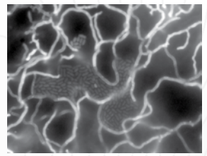
"In grad school, there are a lot of constraints that hold you back from going after some of the big problems and trying things that no one else will try.

The Hertz Fellowship gives you freedom to innovate. Each day, I see it augmenting my graduate experience. Having the freedom to take non-linear paths is important because innovative ideas come from detours. The Hertz Fellowship offers that freedom."

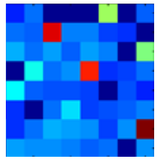
—Shannon Yee



Celebrating 50 Years of the Hertz Graduate Fellowship

the Hertz FOUNDATION

freedom to innovate



LOOKING FORWARD TO THE NEXT 50 YEARS

50th Anniversary Vision

To provide unique financial and fellowship support to the nation's most remarkable PhD students in the physical, biological, and engineering sciences.

To award fellowships that are free of most traditional restrictions.

To nurture Hertz Fellows as they become the innovators and leaders serving in ways that benefit us all.

"If I have seen further, it is by standing on the shoulders of giants."

—Sir Isaac Newton

THE FANNIE AND JOHN HERTZ FOUNDATION GRADUATE FELLOWSHIP

50th Anniversary 1963–2013

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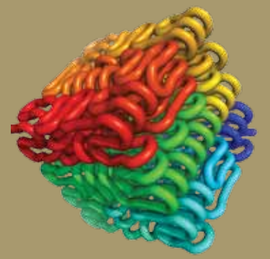


DEDICATION

To the extraordinary men and women of The Hertz Foundation Fellows Community in honor of the founders, Fannie and John Hertz.

ORIGINAL HERTZ FOUNDATION LOGO

The original Fannie and John Hertz Foundation logo was designed in 1966 by Paul Fjelde, symbolizing man's grasp of the atom. The design was used in awards and lapel pins.

HERTZ COMMUNITY PIN

This modern Hertz Fellows Community logo, created for Fellows' lapel pins, was designed in a group activity at the 2010 Hertz Workshop at the University of Virginia. Daniel Slichter, Hertz Fellow 2006, had the principal creative insight.

THE FANNIE AND JOHN HERTZ FOUNDATION GRADUATE FELLOWSHIP

50th Anniversary 1963–2013

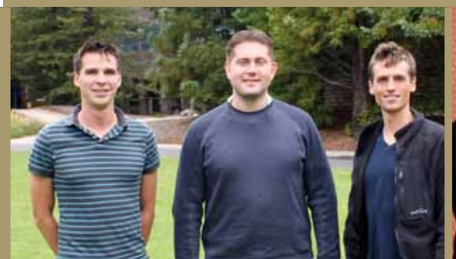
INTRODUCTION

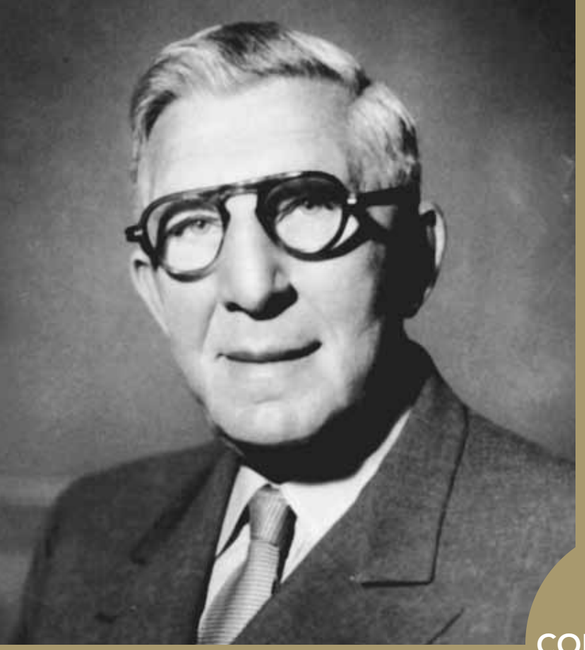
History is made by leaders with determination, foresight, and a relentless spirit for discovery, leaders who see the world differently, and leaders who see opportunity when others see obstacles. This combination of curiosity, creativity, and passion has the power to change the world.

This book is filled with stories about Hertz Fellows, the Hertz Community, and their wide-reaching impact in the physical, biological, and engineering sciences. These stories represent a small collection of examples of the service and innovation of more than 1,100 Hertz Fellows.

We hope you will see reflections of yourself and find inspiration as you read these stories. You will also marvel at the legacy in science and engineering left to us by Fannie and John Hertz. We hope you will take great satisfaction knowing that you are part of something so remarkable.

This book celebrates the 50th Anniversary of the Hertz Graduate Fellowship. We treasure this legacy. We salute the Fellows. We gratefully acknowledge those who support the Foundation and its mission. With anticipation, we look ahead to another 50 years of supporting the extraordinary men and women whose innovative thinking continues to change the world.





COMMITMENT

COMMITMENT

CONTRIBUTING TO SECURITY, PROSPERITY, AND LEADERSHIP

Leaders who make history know that single-minded intention is required to see an idea through, to bring it to fruition, and to make it transformative. The power of intention brings an engineer or scientist into the lab, day after day, to tackle a series of small steps that gradually advance to new discovery and new solutions to a problem.

John Hertz brought many entrepreneurial ideas to life with his own single-minded intention. Hertz remarkably created both service and manufacturing industries. B.C. Forbes, Founder of *Forbes* Magazine, called the Hertz story "one of the most inspiring and most illuminating romances of modern American business." Joined by his wife Fannie, John Hertz believed advancement in science and engineering was vital to the strength, security, and prosperity of our nation. John and Fannie committed themselves to the higher education of students in the science and engineering fields. The legacy that grew and flourished from their commitment is clearly evident today through the Hertz Graduate Fellowships, supporting more than 1,100 students during the past 50 years at universities across the country.

The John D. Hertz story is "one of the most inspiring and most illuminating romances of modern American business."
—B.C. Forbes, Founder of *Forbes* Magazine

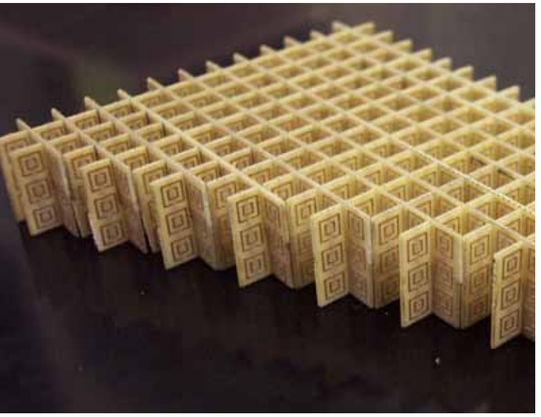
The Fannie and John Hertz Foundation has contributed over $200 million, present day value, to science and engineering university fellowships.

FOUNDING HISTORY

The Fannie and John Hertz Foundation began in a world of new sciences, changing priorities and profound technical challenges, initially granting undergraduate scholarships in engineering in 1957. After John Hertz died in 1961, the program was redefined in 1963 to fund Graduate Fellowships in both engineering and the applied physical sciences. Dr. Edward Teller worked closely with colleagues to devise the selection policies. Assisted by Lowell Wood and others, Edward Teller interviewed hundreds of applicants and developed the original unique process of the Hertz Fellowship Interview.

Originally The Hertz Foundation was chartered from John Hertz's vision that the United States must remain competitive with Russia in the education of engineers and scientists. At the peak of the Cold War there was an emphasis on national security. Today The Hertz Foundation embraces a much larger vision and disciplinary spectrum in the belief that economic competitiveness and education are as important as the understanding of national security threats. Furthermore, the applications to problems of biology and health are as vital to the nation's future as were the past applications to nuclear, aviation, and space matters.

The Hertz Fellows reflect this trend as evidenced by a steady increase of those applying physical and engineering sciences to the biosciences. The multiplicative value of the Hertz Fellowship to our nation continues through building collaboration among the Hertz Fellows Community to innovate in cross-disciplinary endeavors.



"Service to the nation has grown far beyond the military and hard sciences.

It's grown to: Are you the best professor? Are you the best teacher? Are you an entrepreneur that creates a business we never imagined and therefore strengthens the economy? Are you a very clever technical researcher who solves a set of problems in public health for the larger society?

The service to the nation stretches into quality of life and public health."

—Jay Davis

JOHN D. HERTZ

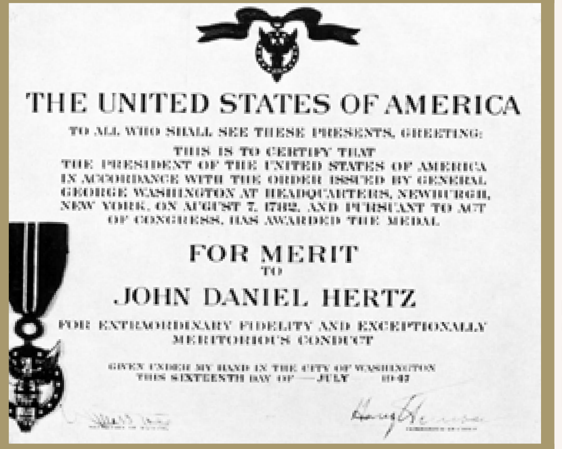
The Fannie and John Hertz Foundation sprang from John and Fannie's great love for our country at the apex of their accomplished life together. When John was five years old, his family emigrated from Hungary to Chicago. As a young boy, he left school and supported himself as a newsboy, boxer, reporter, and auto salesman. John launched Yellow Cab and Hertz U-Drive-It System. He sold the companies to General Motors, was a GM Board Director, and later joined Lehman Brothers as a partner. In both World Wars, he was an advisor to the military on wheeled vehicles, and received the Defense Department's Medal and Certificate of Merit in 1947 for his contribution to the nation. For his dedication to service in the defense of the United States, as exemplified by his endowment of The Hertz Foundation, John Hertz was honored in 1958 with the Defense Department Certificate of Appreciation, its highest civilian award at that time. John originally focused the Foundation on engineering education because of his personal unfulfilled desire to be a college educated engineer.

FRANCIS "FANNIE" KESNER HERTZ

Fannie Kesner was from a well-to-do Chicago family. She and John met in their early twenties and were married on July 15, 1903. Their marriage proved to be an enduring and happy one. They had three children: Leona Hertz Saks, John Hertz, Jr., and Helen Hertz Hexter. Fannie Hertz was a devoted mother and the constant companion and inspiration of John Hertz throughout his lifetime. Their many friends characterized Fannie as the most solicitous, devoted, and understanding of wives. Fannie's gracious hospitality to friends and acquaintances from across the nation was legendary. They loved horses and became outstanding leaders in breeding and racing horses.

EDWARD TELLER

John Hertz and Dr. Edward Teller became friends because of their mutual dedication to the national security effort and their similar background as Hungarian immigrants. They shared a common interest to find, educate, and support future generations of scientists and engineers. Teller was the first Hertz Foundation interviewer. What we value most are his decades of dedication to finding, challenging, and mentoring new Fellows to carry forward The Hertz Foundation vision. Teller travelled to universities throughout the country to interview and select new scientists and engineers for the Hertz Fellowship. The leadership of the Foundation was carried forward by Wilson Talley as an assistant to Teller, and later as President of the Foundation.



THE UNITED STATES OF AMERICA

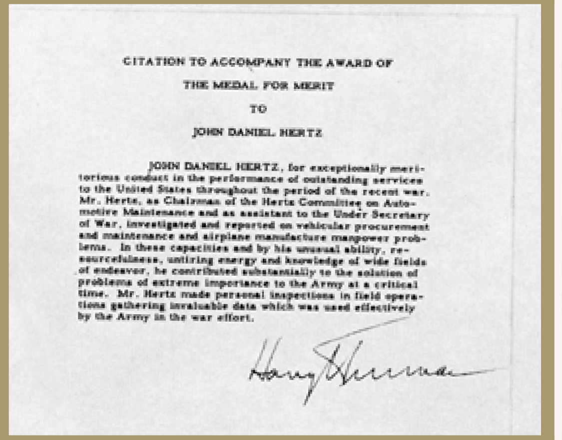
TO ALL WHO SHALL SEE THESE PRESENTS, GREETING:

THIS IS TO CERTIFY THAT
THE PRESIDENT OF THE UNITED STATES OF AMERICA
IN ACCORDANCE WITH THE ORDER ISSUED BY GENERAL
GEORGE WASHINGTON AT HEADQUARTERS, NEWBURGH,
NEW YORK, ON AUGUST 7, 1782, AND PURSUANT TO ACT
OF CONGRESS, HAS AWARDED THE MEDAL

FOR MERIT
TO
JOHN DANIEL HERTZ

FOR EXTRAORDINARY FIDELITY AND EXCEPTIONALLY
MERITORIOUS CONDUCT

GIVEN UNDER MY HAND IN THE CITY OF WASHINGTON
THIS SIXTEENTH DAY OF JULY 1942



CITATION TO ACCOMPANY THE AWARD OF

THE MEDAL FOR MERIT

TO

JOHN DANIEL HERTZ

JOHN DANIEL HERTZ, for exceptionally meritorious conduct in the performance of outstanding services to the United States throughout the period of the recent war. Mr. Hertz, as Chairman of the Hertz Committee on Automotive Maintenance and as assistant to the Under Secretary of War, investigated and reported on vehicular procurement and maintenance and airplane manufacture manpower problems. In these capacities and by his unusual ability, resourcefulness, untiring energy and knowledge of wide fields of endeavor, he contributed substantially to the solution of problems of extreme importance to the Army at a critical time. Mr. Hertz made personal inspections in field operations gathering invaluable data which was used effectively by the Army in the war effort.

THE BOSTON DAILY GLOBE—FRIDAY, OCTOBER 26, 1956 — Twenty-Five

Where Else in This Whole World Could Such a Thing Happen to an Immigrant Boy?

John Hertz Tells Audience of His Own Career—Newsboy, Copy Boy, Sportswriter, Prize Fighter, Fight Manager, Auto Salesman, Founder of Largest Motor Transportation Company in World, Breeder of Thoroughbreds — U.S. Army Officer in Charge of All Wheeled Vehicles in World War II

(John D. Hertz, famous breeder and motor transportation mogul, was honored by the Thoroughbred Club of America at a dinner at the Keeneland Race Course in Kentucky recently. He responded with the address printed below . . . the success story on an immigrant . . . an American story.)

Mr. Toastmaster, Mr. Nuckols, and gentlemen:

I shall not talk too long about thoroughbred breeding and racing. I am just a bit afraid to do so because I know that many of you know the subject better than I do.

If, however, you will be kind enough to indulge with me I would like to talk about something which has a special place in my heart.

I want to express the great debt I owe to our beloved country—the United States of America. I only wish I could express my feelings in words.

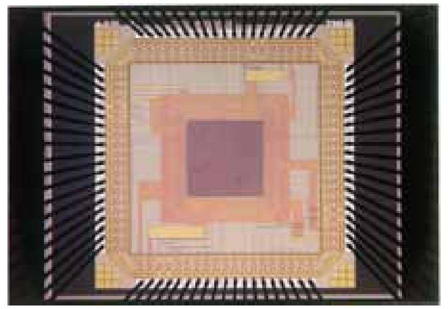
★ ★ ★

"IN 1903 I FELL IN LOVE with the loveliest woman in the world, who now owns Stoner Creek Stud, Amarillo Ranch, their horses and me," said Hertz, shown with his wife.

Garden State Now Richest

HERTZ FELLOWS HISTORY OF INNOVATION

The Hertz Fellows, along with many others who have committed their time, energy and resources to The Hertz Foundation, have made an astounding contribution. The portraits and quotes in the following pages exemplify men and women of immense curiosity, enthusiastically setting about to improve the world. They reflect changing problems and priorities addressed in a span of five decades: from better instruments of national security to better instruments of medicine, from the space race to the race to eradicate malaria, from handheld calculators to the smartest of smartphones, and from measuring the length of an artery to unlocking the secrets in the length of a genome. The Hertz Fellows are integrally connected to all of these: re-supplying the International Space Station with their rockets, helping advance cures for HIV and Alzheimer's, discovering genes for drugs that combat osteoporosis, and letting our smartphones "Bump" into instant connectivity.



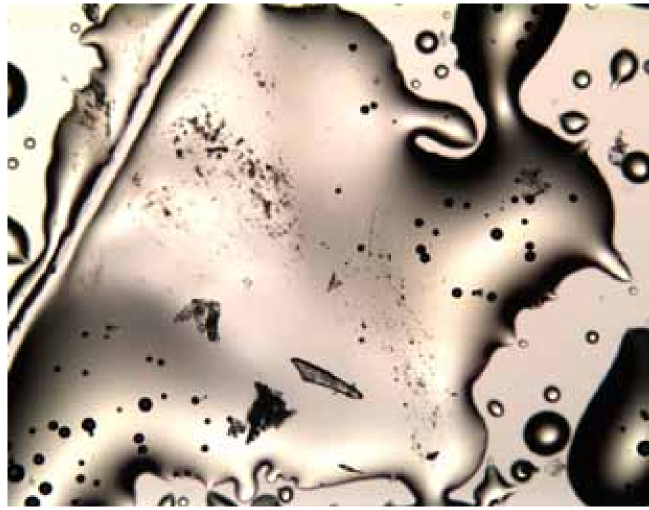
"No endeavor that is worthwhile is simple in prospect; if it is right it will be simple in retrospect."

—Edward Teller

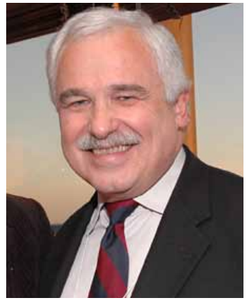
HERTZ FELLOWS ACCOMPLISHMENTS

Include the following:

- More than 200 Companies Founded
- Over 3,000 Patents Granted
- Two Nobel Prizes in Physics
- 400 Tenured or Tenure-Track University Faculty
- Three University Presidents
- Over 100 Scientists/Senior Managers at Los Alamos, Sandia, and Lawrence Livermore National Laboratories
- More than 100 Military Officers—with 3 Major General Officers
- Founding Members of Google's Autonomous Car Project, and Google[x]
- Creating Optogenetics, Supporting Research on Autism and Epilepsy
- Discovering Osteoporosis Cure, Drug Trials Now in Progress
- Producing New Super Computer Designs
- Piloting Space Shuttle Missions
- Designing Next Generation Space Vehicles and Systems



THE HERTZ FOUNDATION LEADERSHIP



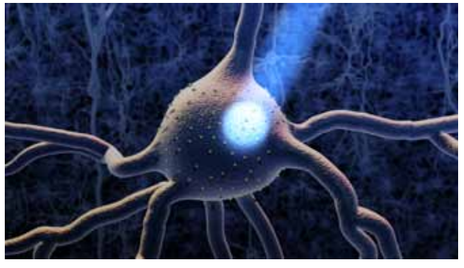
DAVID GALAS

David Galas, Hertz Fellow 1968 and Chairman of The Hertz Foundation Board of Directors, is Principal Scientist for the Pacific Northwest Diabetes Research Institute. He received his MS and PhD degrees in Physics from the University of California, Davis/Livermore, and his undergraduate degree from UC Berkeley. Dr. Galas served as Senior Vice President and Professor for the Institute for Systems Biology, was a Co-Founder of Keck Graduate Institute and served as the first Chief Academic Officer and Chancellor. Dr. Galas was Professor and Chairman of Molecular Biology at the University of Southern California. He was also Director for Health and Environmental Research of the U.S. Department of Energy and directed the DOE Human Genome Project. He has made several genetic discoveries, including one that could eliminate osteoporosis as a health problem.

