colorado State Office of Energy Conservation. Dr. Stedman currently occupies the Brainerd Phillipson Chair of Chemistry at the University of Denver. He received the Air & Waste Management Association's Frank A. Chambers Award, and the American Chemical Society award for Creative Advances in Environmental Science & Technology in 1996.

Dr. Stedman met his wife, Dr. Hazel Stedman, at Cambridge as undergraduates. They have three children: the oldest, Kenneth, teaches at Portland State University where he is an Assistant Professor of Biochemistry. Roy and Ian pursue careers in the Computer world, the former residing in Austin, Texas, and the latter in LA California

DAVID EDDY, 2001 MIDGLEY AWARD RECIPIENT

David Eddy of Delphi Research Laboratories will be receiving the 2001 Thomas Midgley Award for his outstanding research contributions that led to the development and implementation of automotive exhaust oxygen sensors.

In the early 1970's, several technological advances came about to make closed-loop electronic control of the internal combustion engine a practical reality. The need for this closed-loop control was driven by the need to satisfy new governmental regulations from the early 1970's setting limits for emissions of carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NOx) into the atmosphere. Digital micro-electronics technology had advanced to the state where dedicated electronic micro-controllers were feasible. Secondly, a 1972 paper found that a noble metal catalytic converter without secondary air injection could simultaneously oxidize CO and HC emissions and reduce NOx emissions with near complete conversion. But this three- way catalysis would only occur provided that the engine air-fuel ratio was very closely regulated in a very narrow band around the stoichiometric air-fuel ratio point. Thirdly, the engine exhaust oxygen sensor, when fully developed, had the potential to be a practical on-vehicle chemical sensor for the detection of equilibrium oxygen content in the engine exhaust. The output signal of this sensor had maximum sensitivity at the stoichiometric air-fuel ratio point making it ideal for closed loop engine control at the stoichiometric ratio. The exhaust oxygen sensor together with actuators (fuel injectors), controller hardware, and software algorithms form the backbone of the engine control system. In general, the important aspects of successful sensor development are

1) an overall principle of operation,
2) device modeling and design,
3) amaterials technology system,
4) a packaging and interconnection system,and
5) a manufacturing system for high volume production.

Because ofthe multifaceted nature of sensor development, these aspects must be addressed glo- bally in a common design at the start of development rather than summing the individual parts at the end. The automotive exhaust oxygen sensor development serves as an example of this pro- cess. Oxygen sensors remain the largest volume chemical sensor on automobiles, at least one on each vehicle with a three-way catalytic converter. The events and milestones of the early oxygen sensor development led to a very successful commercial automotive product

DR. EDWARD KRESEGE, 1998 MIDGLEY AWARD RECIPIENT

The 1998 Midgley Award is presented to Dr. Edward N. Kresge for his role in the development of thermoplastic olefin blends now widely used in the automotive industry for bumpers, dashboards, door panels, and many other components. This work was conducted during his research career at Exxon Chemical Company, which he joined after finishing his PhD at the University of Florida. He became Chief Polymer Scientist in 1979. He retired from Exxon in 1993, after 30 years with the Company. He has over 50 publications and patents in polymer and rubber science and technology. His honors include the National Inventors Hall of Fame Medal, 1976; Chairman, Elastomers Gordon Research Conference, 1987; Arnold Smith Award, Rubber Division, ACS, 1993; Melvin Mooney Technical Achievement Award, Rubber Division, ACS, 1995. It has been active in the national ACS, and has served as Co-chair of the Macromolecular Secretariat Symposium on Polymer Processing, 1987; Cope Award Committee, 1988-90; General

Secretary of the Macromolecular Secretariat, 1993; and the Society Committee on Professional Training, 1993-present. He has also held numerous positions in the ACS Rubber Division. Dr Kresege now is an independent consultant in polymers and resides in Watchung, New Jersey.