JAY DAVIS

The current President of The Hertz Foundation, Jay Davis is among the most enthusiastic builders of the Hertz Fellowship Community. He has devoted his considerable energy, insights and interpersonal skills toward its promotion. Jay is a nuclear physicist trained at the Universities of Texas and Wisconsin. In his three-decade career at the Lawrence Livermore National Laboratory, he built accelerators for research in nuclear physics and for materials science. He founded the Center for Accelerator Mass Spectrometry, the world's most versatile and productive AMS laboratory. Among his many services to our nation, for which he twice received the Distinguished Public Service Medal, Jay was Founding Director of the Defense Threat Reduction Agency. He and his wife Mary operate a small Livermore vineyard, producing Petite Syrah grapes for the boutique "Talking Bull" wine.

"You need to have somebody who can meet you at the boundary and pull you across. So I think some of the excitement of those of us who run the Foundation is this business of building bridges and building them very early in their lives."
—Jay Davis



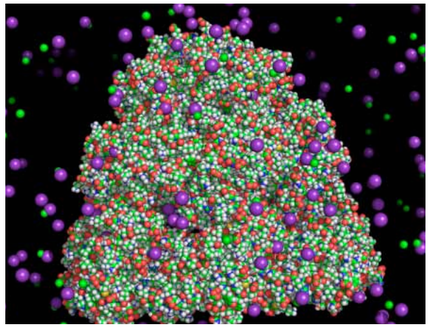
1963—THE FIRST CLASS OF FELLOWS

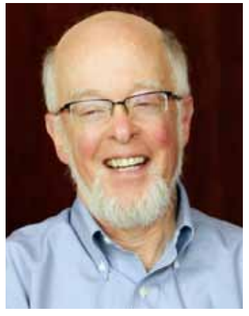
In 1963 The Hertz Foundation Board of Directors selected the inaugural class of Hertz Graduate Fellows to support in PhD graduate studies in engineering and applied physical sciences. These four Fellows were the first of many Hertz Fellows to become leaders in applied scientific and technological advances, exemplars of teaching skills in the applied physical sciences, and key contributors to the advancement of national technological capabilities for the long-term well-being of the United States.

JACK MARLING
CHRISTOPHER McKEE
PAUL RUBBERT
RICHARD VAN KONYNENBURG In Memory 2012

"Study or work with what you love. It's as simple as that."
—Jack Marling

"Now through email and regular mail from The Hertz Foundation, I see a community coming to life. I've been admiring of the fact that they've instituted this in recent years."
—Christopher McKee





CHRISTOPHER McKEE

"The Hertz Foundation was transformational. It literally changed my life…"

Christopher McKee, Hertz Fellow 1963, was one of the first Hertz Graduate Fellows. As Professor Emeritus of Physics and of Astronomy at University of California, Berkeley, he has advised many graduate students and postdoctoral research fellows over four decades. McKee received his PhD in Physics at UC Berkeley.

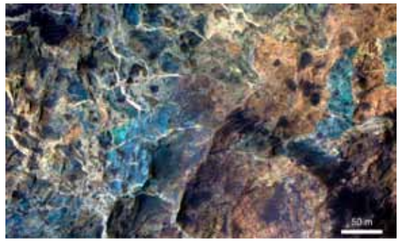
As an astrophysicist, his research has ranged from the physics of relativistic shocks to collisions between tiny dust grains. Much of his research has focused on the theory of physical processes in the interstellar medium, the diffuse gas between the stars—and how stars form out of this tenuous gas, and what effect these stars have on the interstellar medium.

M. MICHAEL ANSOUR

M. Michael Ansour, Hertz Fellow 1974 and Hertz Foundation Director, is the Managing Partner of March Partners LLC, an asset management company which he founded in 1992 and which specializes in event-driven investments. Previously he was a Vice President in the Mergers and Acquisitions Group at The First Boston Corporation. Dr. Ansour also serves on the Board of Servco Pacific Corporation and is a member of the Council on Foreign Relations. He received his PhD in Physics from MIT, sat for Part III of the Mathematics Tripos at Cambridge University as a Churchill Scholar, and earned his law degree, *magna cum laude* from Harvard Law School. "The Hertz Fellowship was a tremendous gift and boost to my life," says Dr. Ansour. "It allowed to me to concentrate on my physics work and hone my thinking and skills. It also allowed me to associate with an incredibly talented and can-do group of people. The Hertz Foundation is truly remarkable for the work it does."

FAVORITE QUOTE: "Never never never give up." —Winston Churchill, and Michael's own variation, "I survived my Hertz Interview."

"Seeing all the other sorts of unconventional and off the beaten track things that other Fellows have done has given me some courage."
—James Valcourt



STEPHEN D. FANTONE

Stephen D. Fantone, Hertz Fellow 1975, is the President and Chief Executive Officer of Optikos Corporation. He received SB degrees in Electrical Engineering and Management from MIT, and a PhD from the Institute of Optics at the University of Rochester. He has been awarded over 65 U.S. patents. Currently, he serves as Director of Rofin-Sinar Technologies and Zygo Corporation, and is Chairman of the Pioneer Institute for Public Policy. Since 1996, he has been a Director and Treasurer of the Optical Society of America and a Senior Lecturer in the Mechanical Engineering Department at MIT. Stephen brings the combination of business and technical expertise to his leadership as a Hertz Director.

PAUL M. YOUNG

Paul M. Young, Hertz Fellow 1986, is currently the Partner in Goldman Sachs' Securities Trading Division responsible for Quantitative Strategies—the group that builds trading models, quantitative applications and bespoke securities and derivatives structures.

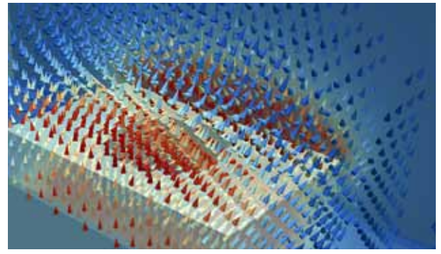
Paul was a Hertz Fellow while earning his PhD from Harvard University in Applied Physics. During that time he had the pleasure of working for a summer at Lawrence Livermore National Lab with Lowell Wood and Edward Teller. Prior to Harvard, Paul was a Carnation Prize Scholar at Caltech. He is now an enthusiastic supporter of The Hertz Foundation through charitable grants harnessing the Foundation's recent status as a Public Charity. Paul encourages everyone to help see John Hertz's vision through.

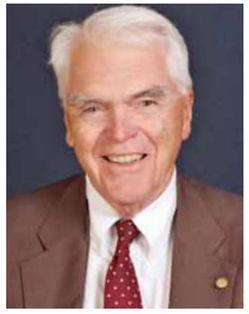
ERIC WEPSIC

Eric Wepsic, Hertz Fellow 1992, is a Managing Director and Executive Committee member of the D. E. Shaw Group, a global investment and technology development firm with approximately $30 billion in investment capital as of April 1, 2013. Eric jointly supervises the firm's worldwide asset management businesses, and is responsible for overseeing much of the firm's systematic alternative investment activities and its global trading technology platform. Since its founding in 1988, the D. E. Shaw Group has earned an international reputation for successful investing based on innovation, careful risk management, and the quality and depth of staff.

SPARKS MY CREATIVITY: What inspires me to creativity is usually something that I find irritating; or sometimes things that remind me of other things; or things that combine in my mind. And, of course, the creativity of the people around me.

"This incredible academic freedom is only surpassed by the extraordinary students, entrepreneurs, and professors I have had the privilege of meeting through Hertz Foundation events, such as the Fellows Retreats and the Hertz Symposium."
—Gleb Akselrod





HANS MARK

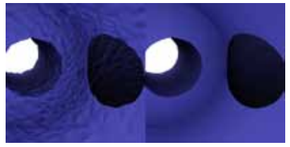
Hans Mark's career serves as a role model for Hertz Fellows. Dr. Mark, Hertz Director and Interviewer, is a champion of innovation and ways that government, academia, and industry can advance our civilization. Fleeing Nazi Germany with his family, Dr. Mark lived in England during the months before World War II. Later his father moved the family to Canada and then to the United States. He famously learned English from reading *Winnie the Pooh*. Dr. Mark is Professor of Aerospace Engineering and Engineering Mechanics, University of Texas at Austin, where he holds the John J. McKetta Centennial Energy Chair. Dr. Mark was Chancellor of the University of Texas System from 1984 until 1992. He also served as Director of Defense Research and Engineering for the Department of Defense from 1998 to 2001. Dr. Mark was formerly Deputy Administrator for NASA, Secretary of the United States Air Force, and Director of the NASA Ames Research Center in California. He earned his AB in Physics from the University of California, Berkeley and his PhD in Physics from MIT.

CAROL BURNS

Carol Burns, Hertz Fellow 1983 and Hertz Director, is a Laboratory Fellow at Los Alamos National Laboratory, and Division Leader for Chemistry. Since coming to Los Alamos as a J. Robert Oppenheimer Postdoctoral Fellow, she has served in a number of line and program positions. Dr. Burns served as a Senior Policy Advisor in the Office of Science and Technology Policy in 2003–2004 for national security science and technology issues. She is a recognized expert in actinide and radionuclide chemistry, with more than 100 peer-reviewed publications, and is active in workforce development efforts. She was awarded the LANL Fellows Publication Prize in 2002, and was named a Laboratory Fellow in 2003. Carol is a graduate of Rice University, BA in Chemistry, and University of California, Berkeley, PhD in Chemistry.

FAVORITE QUOTE: "Do unto others 20% better than you would expect them to do unto you, to correct for subjective error." —Linus Pauling

"It's a community of thinkers and doers. They (Hertz Fellows) are changing the world and I hope to live up to that and be part of that."
—Joshua Mueller



WENDY R. CIESLAK

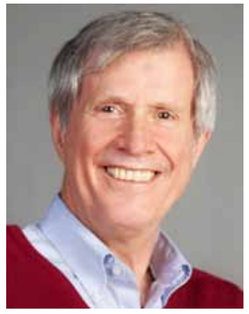
Wendy R. Cieslak, Hertz Fellow 1979, is the Principal Program Director for Nuclear Weapons Science & Technology at Sandia National Laboratories. Dr. Cieslak is responsible for the programmatic stewardship of the technical foundations necessary for Sandia to perform its nuclear weapons mission today and into the future. Her immediate preceding job was as Materials Science & Technology Division Leader at Los Alamos National Laboratory. Altogether, she has enjoyed a 30 year career at these laboratories in the time since earning her BS and PhD in Materials Engineering from Rensselaer Polytechnic Institute. Wendy pioneered the establishment of part-time employment at Sandia so that she could continue her career while raising her two daughters. She is an active mentor and coach, especially to women, and initiated the Network for Success for Hertz Fellows that launched our mentorship program. Wendy performs regularly as a violinist in the Albuquerque Philharmonic Orchestra, the Los Alamos Symphony Orchestra, and informal chamber ensembles.

FAVORITE QUOTE: "Seek first to understand, then to be understood." —Stephen Covey
SPARKS MY CREATIVITY: I get really happy when I have mounds of data that I can stare at, rearrange, group, and ponder until themes emerge for me and I gain conviction in my conclusion.

JOHN WAKERLY

John Wakerly, Hertz Fellow 1970, spent a few years at Stanford University earning his Master's and PhD degrees in Electrical Engineering, and then joined the faculty to continue research and teaching. He soon realized that he wanted to be a "real engineer" and build things. The success and confidence that he had experienced as a graduate student, much the result of his Hertz Fellowship, allowed him to break out of the typical academic mold. He subsequently pursued a career involving equal doses of product development and entrepreneurship on one hand, course development and textbook writing on another, and technical consulting and eventually mentoring on yet another (three hands are better than one!). John's proudest professional accomplishments include authoring eight textbooks and editions, co-founding three start-up companies, and helping to design and deliver products that have enjoyed billions of dollars of sales. John learned the importance of giving back from his late wife Kate, and together they started the Wakerly Family Foundation, where he now serves as President and is assisted by their three adult children.

FAVORITE QUOTE: "D'oh!" —Homer Simpson
SPARKS MY CREATIVITY: Seeing a problem that needs solving.



RICHARD MILES

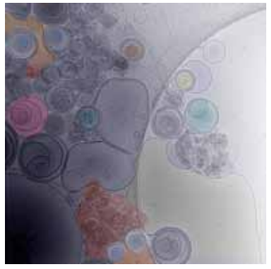
As a leader and innovator, Professor Richard Miles, Hertz Fellow 1969, is recognized for pioneering work in flowfield diagnostics, understanding of nonequilibrium plasma behavior, and use of plasmadynamics and magnetohydrodynamics for flow control. Miles, Robert Porter Patterson Professor of Mechanical and Aerospace Engineering at Princeton University, is the recipient of the AIAA Aerodynamic Measurement Technology Award and Medal (2000) and the AIAA Plasmadynamics and Lasers Award and Medal (2012). From 1980 to 1996 he served as Chairman of Engineering Physics at Princeton. He is a Fellow of the AIAA, a Fellow of the Optical Society of America, and a member of the National Academy of Engineering. He serves as a Hertz Director and Interviewer.

FAVORITE QUOTE: "Yes the mountains are dancing together."

SPARKS MY CREATIVITY: Outlandish challenges.

"By enabling our country's finest to contribute, to innovate, to go on with advanced degrees without having their interests shaped by their advisors' priorities, I think is one of the very unique aspects of The Hertz Foundation."

—Ruth David



J. DOUGLAS BIRDWELL

Dr. J. Douglas Birdwell, Hertz Fellow 1975, has inspired generations of graduate students as a Professor of Electrical and Computer Engineering at the University of Tennessee since 1978. He values the freedom from traditional research restrictions that the Hertz Graduate Fellowship afforded him to complete his PhD in Electrical Engineering from MIT, specializing in reliable control systems design. Doug received his BS and MS degrees in Electrical Engineering at the University of Tennessee in 1974.

Presently Doug is the Director of the Laboratory for Information Technologies, which since 1995 has developed secure distributed information systems and high performance bioinformatics databases for law enforcement agencies. He has over 100 publications, holds 24 patents, and has directed in excess of $10M in externally sponsored research and development projects at the University.

THOMAS McCANN

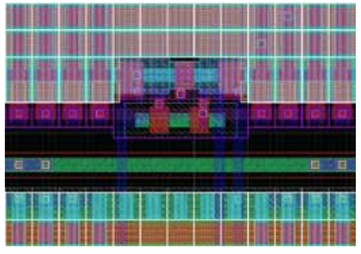
Thomas McCann, Hertz Fellow 1977 and Hertz Director, is President and Founder of McTech LLC, a consulting firm to the aerospace and entertainment industries. Tom has led prominent roles in the technology and engineering sectors. He was the Senior Vice President of Engineering for Walt Disney Imagineering until 2006. Previously, McCann was a Technical Director at Raytheon Systems Corporation, and was a Senior Scientist for the Extended Air Defense Testbed (EADTB) program at Hughes Aircraft Corporation. Preceding his business career, he served 21 years of active duty with the U.S. Air Force, retiring as Lieutenant Colonel in 1986. Tom received his BS in Mathematics and MS in Physics from the University of North Texas. He completed his PhD in Engineering and Applied Science at the University of California, Davis.

GREGORY CANAVAN

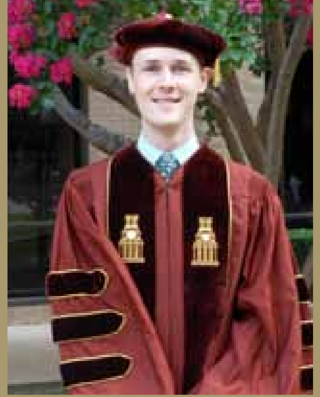
Gregory Canavan, Hertz Fellow 1968 and former Chairman of the Hertz Board, is a Senior Fellow and Scientific Advisor for Los Alamos National Laboratory. He previously served as DOE Director of the Office of Inertial Fusion; as Special Assistant to the Chief of Staff, U.S. Air Force; and as a Presidential White House Fellow. He has been a member of the National Academy of Science Committee on Climate Change, the Army Science Board, and the Commission on the International Space Station. He is a member of the National Missile Defense Advisory Committee and the Air Force Space Command and Research Laboratory Advisory Group. Canavan received his BS in Mathematics from the USAF Academy, an MBA from Auburn University, and an MS and PhD in Applied Science from University of California, Davis.

"What it means to be a Hertz Fellow is really transforming—making it not only valuable in terms of the academic freedom it gives you, but valuable in terms of the collaboration of having people to talk to, share ideas with, and being able to come together and get rejuvenated with people that think like you do."

—Grant Gillary









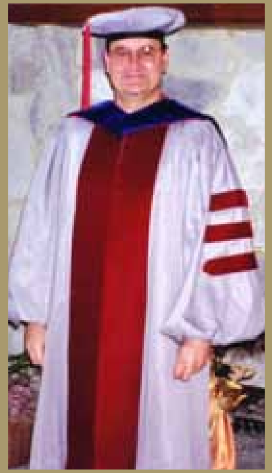




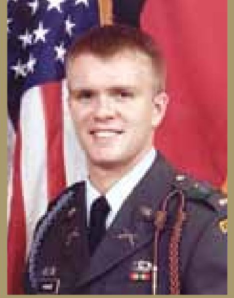
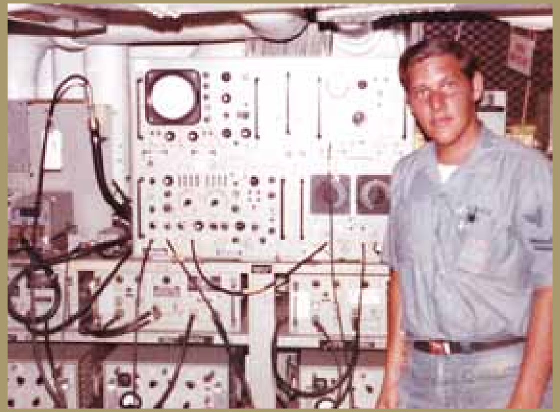


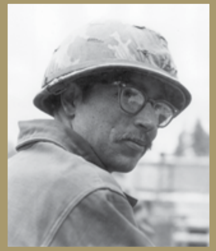
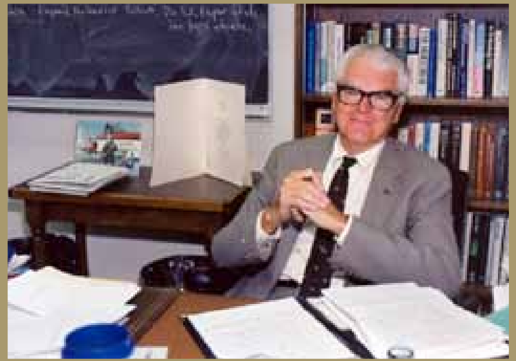


STAATS





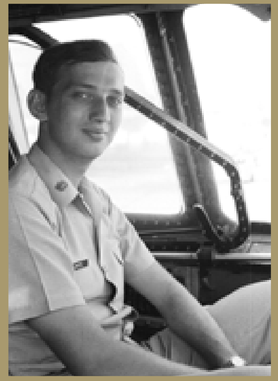










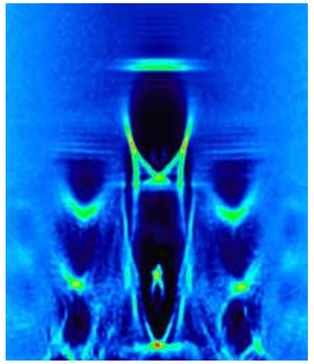



PAUL D. NIELSEN

Major General (Retired) Paul D. Nielsen, Hertz Fellow 1972 and Hertz Director, collaborates with researchers and software practitioners around the world to improve the skills and productivity of the software and cyber security communities. Prior to his arrival at Software Engineering Institute (SEI), Carnegie Mellon University, as CEO and Director, Nielsen served in the U.S. Air Force and has worked the full range of Air Force Systems—space, C3I, and aeronautical systems—for more than 30 years as a manager of science, technology, and acquisition programs for the Air Force. He retired from the Air Force as a Major General after 32 years of distinguished service. Nielsen was in charge of the Air Force Research Laboratory. For over four years, he managed the Air Force's science and technology budget of more than $3 billion annually, and 8,700 men and women at ten sites across the United States. Nielsen received his PhD in Applied Science from the University of California, Davis.

"The Hertz Fellowship allowed me to pursue my PhD in a newly developing field, and to be part of its development into what is now one of the leading concepts for next generation high energy physics and light source experiments."

—Cameron Geddes



ELLEN M. PAWLIKOWSKI

Ellen M. Pawlikowski, Lieutenant General USAF, Hertz Fellow 1979, is the first woman to assume command of the Space and Missile Systems Center at the Los Angeles Air Force Base. She is responsible for more than 5,000 employees nationwide and an annual budget of $10 billion. As the Air Force Program Executive Officer for Space, Lieutenant General Pawlikowski manages the research, design, development, acquisition, and sustainment of satellites and the associated command and control systems.

Her extensive portfolio includes military satellite communication, missile warning, navigation and timing, space-based weather, space launch and test ranges, certification for launch, space superiority, responsive space and other emerging evolutionary space programs. She has previously served as Commander of the Air Force Research Laboratory, managing the scientific research and development operations of the Air Force. Pawlikowski received her PhD from the University of California, Berkeley in Chemical Engineering.

FAVORITE QUOTES: "Do the right thing even when it's hard." —from my husband, who died in 2010; and "Just always do your best." —from my mother, who died in August 2012.

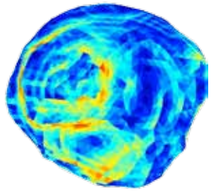
WILLIAM N. McCASLAND

Major General William N. McCasland, Hertz Fellow 1979, is the Commander of the Air Force Research Laboratory, Wright-Patterson Air Force Base, Ohio. He is responsible for managing the Air Force's $2.2 billion science and technology program as well as additional customer funded research and development of $2.2 billion. He is also responsible for a global workforce of approximately 10,800 people in the laboratory's component technology directorates, 711th Human Performance Wing and the Air Force Office of Scientific Research.

Major General McCasland was commissioned in 1979 after graduating from the U.S. Air Force Academy with a Bachelor of Science degree in Astronautical Engineering. He has served in a wide variety of space research, acquisition and operations roles within the Air Force and the National Reconnaissance Office. General McCasland holds a PhD in Astronautical Engineering from the Massachusetts Institute of Technology.

"My Hertz Fellowship opened doors that I previously didn't even know existed."

—Paul Shuch

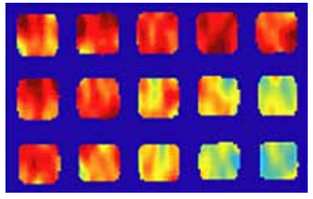


J. DOYNE FARMER

Dr. J. Doyne Farmer, Hertz Fellow 1978, is Professor of Mathematics and Director of Complexity Economics for the Institute for New Economic Thinking at the University of Oxford. Doyne was a founder of Prediction Company, a quantitative trading firm sold to the United Bank of Switzerland in 2006; he was their chief scientist from 1991–1999. During the eighties he worked at Los Alamos National Laboratory as an Oppenheimer Fellow and founded the Complex Systems Group. Doyne began his career as part of the UC Santa Cruz Dynamical Systems Collective, a group of physics graduate students who did early research in what later was called "chaos theory." During graduate school, Doyne led a group that designed and built the first wearable digital computers (which were used to beat the game of roulette).

"Every one of the patents I have been awarded was created in response to real-world needs. Thus I am very grateful for my Hertz Fellowship and am interested in paying it forward."

—Stephen Wurst



NEIL JABLON

Neil Jablon, Hertz Fellow 1981, has over 25 years of experience in telecommunications with the world's top global companies. He is the head of the Qualcomm Reference Design Hardware Component Ecosystem at Qualcomm Technologies, Inc. Neil joined Qualcomm in 2006 and is currently leading a China-based cross-functional team that has verified hundreds of hardware components for smartphones in China and other markets. Previously at Qualcomm, Neil led the Sales Forecast Team in the same division, which forecasted demand for over 600 million wireless semiconductor devices per year. Neil was Executive Consultant, IBM Global Services (Communications Sector), Beijing from 2003–2006, and Director, Regional Strategy, Vodafone Group, Tokyo from 2000–2002. Neil received his BE in Electrical Engineering from the State University of New York at Stony Brook, his MS and PhD in Electrical Engineering from Stanford University, and his MBA in General Management from the UCLA Anderson School. He is fluent in Chinese.

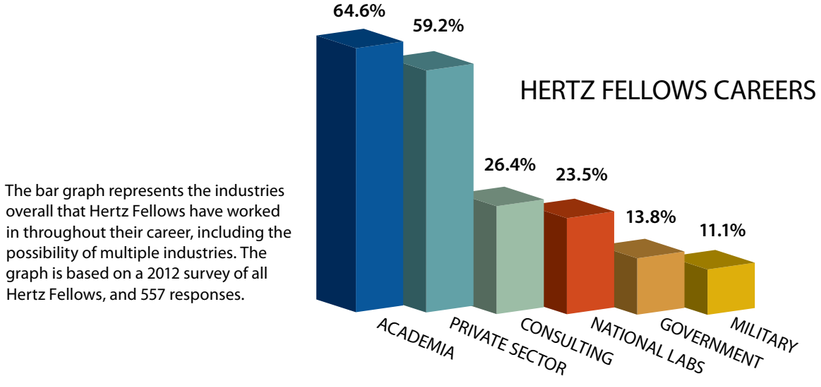
SPARKS MY CREATIVITY: Interesting work, especially involving telecommunications in the Asia/Pacific region, particularly China. Lots of time in the Asia/Pacific region, in order to understand what's REALLY happening.

KIRK R. HASELTON

Climate change research, technology development (epitaxial level heterogeneous integration) and intellectual property strategy are Kirk's current and future interests. Kirk's undergraduate and PhD research began with optics, semiconductors and MEMS and concluded with the remote sensing of rainfall using passive microwave data from the Special Sensor Microwave/Imager (SSMI) instrument on satellites from the Defense Meteorological Satellite Program (DMSP). Kirk received a BS with Honors, Applied Physics in 1984, California Institute of Technology; Master of Science in 1988, and PhD in 2001 in Applied Physics, Cornell University. He was awarded the Hertz Fellowship in 1984 and was awarded a NASA Graduate Research Fellowship in 1992.

GUY WEYL

Guy Weyl was born in Strasbourg, France. He came to America with his family at the beginning of World War II and they became American citizens. Homesick for France, Guy returned to attend the prestigious Physics and Chemistry School of Paris in 1960. After his graduation, he returned to the U.S. to begin his career in infrared physics, and then pursued a PhD in Theoretical Plasma Physics at UCLA as a Hertz Fellow (1967). Guy worked for several decades as a physicist in companies doing government funded research. In addition to his passion for math and science, Guy always has been (and still is) an avid skier. Weyl's skiing claim to fame is to have beaten the future world ski champion, Jean Claude Killy, in a slalom race in Val d'Isere, "I was 22 and placed 3rd; he was 15 and fell."



The bar graph represents the industries overall that Hertz Fellows have worked in throughout their career, including the possibility of multiple industries. The graph is based on a 2012 survey of all Hertz Fellows, and 557 responses.

SID SINGER

Sid Singer extends his energetic service, generous philanthropy, and professional expertise to The Hertz Foundation as a Hertz Director. Sid retired in 1994 after an illustrious 38 year career at Los Alamos National Laboratory during which he worked in testing nuclear weapons, nuclear rocket propulsion reactors, satellite-based magnetosphere experiments, inertial confinement fusion, x-ray astronomy, technology transfer, free electron lasers, and nanotechnology. In 1996, Sid received the New Mexico Distinguished Public Service Award for his business and civic contributions, and was declared Citizen of the Year by the Los Alamos County Chamber of Commerce. He is a graduate of Wayne State University with a major in Physics and Mathematics, and received an MS and PhD in Physics and Mathematics from the University of Illinois. Sid and his wife, Elizabeth, reside in Santa Fe, New Mexico.

SPARKS MY CREATIVITY: Some of my most creative moments have been associated with an abrupt understanding of some issue or the acquisition of new knowledge. That moment of truth, that "Aha! That's it!" insight creates that blinding flash of comprehension that leads to the seemingly instantaneous formation of axons and synapses connecting to previously uninvolved parts of one's consciousness. Doors open, new possibilities, new perspectives and directions become evident. It is one of the most exciting and satisfying experiences in life.

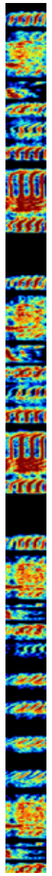
P. MICHAEL FARMWALD

P. Michael Farmwald, Hertz Fellow 1978, is a successful serial entrepreneur in the Silicon Valley high-tech industry. Mike has co-founded a number of companies to date, including FTL, Rambus, Chromatic Research, Epigram, Matrix Semiconductor, Dash Navigation, and Pedestal Networks. As a partner at Skymoon Ventures, Mike invests directly in startups, and also works closely with Benchmark Capital. Rambus, a developer of high-bandwidth interfaces for memories and other chips, is a public company. Farmwald holds a Doctorate in Computer Science from Stanford University. He serves as a Director for The Hertz Foundation. He is married to Barbara Paldus and has a son, Josef.

"Doing well by doing good."
—Lowell Wood

WHAT HOLDS YOU TO THE HERTZ FOUNDATION?

The Hertz Foundation Board of Directors includes Hertz Fellows as well as many professionals equally dedicated to advance the mission of the Foundation. In response to the question, "What holds you to The Hertz Foundation?" several Hertz Directors offer their reflections on their service to the Foundation.



"The Hertz Foundation is an amazing collection of exceptionally creative men and women who are tackling some of the most interesting and important problems in the applied physical sciences. It is an honor just to be associated with this organization."
—Bob Borchers

"It has been both an honor and a pleasure to help select and support some of the best young scientists and engineers in our country. I don't know of another organization that could reward me with the excitement and the gratification that The Hertz Foundation provides."
—John Browne

"The strength of our nation and the future of the world at large have been and will continue to be based largely on advancement and understanding of science. The Fellows of The Hertz Foundation have been and are superb contributors to advancement in science."
—Gil Decker

"Mission! The Hertz Foundation strives to identify and fund those very select students with demonstrated outstanding potential in the natural sciences. This is accomplished with an extraordinarily competitive selection process that focuses sharply on intellectual capability coupled with exceptional creativity and dedication to accomplishment. There is simply no other equivalent to Hertz."
—Paul DeLuca

"It is an honor to be part of an organization dedicated to advancing our nation's technical prowess. Having spent a career addressing some of our most pressing technical national security challenges, I firmly believe that as a nation we are stronger today because of the scientific achievements, research, innovative spirit and commitment of the Hertz Fellows."
—Joanne Isham

"In our first fifty years, Hertz Fellows played a critical role in bringing the Cold War to an end. I don't know what great challenge the next fifty will hold for us, but I'm absolutely certain that whatever it is, Hertz Fellows will again be in the thick of it."
—Karl van Bibber

WILSON TALLEY President, Hertz Foundation 1972–1998

In 1960, I became Dr. Edward Teller's teaching assistant. Little did I know how meeting Dr. Teller would influence my life. The most significant event occurred in 1972 when Dr. Teller asked me to join the Fannie and John Hertz Foundation. I served as President and Director while concurrently holding a teaching position at UC Davis/Livermore and consulting for various government agencies and private companies. In the beginning, the Hertz office staff consisted of Katherine Smith and me. We worked out of my office at Hertz Hall, formerly a satellite campus of the UC Davis Department of Applied Science. In 1998, I suffered a stroke. My goal was to return to my job at The Hertz Foundation, and understandably it was a very sad and emotional day when I realized that I would step down. Since then, it has been very fulfilling to continue being a part of the Foundation as President/Director Emeritus. I have always believed that the Hertz Fellowship Program is one of the finest opportunities available to top-notch graduate students. And now, I hope all of you (Hertz Fellows) will take a role in supporting the Foundation in any way you can, financially or otherwise.

FAVORITE QUOTE: "No ifs, ands, or buts."

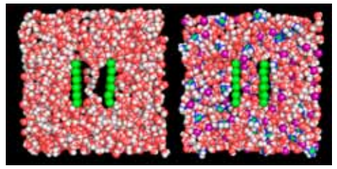
JOHN HOLZRICHTER President, Hertz Foundation 1999–2009

Two of my proudest life-accomplishments were receiving a Hertz Fellowship in 1969 and election to the Hertz Presidency in 1999. I was also very fortunate to have participated in the development of tunable laser spectroscopy under Hertz support at Stanford. I then joined the Livermore Lab to develop the high power lasers needed to demonstrate inertial confinement fusion concepts. Subsequent management experiences included building an effective VC-like program to support new ideas at Livermore. Then, from 1999 to 2009 I presided over The Hertz Foundation's transition to a nationally recognized and supported institution.

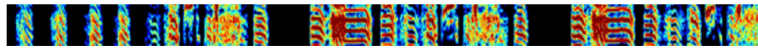
FAVORITE QUOTE: "Experiments in the lab and in life always reveal something unexpected."

SPARKS MY CREATIVITY: I am easily excited by almost anything new—followed by an uncontrollable desire to understand and participate.

"The Hertz Fellowship is a magnificent early-stage booster rocket that stays with you throughout your life."
—John Frank



2013 BOARD OF DIRECTORS



DAVID GALAS
Board Chairman; Hertz Fellow; Principal Scientist,
Pacific Northwest Diabetes Research Institute

JAY DAVIS
President
The Fannie and John Hertz Foundation

M. MICHAEL ANSOUR
Hertz Fellow
Managing Partner of March Partners LLC

BOB BORCHERS
General Partner, Opus Capital

JOHN BROWNE
Consultant (Retired), JCB Scientific Consulting LLC

CAROL BURNS
Hertz Fellow
Division Leader, Los Alamos National Laboratory

GREGORY CANAVAN
Hertz Fellow
Senior Fellow & Scientific Advisor
Los Alamos National Laboratory

WENDY CIESLAK
Hertz Fellow
Principal Program Director
Sandia National Laboratory

RUTH DAVID
President and CEO, Analytic Services Inc.

GILBERT DECKER
Consultant, Strategic Planning and Technology

PAUL DELUCA
Provost and Vice Chancellor for Academic Affairs
University of Wisconsin-Madison

PHILIP ECKHOFF
Hertz Fellow
Research Scientist and Principal Investigator
Intellectual Ventures

STEPHEN FANTONE
Hertz Fellow
President/CEO, Optikos Corporation

P. MICHAEL FARMWALD
Hertz Fellow
Partner, Skymoon Ventures

JOANNE ISHAM
Senior Vice President, L-1 Identity Solutions

HANS MARK
Professor, University of Texas at Austin

THOMAS McCANN
Hertz Fellow
President, McTech LLC

RICHARD MILES
Hertz Fellow
Professor, Princeton University

HAROLD NEWMAN
Partner, HJ Newman Capital LLC

PAUL D. NIELSEN
Hertz Fellow, Major General (Retired)
CEO and Director Carnegie Mellon University

JESSICA SEELIGER
Hertz Fellow
Assistant Professor, Stony Brook University

SIDNEY SINGER
President, Sistos, Inc.

KARL VAN BIBBER
Professor, University of California, Berkeley

THOMAS WEAVER
Senior Fellowship Interviewer, Hertz Fellow

Read complete biographies at www.hertzfoundation.org

COMMUNITY

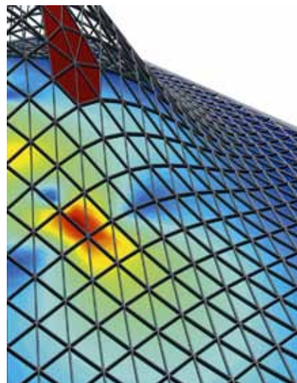
COMMUNITY
COLLABORATING TO INSPIRE

What unique qualities define a Hertz Fellow? The quality and caliber of a Hertz Fellow surpasses academic distinction. A singular set of attributes includes curious intellect and a joyous drive to explore and discover. Importantly, Hertz Fellows ask how the discovery of what was once unknown might be of value to humanity.

The power of the individual is amplified in the vibrancy of the Hertz Fellowship Community. At Summer Workshops, Fall Retreats or Symposia, Hertz Fellows meet in relaxed conference settings away from their campuses. Fellows revel in their conversations across disciplines, geography, and generations. The Fellows inspire one another, often engaging in collaboration, and further augmenting their ability to contribute.

Five decades have seen a marked outward-reaching trend toward interdisciplinary collaboration. With great mutual respect, an astrophysicist uses the keys of a mathematician's insights to predict how close, and when, an asteroid will pass by our planet. Another mathematician works with researchers in medicine to predict how close we are to eradicating polio. Engineers, environmentalists, physicists and chemists teamed together for a Gates Foundation Global challenge to re-invent the toilet for a million-person township in Kenya. Fellows tutor and mentor science educators about the fun of science and math to encourage the natural curiosity found in students of all ages. Some of these developments can be found in the biographies that follow.

"You'll come to a Hertz retreat and you'll meet people who do something completely different from you. And they'll get you excited about it. I'm a physicist and I've learned about synthetic biology using chemistry to simulate the primordial soup conditions where life began. I've learned about people who are trying to find near-earth asteroids, people doing crazy, futuristic, image processing work. It's an extraordinary expansion of research areas."
— Daniel Slichter



RAY SIDNEY

Ray Sidney, Hertz Fellow 1991, is a transformational leader for the Hertz Community. Ray supports five Endowed Fellowships and due to his generosity and ingenuity, The Hertz Foundation's Summer Workshops were launched in 2009. He knew Fellows coming together for fun, learning, and collaboration would have far-reaching impact. He was right. Ray is interested in the problems humanity faces in the realms of energy, population, education, and the environment. He is involved in the X PRIZE Foundation's mission to stimulate radical breakthroughs for the benefit of humanity through new industries.