Thermoplastic elastomers based on blends of polyolefins, TPOs, are widely used in many attractive economics has made TPOs the material of choice for several automotive areas. The morphology of TPO blends controls both physical and processing properties. Insoluble blends dominate the thermoplastic elastomer blend area. At use temperature these blends usually consist of two co-continuous phases or a continuous semi-crystalline and a dispersed elastomeric phase. An example of a co continuous phase blend is isotactic polypropylene, iPP, blended with ethylene propylene copolymer, EP. Intensive mixing of iPP)P and EP at the proper viscosity ratios and polymer volume fractions results in co-continuous phase blends. The continuous iPP phase is elastic at low extensions. However, at higher extensions plastic deformation of the iPP phase results in permanent set. Compatibilizers are employed to control phase size during mixing, minimize phase size growth in the melt, and to achieve good phase adhesion especially where there is a large difference in cohesive energy density between the polymer pairs. Insoluble blends with a dispersed elastic phase are obtained at low EP volume fractions and high EP viscosity. Dispersed EP phases are also synthesized by dynamic vulcanization to produce TPVs. During intensive mixing the rubber phase is chemically crosslinked resulting in elastic gel particles in a semi-crystalline iPP matrix. Formation of compatibilizers in-situ is very effective in these systems. Crosslinking the elastomeric phase stabilizes the morphology of the blends during subsequent processing and results in highly elastic physical properties.

DR. JOHN L GERLOCK, 1996 MIDGLEY AWARD RECIPIENT

The Award winning work is based on the premise that it should be possible to use sensitive spectroscopic-analytical techniques to detect weather-induced chemical composition changes in coatings long before their appearance changes and relate these changes to long-term weathering performance. This capability would provide Ford with means to select superior coating systems quickly while avoiding the pitfalls of harsh exposure accelerated weathering test and would provide coating suppliers with means to develop new coating systems faster.

Initial experiments employed electron spin resonance spectroscopy to quantify the rate of photoinitiation of free radicals in clear- coats. Subsequent work has employed a host of spectroscopic analytical techniques to assess photooxidation. Most of the work to date has been carried out on isolated clear-coats. Present work is aimed at extending isolated clear-coat techniques to complete, multi-layer paint systems. For example, it appears that time-offlight secondary ion mass spectroscopy can be used to map photooxidation in all coating layers in paint systems weathered using an Oxygen-18 /Nitrogen atmosphere.Work in progress upgrades our initial premise with recognition of the fact that weather-induced chemical composition changes must be linked to their mechanical repercussions in order to be truly informative. Stress relaxation and fracture toughness measurements are being used to assess the mechanical repercussions.

Dr. Gerlock received a PhD. in Physical Organic Chemistry from The University of Georgia in 1970 under Professor E. G. Janzen, pursued Postdoctoral Research with Professor G. A. Russell at Iowa State University and joined The Ford Motor Company in 1974. He began work on developing means to anticipate the long-term weathering performance of automotive paint systems in the early 1980s. He is the recipient of four patents, three Ford Research Laboratory Technical Achievement Awards, two Cleveland Coating Society Presentation Awards and The Coatings Society International Medal for Outstanding Technical Achievement. His work has Resulted in 40 publications and 45 invited presentations on the topic of paint weathering. He is presently Senior Technical Specialist in the Manufacturing Department of the Ford Scientific Labs.

DR. CHARLES TUESDAY: 1995 MIDGLEY AWARD RECIPIENT

Dr. Tuesday was born in Trenton, New Jersey and his grammar and high school education were in that area. After high school, he spent two years in the U.S. Army and then enrolled in college. He received his A.B. from Hamilton College and went on to Princeton University where he received his MasterS and Doctorate. Dr. Tuesday joined the GM Research Labs Fuels and Lubricants Department as a Senior Research Chemist and in 1964 became a Supervisory Research Chemist. He was later promoted to Assistant Head and then Head of that same Department. His next several assignments were as Acting Head and Head of the Environmental Sciences Department and Acting head of Physical Sciences. Dr. Tuesday finished out his 37 years at General Motors in the Chemical, Materials and Biological Sciences areas, first as Technical Director and then as Executive Director the latter being his position when he retired from General Motors in 1992.