After receiving a degree in Mathematics from Harvard, Ray became a Hertz Fellow and earned his PhD in Mathematics from MIT. His interests include cryptography, probability, logic, complexity, and real analysis. Ray pursues various real estate and equity ventures, owns the real estate investment company Big George Ventures, and is the primary owner of the Ritz Carlton Residences at Dove Mountain. Ray serves on several committees at his alma maters and several corporate boards, including Hemedex and Covia Labs. He is a co-chair of the local organizing committee for the 2014 World Financial Group Continental Cup and is a co-founder of Lake Tahoe Epic Curling.

"What can come out of these workshops and conversations is really anybody's guess. My hope is that these workshops enable research, products, companies, or collaborations of any sort that could make a big change for the better."

—Ray Sidney

LOUIS LERMAN

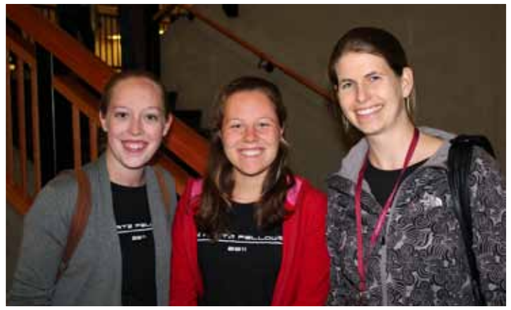
Louis Lerman, Hertz Fellow 1982, is a true champion of The Hertz Foundation. His generosity and imagination holds an honored place in the ongoing creation of the Hertz Fellows Community. As benefactor of the Hertz Fellows Fall Retreats, Louis also created and supports the Lerman Challenge, the Regional Get-Togethers, and the HertZigs. He sponsors a Named Fellowship in honor of his father, Dr. George Lerman.

Louis's generosity is matched by the important bridge building he brings to science, technology, business, and art. During his Hertz Fellowship at Stanford he focused on the interdisciplinary: high-energy physics and multi-scale self-organizing systems. His development of the flotilla concept for low-earth orbiting unmanned space systems led to his involvement with a start-up, Insitu, which has become a major force in autonomous unmanned aerial vehicles. Louis's highly publicized Bubble Hypothesis on the origin of life is now in biology textbooks and is currently being applied to the search for life on Mars. Lerman's application of self-organizing systems to urban land development helped his partnership become the largest land developer in Nevada, which in turn built the best-selling communities in the entire U.S. Currently, applications at the nanoscale guide his newest start-up, QuarkStar, with more than 75 patent applications in process in solid-state lighting.

"One of the things you learn is that by yourself it's very hard to make a contribution that's meaningful. If you want to create value in the world, it's with a team."

—Louis Lerman

"That was the thing I was most excited about in receiving the Hertz Fellowship—the community I would be able to join."
—Melanie Smith

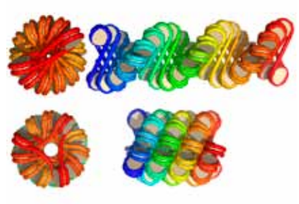


JESSICA C. SEELIGER

Like many Hertz hopefuls, Jessica C. Seeliger was convinced that she had flunked her second round interview with David Galas. As an Interviewer, Dr. Seeliger, Hertz Fellow 2000, now has the privilege of ensuring that new generations of Fellows also enjoy the Hertz experience. The remarkable creativity and intellectual energy of the Fellows motivates her work as a Hertz Director and she relishes every opportunity to interact with the community and bring Fellows together. Jessica earned her PhD in Biophysical Chemistry at Stanford University and is Assistant Professor of Pharmacological Sciences at Stony Brook University. She is also a violinist/violist and avid chamber musician.

SPARKS MY CREATIVITY: Students whose curiosity and lack of prejudice lead them to ask insightful questions and to challenge assumptions.

"We tend to get isolated in our laboratories, and so the idea that The Hertz Foundation was moving in this direction was very interesting to me—I was very keen to be involved in promoting these efforts."
—Jessica Seeliger



BRIAN VON HERZEN

Brian Von Herzen, Hertz Fellow 1980, could talk with you in French about reinventing the toilet while he pilots you in his plane to look at plankton plumes. Brian exemplifies a Hertz Fellow's curious, multi-disciplined mind and scientifically sound approach towards sustaining our planet. While studying at Princeton and at Caltech, Brian worked on models related to the climate change challenge. He envisioned solutions to global warming using wave-driven ocean pumps for plankton plume growth, and biogeochemical interactions like biochar. These and other techniques, developed by Brian as Founder of The Climate Foundation, sequester gigatons of carbon from the atmosphere for millennia.

FAVORITE QUOTE: "If you want to go quickly, go alone. If you want to go far, go together."
—Old African Proverb

SPARKS MY CREATIVITY: Interaction with other inventors such as Hertz Fellows young and old sparks my creativity. The number of patents best correlates with the density of inventors, not their absolute numbers.

THE HERTZ BIOCHAR GROUP

When Hertz Fellows gather, the sparks of innovation get ignited. Sometimes, during all the fun and conversation, those sparks take off for dynamic, real-world achievement. The Biochar Group was formed at the first Summer Workshop, when Brian Von Herzen shared his reverse geoengineering strategies to revitalize plankton blooms that fix CO_2 from the earth's atmosphere and begin to restore global carbon balance. Fellows were galvanized. In the midst of a boisterous idea exchange, someone asked: "What about biochar?" Talk escalated. Louis Lerman issued "The Lerman Challenge." Thanks to his grant, the Hertz Fellows Biochar Group was born.

Hertz Fellows John Frank, Tony Miller, Matt Lucas, Shannon Yee and Brian plunged in with deep excitement. Within two years, four generations of biochar machines were built. Their vision was to engineer a harvester or "charvester" that would gather corn stover and crop stubble. Converting just ten percent of that fixed carbon into biochar on a global basis sequesters most of the atmospheric carbon dioxide emitted each year, while concurrently making the soil richer.

The Biochar Group was selected as a grant recipient in the Bill & Melinda Gates Foundation's "Reinvent the Toilet Challenge" to develop a 21st century toilet without links to water, energy, or sewer lines, and costing users under $0.05 a day. Work to reverse carbon depletion in soil will now be applied to transform the disposal and sterilization of sewage in a million-person slum within the city of Nairobi, Kenya. This work will be carried out in conjunction with Sanergy, an on-the-ground MIT startup team that has already been working in Africa on sanitation and renewable energy.

Courtesy: CarbonZero Foundation

"After graduating, the Hertz Fellowship creates great community and an opportunity to collaborate with other Fellows on projects and learn about diverse fields, diverse from their own."

– Brian Von Herzen

"In the Lerman Challenge session, it was exciting to brainstorm ways that the Hertz Community could reach out and impact other areas of society. A number of us are continuing to discuss ways to implement new ideas to improve science education."

—Po-Ling Loh

ENGINEERING CHALLENGES

One has only to watch the tradition of an engineering challenge issued at the start of every Hertz Fellows Symposium, Summer Workshop, or Fall Retreat to see how these creative, brilliant Fellows work together. For instance, given a blender, string, bowling ball, egg carton, aluminum foil, odd sized pieces of lumber, and a mere two hours together—the Fellows designed a Rube Goldberg machine that started with dropping an apple and ended with lighting "The Hertz Candle." This whimsical operation is but one collaborative example of the power of the Hertz Fellows Community in action.

TOM WEAVER

Tom Weaver, Hertz Fellow 1971, carries forward that great and singular tradition that is the Hertz Interview. As Senior Fellowship Interviewer, Tom ensures a fair, yet rigorous process that will find those rare, gem-like young minds whose creativity and passion are changing the world. His dedication extends to years of service as a Director of the Board, and as a mentor to the In School Fellows, visiting and coaching them at regular intervals. Tom is a distinguished scientist and research pioneer in the evolution and chemical composition of massive stars and supernova. As with many Hertz Fellows, Tom's current research interests have expanded to include theoretical biology, the nature of complex systems, and the mind/brain operation and associated phenomena of consciousness. He has also helped develop a broad range of new ideas and inventions in physics, engineering and biology, including advanced nuclear reactors.

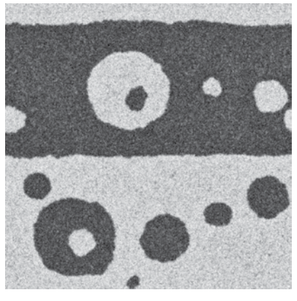
SPARKS MY CREATIVITY: Reading widely and looking for the underlying relationships behind all the details.

LOWELL WOOD

Lowell Wood retired in 2006 from the University of California's Lawrence Livermore National Laboratory of the U.S. Department of Energy, where he had worked in a variety of capacities since receiving his PhD. Lowell received his undergraduate degrees in Chemistry and Math in 1962 and a PhD in Astrophysics in 1965 from the University of California at Los Angeles. Lowell has served as an interviewer of applicants, an officer and member of the Board of Directors, and was elected Director Emeritus when he retired from the Board in 2010.

"We want to get the kind of mind that is flexible, curious and not afraid. Sometimes there are no right answers. In the Hertz Interview, we just want to see how you think."

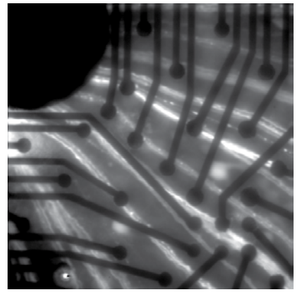
—Michael Ansour



THE HERTZ INTERVIEWERS, 2013 APPLICATION YEAR

With great appreciation, the Foundation recognizes the 2013 Hertz Foundation Interviewers for their service in the Hertz Graduate Fellowship selection process. This year the team of Interviewers reviewed more than 700 applications and contributed over 400 interview hours overall.

VERNON BECK
KEVIN BOWERS
EDWARD BOYDEN
JOHN BROWNE
J. ADAM BUTTS
GREGORY CANAVAN
WENDY CIESLAK
JAY DAVIS
RICHARD DURHAM
PHILIP ECKHOFF
STEPHEN FANTONE
DAVID GALAS
DANIEL GOODMAN
JEFFREY GORE
ANDREW HOUCK
STEPHEN LIBBY
HANS MARK
DANIEL MARSHALL
THOMAS McCANN
W. NEIL McCASLAND
BRADLEY MICKLICH
RICHARD MILES
MICHAEL MONTEMERLO
PAUL NIELSEN
ELLEN PAWLIKOWSKI
DOUGLASS POST
DAVID SCHONBACH
JESSICA SEELIGER
CAROLYN SEEPERSAD
H. PAUL SHUCH
LEE SWANGER
BENN TANNENBAUM
KARL VAN BIBBER
THOMAS WEAVER
DANIEL WEISE
CHARLES WESTBROOK
ALEXANDER WISSNER-GROSS



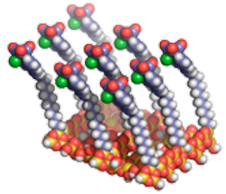
"I think that the reason the Hertz Interviewer gains so much by interviewing, is that the visual observation of a person and the visual observation of a paper application are vastly different. The other thing that is revealed in the interview—and that I credit The Hertz Foundation for—is the passion. You can only gauge passion by seeing a person—in person."

—Po-Shen Loh

HERTZ FELLOWSHIP APPLICATION AND INTERVIEW PROCESS

The Hertz Graduate Fellowship Selection Process is aimed at finding exceptional scientific and technical innovators—and providing them with the maximum possible freedom and encouragement to innovate. We do this by a multilevel process that includes written applications and reference reports, as well as two rounds of face-to-face technical interviews. This approach is unique among major institutions that award graduate fellowships in the applied sciences.

Rigorous technical interviews have played a central role in the selection of Hertz Fellows since the Program's inception. Edward Teller provided an initial compelling example of how to assess the depth of a candidate's technical understanding, creativity, and potential for outstanding research that has been refined and carried on by successive generations of interviewers. Lowell Wood and Wilson Talley were instrumental in carrying forward this tradition, later joined by Tom Weaver, the current Senior Fellowship Interviewer. Each year, 2–4 new First Round Interviewers are selected and trained, some of whom are eventually chosen to replenish the ranks of Second Round Interviewers in a self-renewing process. Philip Eckhoff, Wendy Cieslak, and Ed Boyden represent the latest generation of such interviewers, joining Tom Weaver and David Galas in interviewing the Hertz Finalists.



"What we're looking for is not just academic achievement…we're looking for that spark, that drive, that special inner strength that sets them apart."

—John Browne

A SELECTION OF INTERVIEW AND APPLICATION STORIES FROM HERTZ FELLOWS

Interviewing should be a pleasant affair but occasionally an applicant comes along who is a challenge. In this case, the applicant informed me that he was a future Nobel Prize winner. Lest I forget this key point, he mentioned it several more times during the interview. At the end of the interview I neglected to mention that there was no Nobel Prize for Self Esteem.

—Vernon Beck, Hertz Fellow 1971

Edward Teller shook my hand, reviewed the folder on his desk and said, "Ah, Stacey, I see you are studying nuclear engineering. I think it would be a good idea to submerge nuclear reactors under the sea. What do you think of this?" This was not the question I had prepared for, and the best I could come up with was some marginally coherent remarks about the difficulty of maintenance and refueling and the potential problems of high voltages passing through seawater, etc. This seemed to be good enough, and he passed on to a few other subjects. I finally asked him if he wanted to hear anything about reactor physics, to which he answered, "I know that you MIT boys know about reactor physics." To my great surprise, I got the Fellowship.

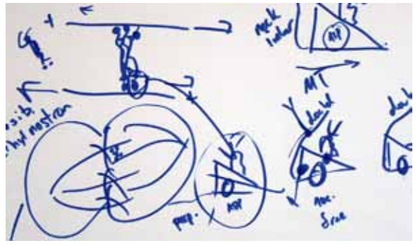
—Weston Stacey, Hertz Fellow 1966

In strict military fashion, and dressed in my woolen Cadet gray uniform, I reported for my interview. Questions ranged from my personal goals in the military to technical questions covering my physics problem solving skills. The interview ended. I rose to leave, and thanked the interviewer for his time. Still somewhat dazed from the questioning, I opened the nearest door and stepped through…and found myself in a closet. For a brief moment, I actually considered the option of staying in there until after the interviewer left (hoping he might not have noticed), but saner thoughts prevailed. I backed out and excused myself. I won the Fellowship, and became the first West Point Cadet in a long gray line of Hertz Fellows from the United States Military Academy.

—Donald Ponikvar, Hertz Fellow 1977

In addition to physics, Lowell Wood and I discussed several of Aleksandr Solzhenitsyn's books that I had read. I figured the interview went well when Lowell offered me a job in his "O" group, for the summer before I began graduate work at Caltech. I have been employed at LLNL since that summer job in 1977.

—Joseph Nilsen, Hertz Fellow 1977

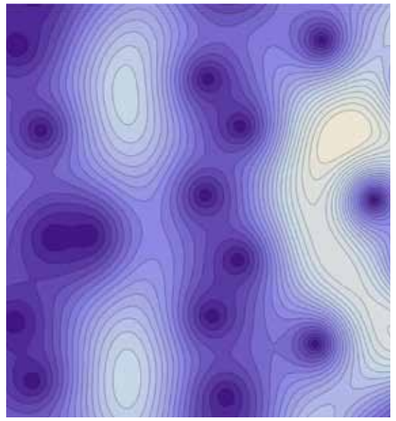


I walk in and meet Lowell Wood and Tom Weaver. Lowell asks me for the most efficient way to invert a matrix, and after I give my answer, Tom confronts me, "You're wrong!" Then he starts packing up, to go to another room, to help them catch up since they're so late. I say, "I don't think so," and Tom shoots back at me, "What's the right answer?!" After he leaves, I look at Lowell and ask, "What's his problem?" Lowell shakes his head and says, "Honestly, I don't know." Then Lowell proceeds to cordially destroy me.

—Michael G. Roberts, Hertz Fellow 1977

My interview with Dr. Teller took place as we walked together through the airport. I was struck by Teller's appearance: a stocky imposing person with big, bushy, black eyebrows. He had a strong Hungarian accent, and walked slowly with a limp helped by a cane. We talked about modeling the infrared bands of water vapor and carbon dioxide that were absorptive in the wavelength bands of interest. I was quite comfortable talking about the subject and felt that I was sort of teaching him some physics. I did not know at the time that he was very knowledgeable in this area and that he had solved a problem on molecular structures that bore his name and is now known in the literature as the Jahn-Teller effect. He then asked me if I could recite the Maxwell Equations of electromagnetism for him, which I did. We soon arrived at the exit to the street. He hailed a taxi and left me.

—Guy Weyl, Hertz Fellow 1967

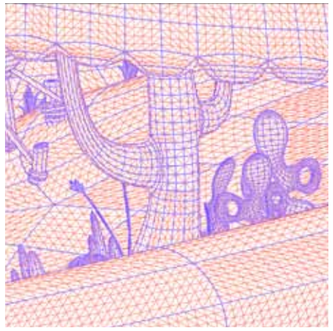


I vividly recall my Hertz Interview. We began with a problem-solving exercise to obtain an aerial view of a castle using only 15th century implements. Siege towers, underground tunnels, and bribing the castle architect made it to the table, before the discussion was steered to contemporary flying devices—I think the solution of choice converged on a contraption involving a kite and a mirror. The experience certainly broadened my perspective both of how to visualize problems and how different disciplines of physics relate to my field of electronics.
—Eric Pankratz, Hertz Fellow 2008

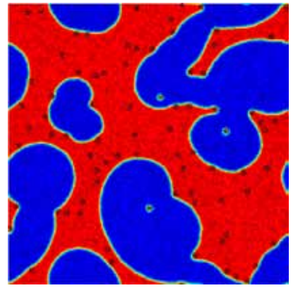
My last interview with Lowell Wood and Philip Eckhoff (my fourth after two years of applying for the Hertz) went surprisingly well. But for the life of me, I couldn't figure out how to open the door to leave the room, even though it wasn't locked. Philip got up and opened it for me.
—Adam Marblestone, Hertz Fellow 2010

I met the Interviewer, Tom Weaver I believe, at the O'Hare Hilton. He had to go catch a plane, but was not satisfied that I had finished the interview, so he said, "Follow me." This was before the days of heavy security, so I went all the way to the gate with him answering questions. Finally, he wanted me to discuss how the concentration of hydrogen dissolved in a platinum group metal would depend on the pressure of gas above it. I hemmed and hawed on this until the final boarding call for his flight. As he stood up, he asked for my final answer and I gave it—square root of hydrogen partial pressure. He looked back over his shoulder as he was heading to board and said somewhat nonchalantly, "That's right." I don't know if I was right or not, but I am convinced in hindsight that at that moment I had effectively won the Hertz Fellowship through persistence if not knowledge.
—John Mitchell, Hertz Fellow 1989

My Interviewer asked me to describe the Third Law of Thermodynamics to which I replied, "There's a third law?" I did recover and recalled the answer: About 0 values for entropy and enthalpy at 0 Kelvin. One of my more memorable jobs as an undergraduate was working for Emory Law School as an expert witness in mock trials. We re-enacted the Amaco Cadiz Oil tanker spill in the 1970s. My Interviewer had been an actual expert witness in that trial. We went back and forth over the trial and specs of the case and with hindsight he had to probably be right but I think I got some marks for my tenacity even though I only had the highlights of the case.
—James P. Chambers, Hertz Fellow 1990



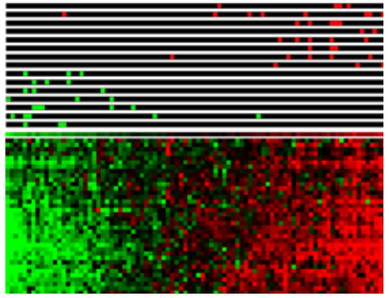
I think my interview was indeed quite memorable; at least it was for me! I was interviewed in Cambridge, by no less a person than Edward Teller. He first questioned me about physics, and I must say that after 15 minutes or so, I literally felt that he had removed the entire contents of my mind, sorted through them and put them back more or less in place. The fact that he kept drumming his fingers on the table and saying, "Well?" did not help, but I apparently managed to stagger through satisfactorily anyway. After disposing of physics, he asked me to choose another subject for discussion. Being entirely ignorant of his background, I immediately suggested Russian literature, which I loved. His response was to pound his fist down on the little table between us and scream, "NO!" I was so surprised, I nearly jumped out of my seat. I think he realized I had meant no disrespect, and more calmly said to choose another topic. I then chose pure mathematics, and all went well from there on.
—David Cannell, Hertz Fellow 1967



I flew into Washington National Airport for my Hertz interview in 1981. I was startled when one of our nation's greatest physicists, Edward Teller, unexpectedly walked into the airport conference room to join my scheduled interview with Lowell Wood. Needless to say, notwithstanding his serendipitous availability to attend the interview, Dr. Teller not only actively participated with Dr. Wood in probing my scientific acumen, but he also steered the discussion in a totally unanticipated direction (for me, at least). Despite the stressful nature of that Hertz interview, I think back on my fortuitous first meeting with Dr. Teller that day as not only a truly great honor, but also as one of the most memorable experiences in my life.
—Robert Bonometti, Hertz Fellow 1982

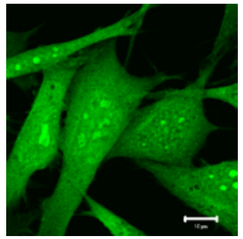
In 1969 I had applied for a Hertz Fellowship and was anticipating an interview in a few weeks, but Edward Teller was in the area that day and decided to get the Hertz interviews out of the way. He appeared unannounced at the Dean's office, requesting immediate interviews. Runners were dispatched to yank the candidates from whatever they were doing. I was snagged on the way to my committee with presentation in hand. Dr. Teller's first question: "Tell me about your research plan." The rest is history.
—Clark Hamilton, Hertz Fellow 1970

I walked to my November interview at a nearby hotel dressed in my standard dress: denim jeans and a sweater my mother had hand knit for me. I noticed that the other candidates awaiting their interviews were wearing suits, but thought nothing of it. When the interview finally started, Lowell's first question to me, said in a purely curious tone, was "why are you putting a five year fellowship at risk by potentially insulting me with your choice of interview clothing?" I was surprised and dumbfounded, it had never occurred to me that talking to a fellow scientist required formal clothes. So I was honest and replied "Dr. Wood, we are both scientists. It would insult you to think you would be insulted by my choice of clothing." He smiled and then proceeded to grill me about lasers.
—Daniel Weise, Hertz Fellow 1980



In order to accommodate my observance of the Jewish Sabbath, Wilson Talley agreed to interview me at 7 am Sunday. I got up around 5 am, dressed in my only suit, and called a cab to bring me to the Marriott. Unfortunately, as we approached the hotel at 6:40 am I found that the only money in my wallet was a $100 bill. The cabbie wouldn't accept it, so we turned around to head to a convenience store to get change. I sprinted into the lobby at perhaps 7:02 am, to hear someone on the phone in the lobby saying "My seven o'clock didn't show." I cried "Wait!", introduced myself, apologized, and we sat down to an interview in the hotel lobby. Soon thereafter, the hotel fire alarm went off, and guests began to trickle downstairs in their pajamas. Through it all, we continued the interview. I still remember some of the questions, and the gleeful tone in which Dr. Talley posed scenarios such as stepping off a 20th story window sill, holding a water-filled fishbowl with a float attached to the bottom of the bowl by a spring: does the float rise, sink, or neither as you enter free-fall? I guess I did well enough to intrigue Dr. Talley, and he graciously attributed my nervousness to the fire alarm. I was granted a (presumably rare) second "first interview"—which went much more smoothly—and after a third and final interview I was fortunate enough to be awarded a Hertz Fellowship.

—David Goldhaber-Gordon, Hertz Fellow 1994

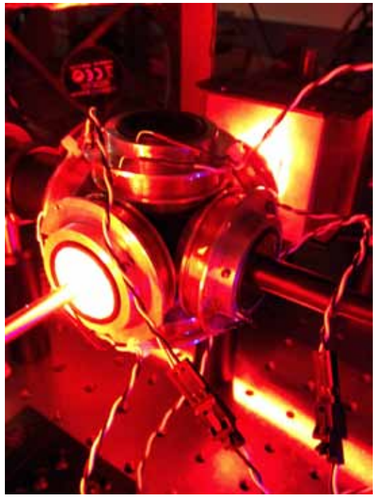


My interview was with Dr. Hans Mark, who at the time was Director of NASA Ames Research Center. Rather than a more traditional interview, what I recall is our having a lengthy and spirited discussion. While an enjoyable and intellectually stimulating conversation, I recall that there were numerous points of both analytical technique and policy perspective on which we clearly did not agree. He was obviously very confident of his opinions and judgment but so was I. I recall thinking that although the conversation had been fascinating, there was no way he was going to recommend me for anything. However, near the end he said something to the effect that he was going to recommend me for the Hertz Fellowship, because obviously I "hadn't learned much at UC Santa Cruz" and Stanford, where I was hoping to pursue my PhD, "would be good for me." I, of course, disagreed on the former, while concurring on the latter. He concluded by reminding me that from the perspective of The Hertz Foundation I was "an experiment" and hoped I would work hard in hopes said experiment would have a positive outcome. It was, and remains, my most memorable, as well as most interesting, interview.

—David Cohan, Hertz Fellow 1976

The interview: It was delightful. I should be proud to interview a candidate like Stearns did. The questions I remember were:
Q: What do you want to do?
A: Without a blink, I said: I want to develop the engines for deep space travel. (For which I had zero training. Over the years, I've come to appreciate the secondary importance of appropriate training compared to desire.)
Q: What kind of music do you like?
A: Shostakovich. This led to the next question.
Q: How about Rubenstein? I went to a concert he gave last evening.
A: Yes, Rubenstein. I like him too.
I was stunned that Stearns let me off the hook regarding music so lightly. Over the years, I've come to see that the most capable people are very relaxed about forgiving such faux pas. Over the years, I appreciate more the accomplishments of my interviewer in the context of the way he conducted the interview. Getting a Hertz changed my life. And meeting people like Robert Stearns (however briefly) as a result of being in the Hertz community has contributed to emboldening me to continue reaching for the stars.

—Robert Burke, Hertz Fellow 1964



A few weeks after my interview, I received a letter from the Foundation that I had not been selected for a Hertz Fellowship. In the late spring of my senior year, the big sporting event was the heavyweight boxing title bout between Cassius Clay (he wasn't yet Muhammed Ali) and Sonny Liston. I was listening to the pre-match commentary on the stereo set in my dorm room when I got a call on the intra-dorm phone that there was an outside call for me. The call was from the administrator of the Foundation advising me that another student had failed to pass his general exam, that I was the runner-up, and that a Hertz Fellowship was mine if I wanted it. I was surprised (stunned might be a better word) and I believe I told her I'd decide quickly, or maybe I accepted on the spot. I no longer remember when I made my decision, but I do remember that when I got back to my dorm room after a two- or three-minute call, the Clay-Liston fight was over—Clay had knocked Liston out in the first round.

—Steve Lipner, Hertz Fellow 1965

INNOVATION

Photo by: Lianne Milton

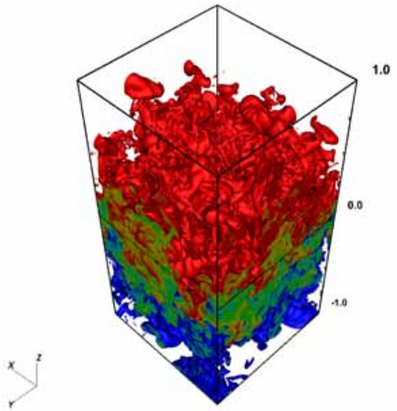
INNOVATION

CREATING SOLUTIONS WITH WORLD CHANGING OUTCOMES

Innovation—and the creativity that fuels it—requires a freedom unhampered by financial concerns, uninhibited by grant funding dictates, and independent of academic trends. Integral to the Hertz Fellowship is access to the Hertz Fellows Community with a set of collaborators across all disciplines and technologies. The Hertz Fellows meet at their disciplinary boundaries, and pull one another across those boundaries. Innovation is enhanced, expanded, and accelerated.

Five decades ago the elderly might struggle with makeshift canes, now they can wear devices in their shoes to measure and aid their balance. Once the hope was to launch just one satellite into space, now many satellites in orbit help with daily tasks like personal navigation, financial transactions, and communication for business and entertainment. Where once major exploratory surgery had to performed to learn of a disease, we now can image non-invasively and better understand the illness or injury.

Freedom to innovate is not just a slogan. Freedom is the lifeblood of innovation. The impulse to create, explore, and improve thrives on freedom and wise support. The financial support Hertz Fellows receive is returned abundantly to society at large. One might say it is the best of investments. These biographies that follow are examples of that return on investment.



"If you have an engineer look at a problem, you'll get an engineering solution.

If you have a medical researcher look at a problem, you'll get a medical solution.

If you have the two of them look together, you'll get a patent."

—Lee T. Todd

ALFRED SPECTOR

Alfred Spector, Hertz Fellow 1977, joined Google in 2007, where he leads research, open source, university relations, internationalization, engineering for Google.Org, and many education initiatives. Previously, Spector was Vice President of Strategy and Technology at IBM's Software Business, and prior to that, he was IBM's Vice President of Services and Software Research. He founded Transarc Corporation, was a pioneer in distributed transaction processing and wide area file systems, and was an Associate Professor of Computer Science at Carnegie Mellon. Spector received his PhD from Stanford and his Bachelor's from Harvard. He is a member of the National Academy of Engineering and a Fellow of the American Academy of Arts and Sciences, the IEEE, and the ACM. In 2001, Spector received the IEEE Computer Society's Tsutomu Kanai Award for work in scalable distributed systems.

FAVORITE QUOTE: "The only thing constant is change." —Heraclitus

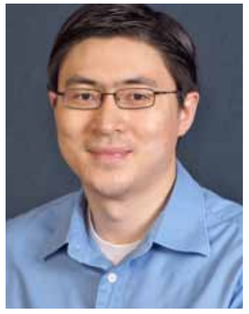
SPARKS MY CREATIVITY: An important problem, and preferably one that I can attack either by transforming a solution from another domain, or by combining/hybridizing multiple approaches.

LILY KIM

Lily Kim, Hertz Fellow 1998, is Associate Director of Platform Development at the Wyss Institute for Biologically Inspired Engineering at Harvard University, where she focuses on technology translation and commercialization strategy. Before joining the Wyss, she was a consultant advising global pharmaceutical, biotechnology, and medical device firms on developing strategy and identifying and evaluating market and product opportunities. Lily founded and leads FluidicMEMS, a resource for the New England microfluidics innovation cluster that brings together academia and industry via an event series and a blog. She also serves on the MIT Enterprise Forum and was selected as one of Mass High Tech's "Women to Watch" in 2013. Lily holds a PhD in Biomedical Engineering from the Harvard–MIT Division of Health Sciences and Technology and an SB in Electrical Engineering from MIT.

"Being part of the Hertz Community is one of the best things that's happened to me. It means building lifelong relationships with some of the most amazing people ever—the Hertz Community is energetic, intellectual, caring, playful, inventive, supportive, optimistic, astounding!"

SPARKS MY CREATIVITY: Randomness! I love juxtaposing seemingly unrelated fields, ideas, problems and finding ways to tie them together.



MUNG CHIANG

Mung Chiang, Hertz Fellow 1999, is an outstanding researcher with the additional attribute of being a dedicated teacher too. He is the Arthur LeGrand Doty Professor at Princeton University. He has won several prestigious awards, including the 2013 Waterman Award from NSF for young researchers, which cites Dr. Chiang for his fundamental contributions to the analysis, design and performance optimization of wireless networks. For his textbook and contribution to education, he received the 2013 Terman Award from the American Society of Engineering Education. He has also had a deep impact on the development of communications networks, through technology transfer to industry and startup companies.

FAVORITE QUOTE: "What does not kill me makes me stronger"—Friedrich Nietzsche

SPARKS MY CREATIVITY: Reading books unrelated to my own study—biography and poetry

"The Hertz Fellowship was crucial in allowing me to have the support to explore research topics that excited me most, which turned the luxury of intellectual freedom to a reality of daily life since my PhD years."

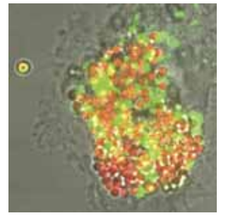
—Mung Chiang

MICHAEL MONTEMERLO

Michael Montemerlo, Hertz Fellow 1997, has a cure for the commuter blues. He made contributions to the field of efficient probabilistic methods for mobile robots. He attended Carnegie Mellon University, where he earned his Bachelor's and Master's Degrees in 1997, and PhD in 2003. His thesis advisors were William L. Whittaker and Sebastian Thrun, both of whom would direct the winning teams in the DARPA Grand Challenge. Under Thrun, Montemerlo became leader of the team at Stanford University that wrote the software for Stanley, an autonomous Volkswagen that won the 2005 DARPA Grand Challenge ahead of four other autonomous cars finishing the course. He is a Senior Software Engineer at Google.

"It (The Hertz Fellowship) gives you a chance by exposing you to all these people and different possible paths…to think about what you can be."

—Yun William Yu



AMY ALVING

Dr. Amy Alving, Hertz Fellow 1986 and former Hertz Director, has a diverse background in government and academia, with over 20 years of accomplishments in the areas of technology and national security. She is the Chief Technology Officer at Science Applications International Corporation, where she is responsible for SAIC's technical and scientific vision and strategy. She also serves on the Board of Directors for Pall Corporation (NYSE: PLL), a global filtration and separation provider. Dr. Alving was a White House Fellow (1997–1998) serving at the Department of Commerce. Prior to that, she was an Associate Professor of Aerospace Engineering at the University of Minnesota. Dr. Alving graduated from Stanford University with a BS in Mechanical Engineering and from Princeton University with a PhD in Mechanical and Aerospace Engineering.

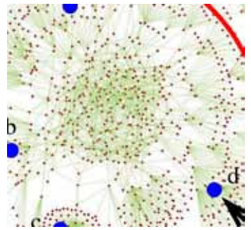
SPARKS MY CREATIVITY: Important, hard problems

L. CURTIS WIDDOES, JR.

Curt Widdoes, Hertz Fellow 1973, is widely recognized as a pioneer of the Electronic Design Automation (EDA) industry. Curt's career began at Lawrence Livermore National Laboratory, as Technical Director of the S-1 Project. There, he co-developed the original Structured Computer-Aided Logic Design (SCALD) software and used it to design advanced computers. In 1984 Curt and another Hertz Fellow, Thomas McWilliams, received the IEEE W. Wallace McDowell Award for developing the SCALD methodology. In 1981, Curt co-founded Valid Logic Systems based on the SCALD technology (IPO 1983). In 1987, he founded Logic Modeling Systems, which developed advanced hardware-modeling technology (acquired by Synopsys). In 1996, he co-founded 0-In Design Automation, which pioneered assertion-based verification for design of integrated circuits (acquired by Mentor Graphics). Curt holds a BS in Engineering and Applied Science from California Institute of Technology and a PhD in Computer Science from Stanford University.

"As I compete for all sorts of young faculty awards I feel that the Hertz Fellowship gives me a distinct advantage. Interacting with the Hertz Fellows has also challenged me to think big and to constantly push my boundaries and has completely changed the way I do science."

—Julius Lucks

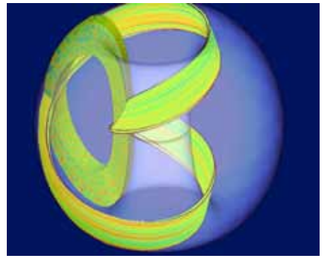


DAVOR SUTIJA

Imagine the possibility of the Internet of Things, by bringing intelligence to disposable goods. Dr. Davor Sutija, Hertz Fellow 1987, CEO of Thinfilm Electronics ASA, is leading the development of printed electronics and printed rewritable memory. Davor's vision is a world where every item is tagged with memory and sensors, harvesting information that then can be gathered at leisure, whether to integrate memory into toys or collectible cards, to detect product authenticity, or to source ingredients from farm to fork. Davor also worked at Microsoft, FAST, and the Renewable Energy Corporation ASA. He is a PhD graduate from UC Berkeley in Chemical Engineering, where he developed novel microsensors.

"We hope to build a Lord of the Rings experience… in the books, every stone and tree has a distinct personality. That world seems magical because inanimate objects are intelligent. With our technology (Thinfilm), we can do the same thing—which allows us to live in a more connected world."

— Davor Sutija



MIKHAIL SHAPIRO

Mikhail Shapiro, Hertz Fellow 2004, is currently a Miller Fellow at UC Berkeley, and will move to Caltech this fall to become an Assistant Professor of Chemical Engineering. His research is focused on developing technologies to image and control brain activity at the molecular level using penetrant forms of energy, such as magnetic fields and sound waves. Mikhail received a BSc in Neuroscience from Brown, a PhD in Biological Engineering from MIT and was a post-doctoral fellow in biophysics at the University of Chicago. In addition to his research interests, Mikhail has been active in entrepreneurship, serving as Co-Founder of the brain-computer interface company Cyberkinetics and a venture principal at Third Rock Ventures. Mikhail has been recognized by the Hertz, Miller, Soros and LSRF Fellowships and the Hertz Thesis Prize, and in 2010 was chosen by the *Technology Review* as a top innovator under 35 years old (TR35).

FAVORITE QUOTE: "Cowards die many times before their deaths; the valiant never taste of death but once." —Shakespeare's *Julius Caesar* (Act II, Scene 2)

LINDA L. CLEMENTS

Linda L. Clements, PhD, Hertz Fellow 1971, is Co-Founder and CEO of Nevada Composites, a leading manufacturer of rapid, low-cost, eco-friendly tooling for composites. Dr. Clements has more than 30 years experience in composite materials, specializing in management, tooling, composites processing and manufacturing, materials selection and characterization. Previously Dr. Clements has been a technical government liaison, director of materials R&D, headed a materials and process consulting firm, served as a professor of materials engineering, held engineering, manufacturing and project leader positions and worked on such diverse programs as military and commercial aerospace, space programs, weapons systems, and alternative energy. Linda received a BS with distinction in Materials Science from Stanford University, MSE in Metallurgy and Materials Engineering from University of Pennsylvania, and PhD in Materials Science and Engineering from Stanford University.

FAVORITE QUOTES: "Find a way…make a way."

"You can never predict where brilliance will appear. The key to brilliance is often opportunity, not background, nor any other factor. The Hertz Foundation provided me opportunity; I've tried to pass it on."