Dr. Tuesday has served on many ACS Editorial Boards including the Boards of Environmental Science and Technology and the Advances in Chemistry and Symposium Series. In 1992, he joined the Editorial Advisory Board of Chemical and Engineering News, a post he still holds. He also served as a member of the ACS Committee on Corporate Associates from 1985 to 1992. The Industrial Science Section of the AAAS was fortunate to have the services of Dr. Tuesday from 1981 to 1991. During that period, he served as a Member and Chair of the Section Nominating Committee, Section Member-at-Large and Section Chair. He has also been associated with the

National Research Council and the Coordinating Research Council and is a member of Phi Beta Kappa, Sigma Xi, ACS, SAE and AAAS. He was made a Fellow of the AAAS in 1993.

Dr. Tuesday' pioneering research at GM helped establish the role of the automobile in smog formation. His work on hydrocarbon reactivity showed that controlling the composition of hydrocarbons, both emitted and evaporative, was as important as controlling their mass. These findings have led California to adopt standards based on reactivity as well as the requirement for Phase II reformulated gasoline.

His work also showed that, under certain conditions, reducing nitrogen oxide emissions would actually increase smog. This latter finding was not accepted at first, but has since been verified by other researchers and is now factored into State Air Quality Implementation Plans

DR. JOHN F. MARSH, 1994 MIDGLEY AWARD RECIPIENT

Dr Marsh was born in Bolton, England and is a British citizen. Most of his schooling was in England. He graduated from Bolton High School and attended London University where he received a BSc in Chemistry and later attended Manchester University where he received his PhD in Chemistry. Dr. Marsh and in 1960 was a post -doctoral fellow at the University of New Hampshire. He joined ESSO in 1961 and carried out assignments in resins, paints, coatings and fuel additives. In 1967 he began working in auto lubricant additives becoming first, project leader and then section manager in the detergent additives area. After other assignments , Dr. Marsh was made Chief Scientist, Physical Chemistry, Paramins Division of ESSo Chemical Worldwide, the position from which he retired in 1993. Lubricant additive technology has helped to reduce material usage, increased oil change intervals and in general has improved engine durability and reduced exhaust emissions. Specifically, Dr. Marsh's contributions in novel copper antioxidants were used in 50% of US passenger car motor oils and his detergent inhibitor technology is used in 20% of all automotive engine oils worldwide today. Dr. Marsh clearly deserves a place with the other Midgley Award winners for his outstanding contributions in the area of chemistry related to the automotive industry.

DR. CHARLES K. WESTBROOK: 1993 MIDGLEY AWARD RECIPIENT

Dr. Westbrook graduated from Harvey Mudd College. Clairmont, California and joined the Theoretical Physics Division of the Lawrence Livermore National Laboratory. While employed there, he completed his PhD in Physics at the University of California, davis.During his early years at LLNL, Dr. Westbrook carried out computational simulation of transport phenomena, including radiation, neutron and charged particles in highly ionized plasmas.

In 1974, he began studies in mathematical modeling of combustion ,focusing on the chemical kinetics of the oxidation of hydrocarbons. Over the past 20 years, Dr. Westbrook has become a prominent researcher in the general area of combustion chemistry. He has developed a close working relationship with scientists and engineers in automotive research laboratories, petroleum industries, universities and other national laboratories, working with them to apply chemical kinetics to more practical problems in internal combustion engines. His work has made a significant impact on the understanding and modeling of engine knock, heat transfer to engine walls , hydrocarbon emissions ignition, detonation and flammability limits. While working with Ford scientists, Dr. Westbrook established that flame quenching on cold engine chamber walls was not the dominant source of unburned hydrocarbon emissions from automotive engines. This led to a better recognition of the role of piston ring crevices. His work also influenced the design of direct - injected stratified charge engines.His more recent research has shown how fuel size and structure influence knock tendencies and how different anti-knock compounds alter these trends.

MR JOSEPH P. MIKNEVICH, 1992 MIDGLEY AWARD RECIPIENT

Mr Miknevich received a Master's degree in Inorganic Chemistry from the University of Pittsburgh and is currently pursuing a PhD in Organic Chemistry at Duquesne University in Pittsburgh

He joined Calgon Corporation in 1980 as a chemist in their Polymer Application Group. In 1984, he was promoted to Group Leader II and to Group[Leader in 1987. He has been Senior Group Leader since 1990. Prior to joining Calgon, Mr. Miknevich was Director of R & D at the Product Research and Development Company. His work there involved the development of products for the reprographic industry including coated papers and dry toners.