—Linda Clements

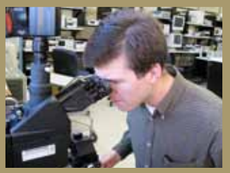
GREG TAYLOR

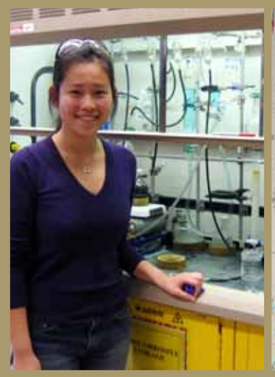
Greg Taylor, Hertz Fellow 1981, is an Intel Fellow and director of the SoC Design Lab in the Integrated Platforms Research Lab in Intel Labs. His interests include Systems on a Chip, Analog/Mixed Signal circuits, and Wireless. Taylor joined Intel in 1991 and has held several senior design engineering positions working on 10 generations of microprocessors including members of Intel's Pentium®, Pentium® II,Pentium® III, and Intel NetBurst® microarchitecture families. Prior to joining Intel, he worked as a principal engineer at Bipolar Integrated Technology.

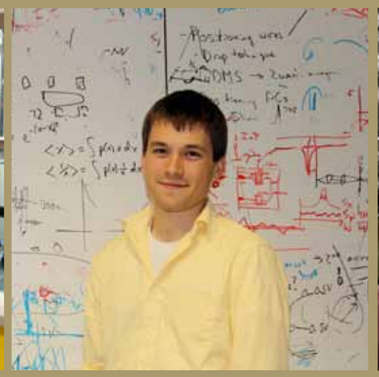
Taylor has received an Intel Achievement Award for his work on deploying advanced packaging. He has published over 60 papers and holds over 60 patents on integrated circuit design and test. Taylor is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE). Taylor received his Doctorate in Computer and Systems Engineering in 1985 from Rensselaer Polytechnic Institute.

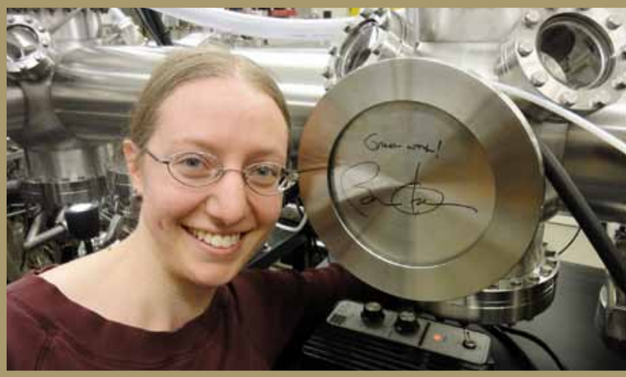
FAVORITE QUOTE: "Don't be encumbered by history. Go off and do something wonderful."

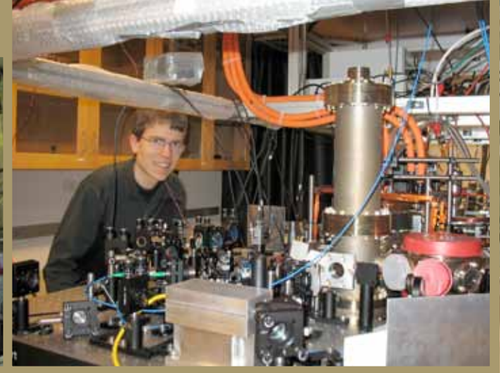
—Robert Noyce

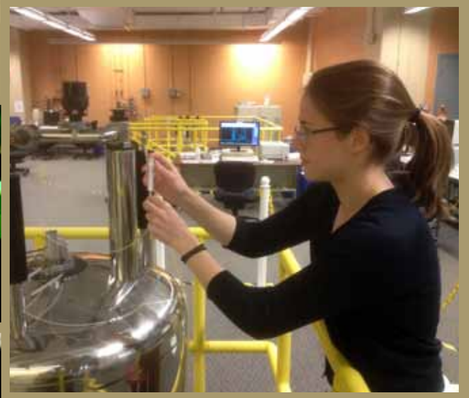




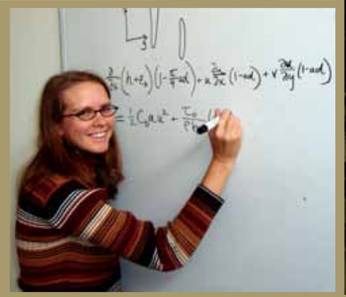









ED RICHLEY

Ed Richley, Hertz Fellow 1979, is the Chief Scientist at Zebra Technologies' Zebra Enterprise Solutions Division. Most recently Ed has worked on developing short-pulse technology for tracking of valuable assets. Prior to this he was at the Xerox Palo Alto Research Center developing various technologies for displays, printing, and mobile computing. His research background includes the development of computational algorithms for the analysis of electric arcs, glow discharges, and ionic fluids. Ed received his PhD from Carnegie-Mellon in 1984, MS in 1980, and BS in 1979 also from CMU. In his off-hours, Ed is an avid biker.

FAVORITE QUOTE: "Don't look back. Something might be gaining on you." —Satchel Paige

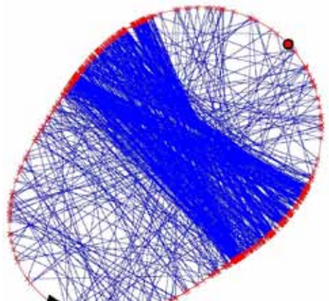
SPARKS MY CREATIVITY: Situations where conventional wisdom leads to an impasse or a contradiction.

ASTRO TELLER

Dr. Astro Teller, Hertz Fellow 1994, currently oversees Google[x], Google's moonshot factory for building magical, audacious ideas that through science and technology can be brought to reality. His official title is Captain of Moonshots. Astro is Co-Founder of Cerebellum Capital, Inc., a hedge fund management firm whose investments are continuously designed, executed, and improved by a software system based on statistical machine learning. Astro is also Co-Founder of BodyMedia, Inc., a leading wearable body monitoring company. Teller has successfully created and grown five companies and holds numerous U.S. patents.

Before his tenure as a business executive, Astro taught at Stanford University and was an engineer and researcher for Phoenix Laser Technologies, Stanford's Center for Integrated Systems, and The Carnegie Group Incorporated. Teller holds a BS in Computer Science from Stanford University, MS degrees in Symbolic and Heuristic Computation also from Stanford University, and a PhD in Artificial Intelligence from Carnegie Mellon University. He is a leading speaker on the future of intelligent technology.

"The Hertz Foundation introduced me to an inspiring community of innovators that motivates me to be continuously learning."
—Eric Hoke



The Hertz Thesis Prize Award

Each Hertz Fellow is required to furnish the Foundation with a copy of his or her doctoral dissertation upon receiving their PhD. The Foundation Thesis Prize Committee examines the PhD dissertations completed by Hertz Fellows during the preceding academic year for their overall excellence and pertinence to high-impact applications of the physical sciences. Some years there are no Thesis Prize winners; in other years more than one Prize is awarded.

1981	Sherman Chan	*Small Signal Control of Multiterminal DC/AC Power Systems*
1981	Peter Hagelstein	*Physics of Short Wavelength Laser Design*
1981	Charles Leiserson	*Area-Efficient VLSI Computation*
1981	Thomas McWilliams	*Verification of Timing Constraints on Large Digital Systems*
1982	P. Michael Farmwald	*On the Design of High Performance Digital Arithmetic Units*
1982	L. Curtis Widdoes	*Automatic Physical Design of Large Wire-Wrap Digital Systems*
1983	Emanuel Sachs	*Edge Stabilized Ribbon Growth; A New Method for the Manufacture of Photovoltaic Substrates*
1984	Michel Floyd	*Single-Step Optimal Control of Large Space Structures*
1984	David Tuckerman	*Heat Transfer Microstructures for Integrated Circuits*
1984	Andrew Weiner	*Femtosecond Optical Pulse Generation and Dephasing Measurements in Condensed Matter*
1985	Stephen Boyd	*Volterra Series: Engineering Fundamentals*
1985	Steven R. Hall	*A Failure Detection Algorithm for Linear Dynamic Systems*
1985	W. Daniel Hillis	*The Connection Machine*
1986	Joel Fajans	*Radiation Measurements of an Intermediate Energy Free Electron Laser*
1986	Lawrence West	*Spectroscopy of GaAs Quantum Wells*
1987	Douglas Bowman	*High Speed Polycrystalline Silicon Photoconductors for On-Chip Pulsing and Gating*
1987	Brian Heffner	*Switchable Optical Fiber Taps Using the Acousto-Optic Bragg Interaction*
1987	Dale Stuart	*A Guidance Algorithm for Cooperative Tether-Mediated Orbital Rendezvous*
1987	Aryeh Weiss	*Real Time Control of the Permeability of Crosslinked Polyelectrolyte Membranes to Fluorescent Solutes*
1988	K. Peter Beiersdorfer	*High-Resolution Studies of the X-Ray Transitions in Highly Charged Neonlike Ions on the PLT Tokamak*
1988	Michael Reed	*Si-SiO2 Interface Trap Anneal Kinetics*
1988	Eric Swartz	*Solid-Solid Thermal Boundary Resistance*
1989	W. Neil McCasland	*Sensor and Actuator Selection for Fault-Tolerant Control of Flexible Structures*
1990	Scott Rakestraw	*Monoclonal Antibody-Targeted Laser Photolysis of Tumor Tissue*
1990	H. Paul Shuch	*Near Midair Collisions as an Indicator of General Aviation Collision Risk*
1992	Robert Barrett	*Development and Applications of Atomic Force Microscopy*
1992	Kenneth Shepard	*Electron Transport in Mesoscopic Conductors*

The Hertz Thesis Prize Award

1994	Richard Braatz	*Robust Loopsharing for Process Control*
1996	Andrew Miklich	*Low-Frequency Noic in High-Tc Superconductor Josephson Junctions, SQUIDS, and Magnetometers*
1996	Krishna Shenoy	*Monolithic Optoelectronic VLSI Ciruit Design and Fabrication for Optical Interconnects*
1997	Eli Glezer	*Ultrafast Electronic and Structural Dynamics in Solids*
1997	Deirdre Olynick	*In-Situ Studies of Copper Nano-Particles Using a Novel Tandem Ultra-High Vacuum Particle Production Chamber Transmission Electron Microscope*
1999	Andrew Thiel	*Detection of DNA Hybridization to Oligonucleotide Arrays on Gold Surfaces Using In Situ Surface Plasmon Resonance and Fluorescence Imaging Techniques*
2000	Joseph Thywissen	*Internal State Manipulation for Neutral Atom Lithography*
2001	Krishna Nayak	*Fast Cardiovascular Magnetic Resonance Imaging*
2002	Daniel Steck	*Quantum Chaos, Transport, and Decoherence in Atom Optics*
2003	David Kent	*New Quantum Monte Carlo Algorithms to Efficiently Utilize Massively Parallel Computers*
2004	Youssef Marzouk	*Vorticity Structure and Evolution in a Transverse Jet with New Algorithms for Scalable Particle Simulation*
2005	Cameron Geddes	*Plasma Channel Guided Laser Wakefield Accelerator*
2006	Edward Boyden	*Task-Specific Neural Mechanisms of Memory Encoding*
2007	Lilian Childress	*Coherent Manipulation of Single Quantum Systems in the Solid State*
2007	Christopher Loose	*The Production, Design, and Application of Antimicrobial Peptides*
2007	Cindy Regal	*Experimental Realization of BCS-BEC Crossover Physics with a Fermi Gas of Atoms*
2008	Alexander Wissner-Gross	*Physically Programmable Surfaces*
2009	Paul Podsiadlo	*Layer-by-Layer Assembly of Nanostructures Composites: Mechanics and Applications*
2009	Mikhail Shapiro	*Genetically Engineered Sensors for Non-Invasive Molecular Imaging using MRI*
2010	Erez Lieberman-Aiden	*Evolution and the Emergence of Structure*
2011	Anna Bershteyn	*Lipid-Coated Micro- and Nanoparticles as a Biomimetic Vaccine Delivery Platform*
2011	Kevin Esvelt	*A System for the Continuous Directed Evolution of Biomolecules*
2011	Monika Schleier-Smith	*Cavity-Enabled Spin Squeezing for a Quantum-Enhanced Atomic Clock*
2012	Dario Amodei	*Network-Scale Electrophysiology: Measuring and Understanding the Collective Behavior of Neural Circuits*
2012	Vincent Holmberg	*Semiconductor Nanowires: From a Nanoscale System to a Macroscopic Material*
2012	Daniel Slichter	*Quantum Jumps and Measurement Backaction in a Superconducting Qubit*

Photo by: Steve McConnell, UC Berkeley

IMPACT

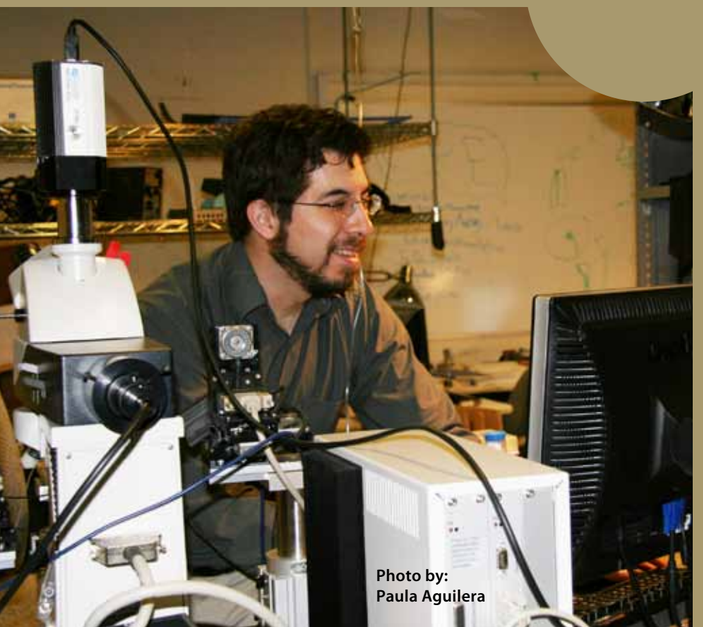


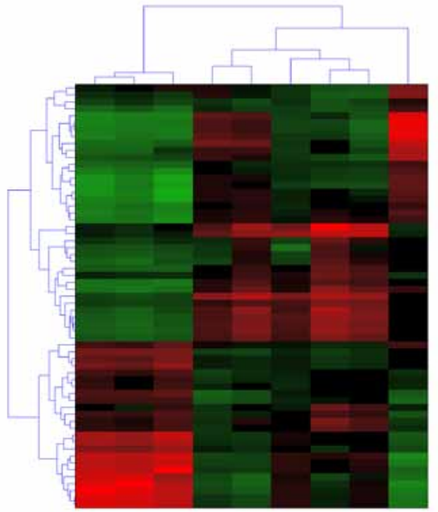
Photo by:
Paula Aguilera

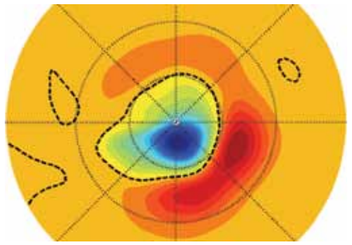
IMPACT

TRANSFORMING IDEAS INTO BENEFITS FOR HUMANITY

The influence of Hertz Fellows is impressive. Their ideas, their passion, their enterprise, their commitment, their enthusiasm and their innovative work serve the nation in many important ways. Since 1963, more than 1,100 scientists and engineers have received the Hertz Fellowship, making exceptional contributions in many fields.

It is impossible to measure the impact of 1,100 Hertz Fellows in one simple way. In the examples that follow, we see the reach of their impact. In the 1960s we grappled with gravity to get to outer space. Hertz Fellow Eric Boe piloted a Space Shuttle. Fifty years ago, few scientists visualized inklings of what might be DNA. Hertz Fellow Erez Lieberman has discovered how DNA folds into a cell's nucleus without getting tangled. In the early years of the space race, we explored the moon. Hertz Fellow John Mather won the Nobel Prize for measuring the background radiation that confirms the big-bang theory. Every day, hundreds of Fellows enter their labs or offices to make the small but essential steps that lead to big discovery.





"The Hertz Fellowship was transformational. The technical depth it helped me pursue was crucial to earning credibility with the founders and inventors of GPS."

—Major General William N. McCasland

NATHAN MYHRVOLD

"One good idea can change the world forever."

Nathan Myhrvold, 1979 Hertz Fellow, has dedicated his career to fostering the spirit of innovation and to reshaping the ways in which inventions are defined and applied to society at large.

Nathan is the Founder and CEO of Intellectual Ventures (IV), a private equity and venture capital firm focused on building and growing an invention marketplace. Additionally, IV brings together the world's brightest minds to collaborate on pioneering solutions to some of the world's most systematic problems. Among the cutting edge projects IV is researching are the climate impacts of zero-emission micro-nuclear reactors and the life-saving capabilities of mosquito zapping lasers that can prevent the spread of malaria.

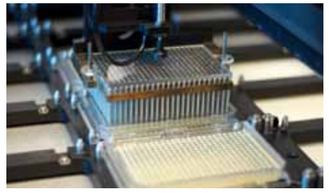
Before founding IV, Nathan spent 14 years at Microsoft serving as its Chief Strategist and Chief Technology Officer. Prior to his time at Microsoft, Myhrvold worked under Dr. Stephen Hawking at Cambridge University during which time he completed his postdoctoral fellowship in applied mathematics and theoretical physics. As a Hertz Fellow, Nathan earned his Doctorate in Theoretical and Mathematical Physics and his Master's Degree in Mathematical Economics from Princeton University. Additionally, Nathan earned Master's Degrees in Geophysics and Space Physics, and his Bachelor's Degree in Mathematics from UCLA. To date, he has been awarded hundreds of patents and has hundreds of patents pending.

Inventing is not Nathan's only passion. He is also a world-renowned paleontologist, an accomplished photographer and an acclaimed master chef. His co-authored cookbook series, *Modernist Cuisine*, has won awards for "Cookbook of the Year" and "Cooking from a Professional Point of View" from the James Beard Foundation.

"Most ideas will fail, and I am completely OK with that. Inventing is not a game where you should count misses or strikes. Inventing is about the power of the idea."

"As my thesis committee has noted, the work I'm pursuing is ambitious with a high potential for reward. By having the Foundation's support, I've been able to take on this longer-term, higher-risk work without detracting from our small lab's financial or scientific welfare."

—Joshua Waitzman



JOHN MATHER

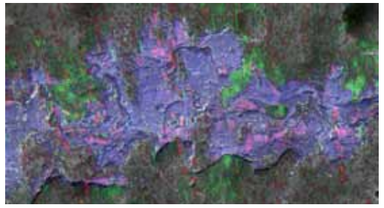
John Mather, Hertz Fellow 1970, won the 2006 Nobel Prize in Physics for his work on the Cosmic Background Explorer Satellite (COBE) with George Smoot. This work helped cement the big-bang theory of the universe. John is an astrophysicist and cosmologist who received his BA in Physics from Swarthmore College and, as a Hertz Fellow, received his PhD From UC Berkeley. In 2007, Mather was listed among *Time* Magazine's 100 Most Influential People in the World. In October 2012, he was listed again by *Time* Magazine in a special issue on "New Space Discoveries" as one of 25 most influential people in space. Mather is the project scientist for the James Webb Space Telescope, a space telescope to be launched to L2 no earlier than 2018.

FAVORITE QUOTE: "You never know how far you can get, so you might as well start!"

SPARKS MY CREATIVITY: Conversation with other people working on unsolved problems.

"The Hertz Fellowship gave me the confidence to pursue the work that led to the Nobel Prize. Pretty good, eh! And the honor was significant in helping others to support my work as well."

—John Mather



CARL WIEMAN

Carl Wieman's persistence served him well in pursuing the research that resulted in winning the 2001 Nobel Prize in Physics, with Eric Allin Cornell and Wolfgang Ketterle, for the production of the first true Bose-Einstein condensate. Carl served as Associate Director for Science in President Obama's White House Office of Science and Technology from 2010 to 2013. In 2004, he was named United States Professor of the Year among all doctoral and research universities. Carl, Hertz Fellow 1973, is recognized as a national leader and advocate to improve undergraduate science education and science instruction. His research delves into detailed analysis of how scientists think, and how to most effectively teach this scientific thinking. Carl earned a BS from MIT in 1973, and his PhD from Stanford in 1977. In a 2007 interview with the Nobel committee, Carl describes his life perspective on his all-consuming passions—including science, chess, and tennis. "My view of everything is that you become good at something by focusing and working hard at it."

Peter Strauss Award Recipients

JOHN STOCKTON, 2012 Award

John Stockton, Hertz Fellow 2000, co-founded two companies after a postdoc building atom interferometers at Stanford. Entanglement Technologies designs ultra-sensitive trace gas detectors using advanced technology borrowed from the quantum optics lab, for a variety of applications including natural resource detection and pollution monitoring. Stockton's second company, quantiFind, provides predictive analytics to a range of customers, including scientific publishers, most major movie studios, and large telecom providers. quantiFind produces actionable intelligence by consuming massive amounts of unstructured social data and viewing it in the context of bottom-line financial data. Stockton was awarded The Hertz Foundation 2012 Peter Strauss Award. John is a graduate of California Institute of Technology with a PhD in Physics.

SPARKS MY CREATIVITY: An unanswered old question and a green field of new data.

CHRISTOPHER LOOSE, 2011 Award

Christopher Loose, Hertz Fellow 2003, represents the next wave of talent and commitment in the Boston area economy as one of "40 Boston Business Leaders under 40." He is the Co-Founder and Senior Director of Technology Development at Semprus BioSciences. The company develops medical and industrial products that can reduce infection, clotting, and fouling. Semprus BioSciences is a forty-person company, recently acquired by Teleflex Inc. In 2012, Semprus received FDA approval and European approval of the first Semprus medical device: a vascular catheter with reduced thrombus accumulation (clotting). Chris earned his PhD in Chemical Engineering at MIT and was awarded The Hertz Foundation 2007 Thesis Prize. He also was honored with The Hertz Foundation 2011 Peter Strauss Award.

SPARKS MY CREATIVITY: 1) Meeting with doctors and nurses and listening to the problems they face in their day to day work. 2) Trying to get our young son to go back to sleep at 3 am.

"Over the years, I have noted the astonishing number of companies formed by Hertz Fellows while in school or promptly upon graduating. Some Fellows have formed companies even within the interval between their undergraduate and graduate schools. I've long wanted to show my support for these new ventures. It is extremely gratifying to see how far we've come today."

–Harold Newman, Hertz Director

Peter Strauss Award

The Peter Strauss Award was established in 2011 by Harold Newman, Hertz Director, in honor and remembrance of his long time professional associate and friend, Peter Strauss. Peter was a Hertz Director and a financial advisor to the Foundation for many decades.

The annual prize includes a $5,000 award. The award winners must meet one or more of the following criteria:

- Either be an In School Hertz Fellow or recently graduated in less than five years
- Awarded major patents
- Established significant licensing agreements
- Engineered a new start-up company
- Won major national recognition for his/her invention

RECIPIENTS

2012 JOHN STOCKTON, Hertz Fellow 2000

Entanglement Technologies and quantiFind

2011 CHRISTOPHER LOOSE, Hertz Fellow 2003

Semprus BioSciences, formerly known as SteriCoat

PETER STRAUSS

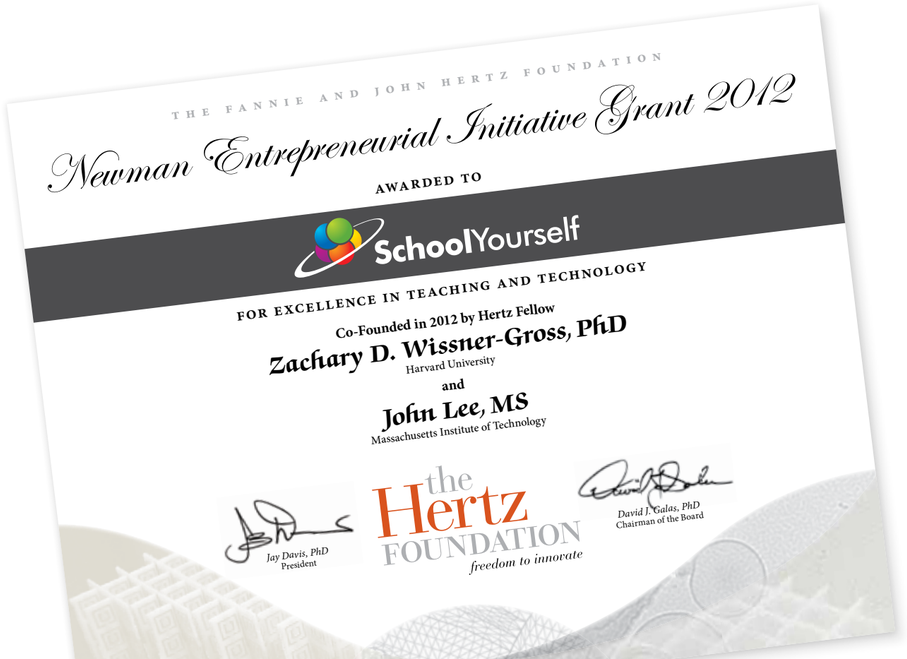
Peter Strauss was a Hertz Director, and Partner at Neuberger Berman. He was a highly successful investment manager. As a United States Marine during World War II, he was decorated in combat and was one of three Marines who accepted the Japanese forces surrender to China at the end of the War. After graduating from Yale, Peter had intended to enter the medical profession, but his wartime service pushed that aside, and he became a financial manager, tending to the health needs of people's investments. He retained a strong and incisive interest in national security matters.

Newman Entrepreneurial Initiative Grant Recipient

ZACHARY WISSNER-GROSS

Zachary Wissner-Gross is re-imagining education. His startup, School Yourself, offers transformative, interactive math and science learning experiences. Zach and School Yourself Co-Founder John Lee are the inaugural winners of the Newman Entrepreneurial Fund Grant. Zach, Hertz Fellow 2007, completed his PhD in Physics at Harvard, where he won the White Award for Excellence in Teaching. Zach attended MIT, where he majored in Physics and Biology with minors in Chemistry and Mathematics, graduating Phi Beta Kappa. Zach believes School Yourself combines his passion for teaching with his fascination with how games engage people.

SPARKS MY CREATIVITY: I love taking subjects or concepts that most people find challenging or even incomprehensible, and breaking those concepts down so that others can understand them and then build upon their new knowledge. Doing this kind of work is often really, really hard, and requires lots of creativity and some great teamwork.



Newman Entrepreneurial Initiative Grant

The Newman Entrepreneurial Initiative Grant was established by an endowment from Harold J. Newman, Hertz Foundation Director and generous donor, to allow the Foundation to support entrepreneurial efforts by Hertz Fellows.

The Newman Entrepreneurial Initiative Grant provides individual investments of up to $25,000, with a particular emphasis on collaborative activities among Fellows. Investments by the Newman Grant are intended to be a one-time funding event, but in extraordinary cases the continuation of investments will be considered. In the spirit of The Hertz Foundation, this support comes without strings, but with the expectation that as these ventures grow and develop, The Hertz Foundation may share in their economic success.

Any Hertz Fellow in good standing with the Foundation may propose a project for funding. Preference is given to Fellows In School or the early years of their careers.

RECIPIENT

2012 ZACHARY WISSNER-GROSS, Hertz Fellow 2007

School Yourself

HAROLD J. NEWMAN

Harold J. Newman has been a valued member of the Hertz Board of Directors for over 20 years. He founded HJ Newman Capital, LLC, after being at Neuberger Berman as Partner and Managing Director for over 33 years. In addition, he is a Trustee and Chairman of the Investment Committee of the Asia Society; he participates on the International Program Committee at the University of Oklahoma which brings together members from the U.S. State Department and their equivalent in China for annual informal gatherings. Harold is active at the New York Historical Society serving on the Chairman's Council, sponsoring a series called, "The World Beyond Tomorrow" with his wife Ruth. Harold also serves on the Board of a non-profit off-Broadway theater group and he is involved in producing Broadway shows, most recently "In the Heights."

Harold graduated with a BS in Geography from University of Oklahoma in 1951; received a MA from the School of South Asian Studies, University of Pennsylvania in 1953; and received an MBA from Harvard Business School in 1957. He served in the US Army in Strategic Intelligence from 1953-1955. In his free time, Harold enjoys ballroom dancing with his lovely wife Ruth.

ERIC BOE

Colonel Eric Boe, Hertz Fellow 1987, NASA Astronaut, has truly taken the spirit of the Hertz Fellowship out of this world. As the pilot of the Space Shuttle Endeavour in 2008, he carried aboard a large Hertz flag, printed with over 1,000 names from the Hertz Community.

Boe made his first trip to space as the pilot of Space Shuttle Endeavour in 2008. Boe piloted his second space flight for the final mission of Space Shuttle Discovery in 2011. The Discovery mission to the International Space Station (ISS) was accomplished in 202 Earth orbits, traveling 5.3 million miles.

Eric is Deputy Chief of the Astronaut Office. He is a graduate of the US Air Force Academy with a BS in Astronautical Engineering and earned a Master's in Electrical Engineering from Georgia Institute of Technology.

FAVORITE QUOTE: "It's not whether you get knocked down, it's whether you get up."
—Vince Lombardi

DAVID THOMPSON

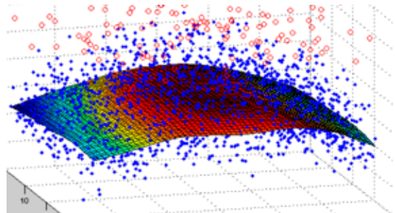
David Thompson, Hertz Fellow 1977, is the Chairman, CEO and President of Orbital Sciences Corporation. As a Co-Founder of the company over 30 years ago, he has led Orbital from a three-person start-up to one of the world's leading space technology enterprises, with approximately $1.5 billion in annual revenues and 3,700 employees.

Before co-founding Orbital in 1982, Mr. Thompson was Special Assistant to the President of Hughes Aircraft Company's Missile Systems Group. As a college student, he worked on the first Mars Landing missions at Caltech's Jet Propulsion Laboratory.

Thompson was awarded the National Medal of Technology and is a member of the National Academy of Engineering, among many other honors. He received a Bachelor's Degree from MIT in Aeronautics and Astronautics, a Master's Degree in Aeronautics from California Institute of Technology, as well as an MBA from Harvard Business School.

FAVORITE QUOTE: "It is better to attempt great things and sometimes fail, than to attempt nothing and always succeed." —Theodore Roosevelt

"I had no idea that there were so many forward-looking people in the world that could come together to do real things!"
—Maria Monks

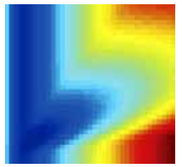


PHILIP ECKHOFF

Philip Eckhoff knows first hand what it is like to be afflicted by malaria. He contracted the disease frequently as a child growing up in Haiti. Today, his considerable acumen in applied and computational mathematics serves a mission to support global eradication of the disease. Philip, Hertz Fellow 2004 and Hertz Director, is currently Principal Investigator of the Epidemiological Modeling (EMOD) team at Intellectual Ventures. Working for the CEO of Intellectual Ventures and Hertz Fellow, Nathan Myhrvold, Eckhoff's team includes several Hertz Fellows and a variety of other experts. Their dedication is focused towards how they can support developing world clinical and public health workers in the field to advance global health breakthroughs through computation modeling of disease transmission for malaria, polio, HIV, and TB. Philip also serves as an external advisor to Gates Foundation programs in Agriculture, Water Sanitation and Hygiene, Nutrition, Family Planning, and Vaccine Delivery.

SPARKS MY CREATIVITY: Seeing public health challenges first-hand in the field, seeing innovative ideas applied to these challenges, and working side-by-side with creative people.

"With people of this caliber, and this degree of intensity and ambition—and a community of those people that are willing to help one another—that's extraordinary."
—David Galas



MARGARET "MEG" FELS In Memory 2011

Margaret Fels (Meg) blazed a trail as the first woman to become a Hertz Fellow in 1966. She received her PhD from the University of California, Davis/Livermore. As much as she loved atomic physics, she fought to avoid work that supported nuclear weapons and their development. She pursued theoretical physics and found her way into the nascent field of energy conservation in the 1970s. She worked at Princeton's Center for Energy and Environmental Studies for almost three decades, during which time she briefly joined Princeton's engineering school faculty. She left her faculty position to research computer technology applications to statistically model and analyze energy use and conservation. Meg created the Princeton Scorekeeping Method (PRISM), which became the national standard-bearer in energy efficiency scoring for over a decade. At Princeton, Meg was instrumental in leading programs to build elementary school teachers' and Princeton undergraduates' competence and confidence in teaching math and science.

LEE T. TODD, JR.

Dr. Lee Todd attended the Massachusetts Institute of Technology as a Hertz Fellow in 1968 where he received his MS and PhD degrees. His research in large-screen, projection displays resulted in six U.S. patents. Todd taught at the University of Kentucky (U.K.) until he left to begin two companies. Projectron was purchased by Hughes Aircraft; and DataBeam Corporation was purchased by I.B.M. Todd then became Senior VP of I.B.M.'s Lotus Development Company in charge of collaboration products. For ten years, Todd served as the eleventh President of the University of Kentucky, significantly increasing enrollment, budget resources, research projects, and faculty start-up company growth. In 2009, U.K. ranked 6th in start-up companies among all U.S. universities. Presently he is a Professor of Electrical Engineering at U.K. Todd continues to provide valuable leadership for K-12 STEM education and university start-up company formation as a co-founder of the not-for-profit, Kentucky Science and Technology Corporation.

FAVORITE QUOTE: "Leadership is taking people to where they need to go whether they know it or not."

SPARKS MY CREATIVITY: My creativity is piqued when I discuss a given problem in the presence of others who are from different disciplines. The solution is always more interesting.

ED BOYDEN

Ed Boyden, Hertz Fellow 1999, made the most of his Hertz Fellowship, using the freedom it offered to spend his late nights inventing all sorts of crazy things. One of these technologies, now known as optogenetics, enables the activity of neurons in the brain to be controlled by light. Called "the most important technical advance in neuroscience in the past 40 years," this work won Ed a share of the 1 million-euro Brain Prize, the world's largest award for neuroscience. Ed is an Associate Professor at MIT where his group develops new kinds of neurotechnologies, from brain-analyzing robots to new kinds of synthetic biology reagents. "I'm still a philosopher at heart," he says, when asked why he chose to apply his engineering skills to the brain.

FAVORITE QUOTE: "Whenever you get advice from someone, visualize the consequences of doing the exact opposite, before deciding whether to take the advice."

SPARKS MY CREATIVITY: I think of creativity as an active process, where I cycle between important problems and potential solutions, to aim for a good match between the two. I develop many exercises for people to strengthen their creativity, and also try to facilitate creativity in collaborative settings, important for an omnidisciplinary field like neurotechnology. Also I like to take long walks.

ALICE P. GAST

Dr. Alice P. Gast, the thirteenth President of Lehigh University, is a renowned leader in higher education and a distinguished researcher in the study of surface and interfacial phenomena. She is co-author of *Physical Chemistry of Surfaces*, a classic textbook on colloid and surface phenomena, and has presented named lectures at several of the nation's leading research institutions. In 2010, Dr. Gast was named to the prestigious post of Science Envoy by the U.S. State Department. Additionally, she is a fellow of the American Academy of Arts and Sciences and a member of the National Academy of Engineering. In 2012, Dr. Gast was appointed to the board of directors of Chevron Corporation. Before coming to Lehigh, Dr. Gast was Vice President for Research and Associate Provost at the Massachusetts Institute of Technology. Prior to that, she was a Professor of Chemical Engineering at Stanford University. Dr. Gast was awarded the Hertz Fellowship in 1980.

FAVORITE QUOTE: From the poem, *The Love Song of J. Alfred Prufrock*. —T.S. Eliot
Time for you and time for me,
And time yet for a hundred indecisions,
And for a hundred visions and revisions,
Before the taking of a toast and tea.

SPARKS MY CREATIVITY: Stimulating conversations, lectures, concerts.

EREZ LIEBERMAN-AIDEN

Erez Lieberman-Aiden, Hertz Fellow 2008, is Assistant Professor of Genetics at Baylor College of Medicine and of Computer Science and Applied Mathematics at Rice University. He graduated with a PhD in Applied Mathematics from Harvard University in 2010. Erez invented a method for three-dimensional genome sequencing; he subsequently led the team that, in 2009, reported the first three dimensional map of the human genome. Together with Jean-Baptiste Michel, he developed culturomics, a quantitative approach to the study of history and culture. Erez's research has won numerous awards, including a New Innovator Award from the National Institutes of Health; membership in *Technology Review's* 2009 TR35, recognizing the top 35 innovators under 35; and the President's Early Career Award in Science and Engineering, the highest government honor for young scientists, from Barack Obama. His last three papers have all appeared on the cover of *Nature* and *Science*. His work has also been featured on the front page of *The New York Times*, *The Boston Globe*, and *The Wall Street Journal*.

ALEX FILIPPENKO

Alex Filippenko, Hertz Fellow 1984, is one of the world's most highly cited astronomers and an elected member of the National Academy of Sciences. He was on both teams that discovered (in 1998) the accelerating expansion of the Universe, probably driven by "dark energy." This discovery was honored with the 2011 Nobel Prize in Physics to the team leaders. Filippenko and his group have developed a robotic telescope at Lick Observatory that is conducting one of the world's most successful searches for relatively nearby exploding stars. At UC Berkeley he has been voted "Best Professor" an unprecedented 9 times, and he was the 2006 National Professor of the Year. He appears in about 100 TV documentaries. As part of his passion for travel, he has observed 12 solar eclipses around the world.

FAVORITE QUOTE: "In every man there is an eye of the soul which is purified and re-illuminated (by the study of astronomy), and is more precious by far than 10,000 bodily eyes, for it alone sees truth."—Socrates

SPARKS MY CREATIVITY: A deep desire to contribute to our understanding of the Universe and its contents.