Mr Miknevich began his research on paint detackification in 1986. He first tried using a number of inorganic chemicals, including metal salts and clays. He soon realized that inorganic materials were effective with all types of paints. He then directed his studies into various types of organic based systems, rapidly focusing on melamine formaldehyde colloids because of their similarities to alum in certain paint sludge collection applications. This research led to a now widely used system known as 'Calgon Paint Kill' in automotive plants

Mr. Miknevich received the Merck Management Award in 1987, the RE Hal Award for Professionalism in Marketing in 1989, 1990 and the Golden

Odyssey Award for Contributions to R&D in 1990.

DR RAY DICKIE, 1991 MIDGLEY AWARD RECIPIENT

This year's Award recipient received a BS in Chemistry from the University of North Dakota and his PhD from the University of Wisconsin. After extensive post-graduate work, he joined the staff of the Ford Motor Co. Scientific Labs in 1968 and is currently Principal Research Scientist ni the Polymer Science Department. of Ford Research.

Dr. Dickie's Research interests center on the chemistry of polymer-metal interface and related areas of adhesive bonding and surface coating technology. The interface chemistry of corrosion-induced adhesion failure has been an area of special. In1989, he received a Technical Achievement Award from Ford Motor for his work defining the chemical mechanisms of polymer-metal bonding. Also in 1989, he was awarded tHe distinguished Alumni Lectureship in Chemistry at the University of North Dakota. To date, Dr. Dickie has published more than 70 papers and has been awarded 36 patents

Dr.Dickie has been an active member of the Society of Rheology and the American Chemical Society. He served as chair of the ACS Division of Polymeric Sciences:Materials and Engineering in 19897and was the general Secretary of the ACS Macromolecular Secretariat in 1990. Dr.Dickie has also organized ACS symposia on composites, cross-linking systems and/or review boards for Journal of Coatings Technology, Progress in Organic Coatings, Polymers for Advanced Technology he and the Journal of Adhesion Science and Technology.

BYRON A. HUNTER, 1990 MIDGLEY AWARD RECIPIENT

Dr.Hunter received a BS in Chemistry and an MA in Organic Chemistry from the University of Utah and a PhD from Iowa State University A major portion of his career was spent at Uniroyal Chemical Company which he joined in 1941. he made major contributions in the area of rubber chemistry including the development of chemical blowing agents which led directly to the commercialization of two such products which were patented in 1956 and 57One of them , azodicarbonamide was the major such agent in its time.He has also developed stablizers for rubber and plastics which gained wide commercial acceptance.

His work led to more than patents and numerous publications covering many aspects of rubber chemistry. After his retirement, he continued his rubber research at Brigham Young University, where since 1978 he has been

Adjunct Research Professor. Dr Hunter has received the Distinguished Alumni award at the University Of Utah twice, once in 1976 and again in 1978. He has also received the Outstanding Achievement Award of the Thermoplastics Materials Division of the Society of Plastics Engineers in 1990.

MR. KENNETH E. ATKINS: 1989 MIDGLEY AWARD RECIPIENT

Mr. Atkins received his BS in Chemistry from the West Virginia Institute of Technology and his MS from West Virginia University. His entire professional career was spent at Union Carbide Corporation which he joined in 1960. Mr. Atkins has made pioneering contributions in fiber reinforced polymers (FRP) and in low profile additive (LPA) chemistry and technology. He elucidated the mechanism for the role of these compounds . His development of commercial ly successful LPA additives has enabled the molding of smooth exterior automotive panels. Mr. Atkin's continuing work has resulted in significant advances that have greatly expanded the utility of FRP in automotive applications. He also discovered and developed the basic chemistry and process for making ethylidene norborene, an important monomer in polyolefin terpolymer rubber.

In 1987 Mr. Atkins was named Union Carbide Corporate Fellow, a prestigious position established to encourage technical excellence by recognizing outstanding individual achievement. In 1986, he received the Union Carbide Technical Achievement Award. He is a member of the American Chemical Society and the Society of the Plastic Industry