ELAINE KANT

Dr. Elaine Kant, Hertz Fellow 1976, is the Founder and President of SciComp Inc., a technology company that uses software synthesis to automatically generate financial modeling software. Elaine received her undergraduate degree in Mathematics from MIT and her PhD in Computer Science from Stanford University. Before founding SciComp, she taught computer science at Carnegie-Mellon University and worked for Schlumberger in several computer science research groups. Elaine is a Fellow of both the American Association of Artificial Intelligence and the American Association for the Advancement of Science. She has written numerous books, chapters, and technical papers on software synthesis, understanding and automating algorithm design, and scientific computing environments. In addition to her professional work, Elaine is interested in encouraging women in STEM careers and organized the first "Expanding Your Horizons in Science and Mathematics" conference in Austin, Texas.

FAVORITE QUOTE: "Every journey starts with a single step."

BILL WEIHL

Bill Weihl, Hertz Fellow 1979, is currently Director of Sustainability at Facebook since early 2012. His group is directing work on sustainability and energy efficiency across the company, including studying how the Facebook platform and network of over 1 billion members can drive sustainability in the broader world. As a Hertz Fellow at MIT, Bill earned a PhD in Computer Science in 1984. He was Professor of Computer Science at MIT for ten years, receiving tenure in 1992, and leaving for industry in 1994. Building upon on his success in the technology industry, Bill focused on renewable energy, climate change, and environmental issues. In 2006, he joined Google, as Green Energy Czar. In 2009, he was honored by *Time* magazine as one of their "Heroes of the Environment" in recognition of the work he and his colleagues did at Google.

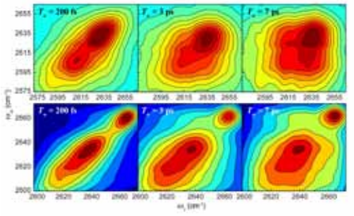
KRISTIN RAUSCHENBACH

Kristin Rauschenbach, Hertz Fellow 1984, is Vice President of Emerging Innovations and a Principal Scientist at Raytheon BBN Technologies. Dr. Rauschenbach's career includes executive leadership, entrepreneurship, scientific research and engineering practice in government, commercial and academic sectors. Her projects combine fundamental scientific exploration with engineering activities that emphasize transition to practice. At Raytheon BBN Technologies, she oversees research groups focusing on quantum information technology, virtualization of large-scale systems and programmable optics. Previously, she was the Co-Founder & CEO of PhotonEx, a start-up company that produced the world's first 40 Gb/s optical transport product. She was also an Associate Division Head at MIT Lincoln Laboratory, where she founded the Advanced Networking Group. Dr. Rauschenbach has a BS degree in Electrical Engineering from University of Minnesota, and MS and PhD degrees in Electrical Engineering from MIT.

SPARKS MY CREATIVITY: Spotting a glint of possibility in an evidently impossible task.

"The people I met through The Hertz Foundation provided access to interesting other people and institutions. Many of these people were role models and motivational examples of what kind of a person and career I could try to emulate."

—Charles Westbrook



ANDY HUIBERS

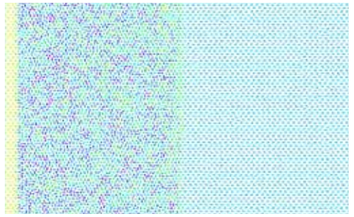
Andy Huibers, Hertz Fellow 1992, gets teased a lot about bumping into people. Andy wrote the original Bump App in 2009, which has been installed on 130 million iOS/Android phones. He received his BS in EE in 1992 from Princeton, followed by an MS and PhD in EE from Stanford. Andy's love of physics led to a PhD on coherent electronic transport, and a professional career building a variety of opto-electronic devices and optical measurement systems. He was the founder and CTO of Reflectivity and a Senior Member of Technical Staff at Texas Instruments, and is an inventor on 112 patents.

FAVORITE QUOTE: "Do not let your fears choose your destiny." There are a lot of versions of this quote, but I try to live up to this aspiration.

SPARKS MY CREATIVITY: Working with other people to figure out what the real problem is. This is often more fruitful than the solution part of the creative process.

"The Hertz Fellowship…gave me the confidence to believe that I could be competitive in big science, which wasn't trivial to this girl from Wyoming. It gave me the freedom and initiative to think outside the box and think big in my scientific endeavors."

—Tina Saxowsky



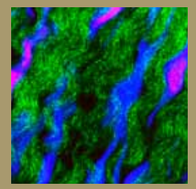
ALEXANDER D. WISSNER-GROSS

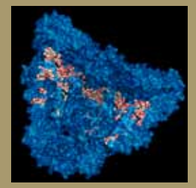
Alexander D. Wissner-Gross, Hertz Fellow 2003, is an award-winning scientist, inventor, and entrepreneur. He serves as an Institute Fellow at the Harvard University Institute for Applied Computational Science and as a Research Affiliate at the MIT Media Laboratory. Alex has been granted 19 issued, pending, and provisional patents, and founded, managed, and advised four technology companies, one of which has been acquired. In 2003, Alex received a triple major, with a Bachelor's in Physics, Electrical Science and Engineering, and Mathematics, while graduating first in his class from the MIT School of Engineering. In 2007, he completed his PhD in Physics at Harvard, where his research on smart matter, pervasive computing, and machine learning was awarded the Hertz Doctoral Thesis Prize.

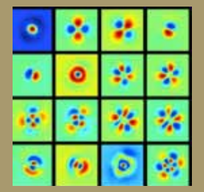
IN SCHOOL FELLOWS—ALREADY MAKING AN IMPACT

The In School Hertz Fellows represent an extraordinary group of graduate students in the applied physical, engineering, and biological sciences, selected for their promise to change the world. Every year there are more than 75 Hertz In School Fellows on track to complete their PhDs in five years. The Hertz selection process identifies almost thirty suitable candidates each year, establishing our long-term goal of increasing the number of In School Fellows to nearly 120 students.

The Hertz Fellowship gives Fellows freedom from financial constraints and allows them to find their creative limits. Overall they represent a wide range of undergraduate universities from across the country. In choosing which graduate university to attend, the majority of Fellows select their graduate program by the strength in their desired field and by the departmental strength. By further providing the In School Fellows with on-going opportunities to interact as a Hertz Community, we help equip them to meet John Hertz's challenge to serve the nation.







Paul Abel
Cheri Ackerman
Kathleen Alexander
Megan Blewett
Nicholas Boyd
Patrick Brown
Allen Yuyin Chen
Anjali Datta
Thomas Dean
Alan Deckelbaum
Robin Deits
Brandon DeKosky
Brent Dorr
Eric Eason
Jesse Engreitz
Zhou Fan
Hilary Finucane
John Frank
Ylaine Gerardin
Grant Gillary
Todd Gingrich
Alex Hegyi
Olivia Hendricks
Arvind Kannan
David Karp
Max Kleiman-Weiner
Beth Kochin
Timothy Kovachy
Ruby Lai
Amit Lakhanpal
Eric Larson
Brian Lawrence
Daniel Lecoanet
Tianhui Michael Li
Kyle Loh
Po-Ling Loh
Katie Maass
Micah Manary
Max Mankin
Adam Marblestone
Stephen Miller
Gregory Minton
Kenneth Mitchell
Andrea Moffitt
Maria Monks
Kelly Moynihan
Joshua Mueller
Cameron Myhrvold
Amy Ousterhout
Kay Ousterhout
Maya Overland
Anand Oza
Tony Pan
James Pelletier
Stephen Pieper
Vyas Ramanan
Bharath Ramsundar
Grant Remmen
Charles Rinzler
Tyler Robarge
Daniel Roberts
Samuel Rodriques
Joseph Rosenthal
Jonathan Russell
Nevada Sanchez
Peter Scherpelz
Jennifer Schloss
Mollie Schwartz
Thomas Segall-Shapiro
Max Shulaker
Aman Sinha
Melanie Smith
Justin Solomon
Jacob Steinhardt
Adam Stooke
Daniel Strouse
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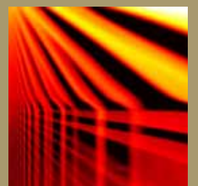
Floris van Breugel
Joshua Waitzman
Darcy Wanger
Jeffrey Weber
Christian Wentz
Shannon Yee
Yun William Yu



"I have very complex theories about how my work is actually helpful to the universe, and it's nice, once in a while, to do something that one can see tangible and immediate impact. "

—Erez Lieberman-Aiden, Hertz Fellow, referring to Bears Without Borders, his non-profit work with wife Aviva, paying local artisans in developing countries to make stuffed animals for children in hospitals and orphanages.

Paul Abel, 2009
Cheri Ackerman, 2012
Peter Adams, 1996
Daniel Adkins, 2001
James Adkisson, 1985
Gleb Akselrod, 2007
Kathleen Alexander, 2013
Heather Allen, 1996
Janet Allison, 1979
Marvin Alme, 1972
Frank Almendinger, 1972
Leonard Alt, 1975
Eric Altschuler, 1992
Luis Alvarez, 1997
Amy Alving, 1986
Richard Ammons, 1984
Dario Amodei, 2007
Bruce Anderson, 1982
David Anderson, 1968
David Andre, 1999
Dana Andrews, 1971
Scott Andrews, 1999
Shelley Anna, 1995
Michael Anshelevich, 1994
M. Michael Ansour, 1974
Marvin Appel, 1985
Mark Applegate, 1987
Aaron Archer, 1998
Shlomo Argamon, 1990
Dmitriy Aronov, 2006
Lewis Aronson, 1987
Joel Austin, 2001
William Averre, 1969
Timothy Axelrod, 1969
Andrew Axup, 1982
Jack Ayers, 1968
James Ayers, 1998
Gregory Balco, 1999
Alexander Balke, 1988

Xiaoyan Bao, 2001
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Derrick Bass, 1995
Walter Bass, 1967
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Barry Battista, 1983
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Leslie Bauman, 1973
Michael Baym, 2004
Andy Bayramian, 1997
Robert Beardsley, 1966
Kimberly Beatty, 2003
Vernon Beck, 1971
Douglas Behenna, 2001
Matthew Behrend, 2004
K. Peter Beiersdorfer, 1983
Richard Beigel, 1985
Marc Berger, 1974
Ahmet Berker, 1998
Anthony Bernhardt, 1974
Jonathan Bernstein, 1981
Paul Berry, 1970
Anna Bershteyn, 2006
George Best, 1989
Brett Bethke, 2005
John Betz, 1978
Manjul Bhargava, 1996
Lars Bildsten, 1988
J. Douglas Birdwell, 1975
Charles Bisbee, 1970
Robert Blevins, 1970
Megan Blewett, 2011
Henry Bliss, 1965

Joshua Bloom, 1999
Eric Boe, 1987
Gregory Boebinger, 1982
Jeffrey Bokor, 1976
Robert Bolles, 1974
Tami Bond, 1996
David Bonnett, 1966
Robert Bonometti, 1982
Kevin Bowers, 1998
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Theodore Budzichowski, 1987
Jeremy Buhler, 1996
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Carol Burns, 1983
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Ilene Busch-Vishniac, 1976
Rhett Butler, 1974
J. Adam Butts, 1998

Robert Caflisch, 1978
Russel Caflisch, 1975
C. Scott Cameron, 1976
Brian Camley, 2006
Gregory Canavan, 1968
David Cannell, 1967
Peter Capofreddi, 1992
Jaime Carbonell, 1966
Martin Carlisle, 1991
Elise Cawley, 1986
James Chambers, 1990
Sherman Chan, 1976
Benjamin Chandran, 1992
John Chapin, 1991
Michael Chapline, 2000
Paul Chapman, 1981
Mark Charney, 1990
Pang-Chieh Chen, 1984
Allen Yuyin Chen, 2012
Mung Chiang, 1999
Christopher Chidsey, 1982
Lilian Childress, 2002
Andrew Childs, 2000
Paul Choi, 2003
Harry Chomsky, 1988
Isaac Chuang, 1991
Mark Chudzicki, 1977
Wendy Cieslak, 1979
Nicholas Cizek, 2005
Linda Clements, 1971
Timothy Close, 1984
Geoffrey Coates, 1990
David Cohan, 1976
Adam Cohen, 2001
Wesley Colley, 1993
Constantine Costes, 1988
Sheila Cotter, 1980
Ronald Cotterman, 1982
Gary Couples, 1977

Christine Coverdale, 1988
Howard Covert, 1985
Russell Cox, 2001
Clark Crane, 1970
Edward Crawley, 1976
Christopher Croke, 1974
Mark Cronshaw, 1987
Peter Cross, 1968
Julian Cummings, 1989
Mark D'Evelyn, 1979
Brian D'Urso, 1998
Paul Dagdigian, 1968
David Dankworth, 1987
Roger Dannenberg, 1981
Richard Darst, 2007
Anjali Datta, 2012
Matthew Davies, 1988
Helen Davis, 1983
Thomas Dean, 2011
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Carl Delo, 1990
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Kathryn Dessau, 1987
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Stephen DiPippo, 1984
Michael Distefano, 1972
Allan Divis, 1973

John Doane, 1964
Peter Doerschuk, 1977
Peter Dolan, 1986
Lawrence Dorety, 1969
John Dorgan, 1987
Brent Dorr, 2008
Thomas Downar, 1982
Kenneth Doxsee, 1979
Jon Doyle, 1975
William Doyle, 1979
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Alan Edelman, 1986
David Edwards, 1993
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Edward Ehrichs, 1989
Matthew Eldridge, 1994
Arthur Ellis, 1973
Bernd Enders, 1966
Jeremy England, 2003
Jesse Engreitz, 2011
Gerald Epstein, 1978
John Erkkila, 1972
Kevin Esvelt, 2004
William Evans, 1987
Alexander Fabrikant, 2002
Joel Fajans, 1980
Zhou Fan, 2013
Stephen Fantone, 1975
J. Doyne Farmer, 1978
P. Michael Farmwald, 1978
Michael Farwell, 1997
John Fattaruso, 1978

Andrew Fedorchek, 1989
Jerry Feinberg, 1970
Margaret Fels, 1965
Wayne Felson, 1993
John Fericks, 1973
Andres Fernandez, 1984
Carl Feynman, 1993
Keith Fife, 2003
Alexei Filippenko, 1979
Lydia Finney, 1999
Hilary Finucane, 2013

Eric Firing, 1974
Michael Fischbach, 2004
Hugo Fischer, 1965
Kathleen Fisher, 1994
Matthew Fisher, 2007
Margaret Fleck, 1982
Thomas Flood, 1969
Michel Floyd, 1981
Elizabeth Foley, 1998
Michael Foley, 1967
Frederick Ford, 1966
Michael Foster, 1981
Robert Francis, 1977
Edward Frank, 1978
John Frank, 1998
Kurt Franke, 1997
Joseph Franklin, 1969
Kenneth Franko, 2004
John Fratamico, 1979
Paul Frattini, 1981
Ewa Fredette, 1996
Bruce Freeman, 1970
Charles Freeman, 1980
Elizaveta Freinkman, 2008
Matthew Frey, 1992
Leonid Fridman, 1986
Charles Friedberg, 1970
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Daniel Friedman, 1978
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George Fuller, 1969
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Samuel Fuller, 1970
Dennis Furuike, 1967
Brendan Gaffey, 1997
Stephanie Gajar, 1988
David Galas, 1968
Michael Garceau, 1987
John Garstka, 1983
Alice Gast, 1980
Charles Gaylord, 1971
Cameron Geddes, 2000
Dennis Geels, 1999
Nicholas Gentile, 1988
Ylaine Gerardin, 2010
Edwin Gerber, 2000
John Gersh, 1977
Michael Gibby, 1970
Steven Gieseking, 1987
David Gifford, 1976
Erik Gilbert, 1978
John Gilbert, 1978
Roscoe Giles, 1970
Grant Gillary, 2011
Todd Gingrich, 2008
Robert Givan, 1990
William Glaberson, 1964
Andreas Glaeser, 1976
James Glanville, 1970
Ann Glassman, 1970
Eli Glezer, 1991
Stephen Gold, 1986
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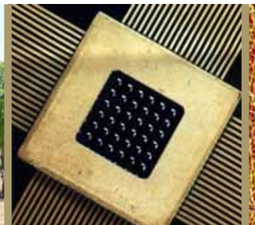
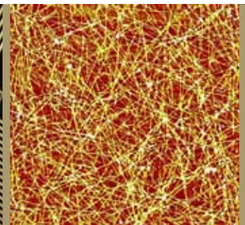
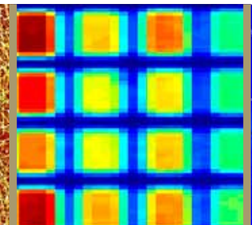
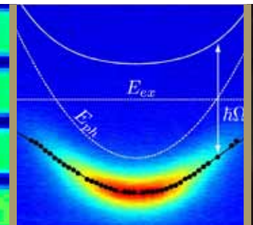
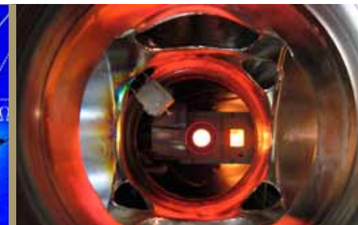
51	Anna Bershteyn
52	Ankur Moitra
53	Kyle Gustafson
54	Elizaveta Freinkman
57	Jacob Kirch
61	Michael Baym
61	Edwin Gerber
62	David Breslow
63	James Wray
64	Matthew Behrend
68	Michael Baym
69	Nick Cizek
73	Daniel Rosenfeld
74	S. Davis Herring
75	Elizabeth Stephens
75	Jeremiah Zartman
75	Adam Houck
75	Matthew Pelliccione
89	Jonathan Bernstein
89	Paul Podsiadlo
89	Mikhail Shapiro
89	Gleb Akselrod
89	Paul Abel
90	Matthew Behrend
90	Brian Camley

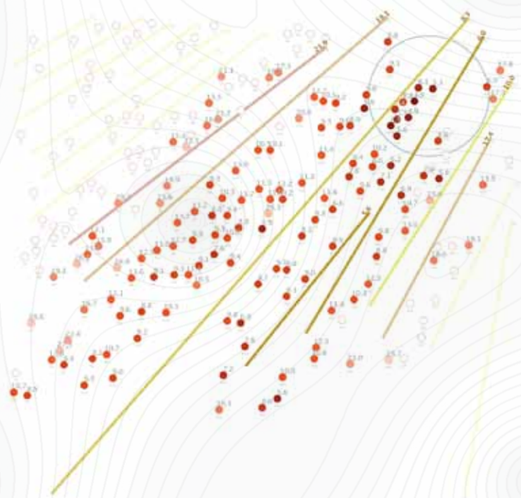
WITH GRATITUDE

Thank you to the Hertz Fellows and the Hertz Community.
These years have been a remarkable journey.







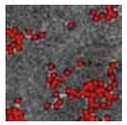
SCIENCE

by David Galas

Whatever it is it must have the strength
to stand against the weakness of our hearts,
to try our craft, and fire the silicon vitals
of our eccentric and small ambitions.

It speaks in breaths of beauty and in awkward truth,
to the sweep of galactic clouds, out of time's reach,
and in the pulse of intricate molecular purpose.
When we find it, it is immense, almost unseen,

and darkly fair. Roaring in splendid defiance,
it will roil the sea and sweep across the land.
Its fate will be to cruelly destroy, to build and love,
and to be lonely mid the hubbub of human minds.



To the beginning of the next 50 years…

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