

The Hertz Foundation builds America's capacity for innovation by nurturing remarkable applied scientists and engineers who show the most promise to change the world.

Remarks to the 3rd Hertz Foundation Biennial Symposium

David J. Galas, Hertz Fellow and Chairman of the Board

"It was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us."



No, this was not from a recent issue of *Fortune* or the *Economist*. Charles Dickens could have been speaking of now in writing of the French revolution in *Tale of Two Cities*. He said "it was the best of times, it was the worst of times." We are indeed in a time of crisis, and the economy is not the only cloud on our horizon. But don't worry, I'm not here to give you another dark analysis of the state of the world, or of my views of the sources of our plight. I'm here to talk to you about the Hertz Foundation.

I want to bring you a message that should be both blunt and bracing as well as optimistic and uplifting—at least that is how I see it.

The Hertz Foundation has for about 50 years tried to change the world. It's done so by nurturing creativity and innovation—by trying to help those young scientists and engineers that have the potential to affect such change. Our passion is to unleash that creativity from some of the best young minds. What we're particularly good at, I would argue, is finding those best young minds. In this half century the Foundation has created a cadre of Fellows that have played a role in essentially every major shift in the state of science and technology. This is now a remarkable group of more than a thousand Hertz Fellows. Some of the most remarkable of them are the recent Fellows.

From solid state physics and electronics, aerospace technology, new energy technologies and efficiencies, basic physics, materials, optics, computer design and applications, modern biology and biotechnology and much more.... All these fields have been imprinted by Hertz Fellows. They were imprinted by advances in basic research, in winning two Nobel prizes so far, the creation of exciting new companies, and a litany of creative applied science and engineering innovations. The list is long indeed, and it is just this impact that makes our small, unique Foundation so worthwhile.

I'm delighted to be able to tell you that there is a movement afoot to create a new Society of Hertz Fellows, who will, with the full endorsement of the Foundation, organize and set their own agenda and develop their own identity. This is a nascent movement that I think is terrific, and overdue. As you could tell from the recent Symposium gathering, Hertz Fellows seem to enjoy each other's company. Perhaps, however, they will take over this Symposium and do other catalytic things, and as they continue to bring new graduate Fellows into their ranks—who knows what they'll take over? I know I will be proud to join such a Society. So there is much to celebrate and to be proud of. You saw the glimmerings of what future imprints on the world might be when reviewing the posters and talking with current student Fellows and recent graduates. It is always exciting!

The news is not all good, however. The Foundation has, over the years managed to affect its human impact with precious little capital—it has been almost enough to support deserving candidate Fellows. In the past 20 years, I'd say we have been able to select and support more than half of those candidates who were truly remarkable and able to use our support in their best creative way. This is certainly not optimal, for us, for the deserving candidates, or for the



Matthew Fisher, Current Fellow, Stanford University; and Eric Wepsic, Alumni Fellow and Endowed Fellowship Donor

Partner with the Hertz Foundation

Join other individuals who have invested to sustain the Hertz Fellowship Program (endowed Fellowships or \$1M gifts).

These special investors include:

- John and Jane Mather
- Ray Sidney
- Peter Strauss
- John Wakerly
- Eric Wepsic

In addition several individuals have pledged annual support to name Fellows:

- Robert Lourie
- Harry Lucas
- Nathan Myhrvold
- Paul Young

Theses 2009

Yedidya Hilewitz, PhD

Princeton University

Advanced Bit Manipulation Instructions: Architecture, Implementation and Applications

Elizabeth J. Hong, PhD

Harvard University

Functional Significance of Neuronal Activity-Dependent Transcriptional Regulation in the Nervous System

Katie R. Mitchell-Koch, PhD

University of Kansas

Charge Transfer Reactions in Porous Material

Bradley D. Olsen, PhD

University of California, Berkeley
Structure and Thermodynamics of Rod-Coil Block Copolymers

world, but it has had its impact. What happens to those who are not awarded a Hertz Fellowship? Clearly, none of these remarkable people lacks for some sort of support at our best research institutions. However, what they could not do in blazing their own path, as the Fellowship permits them to, will have to remain unknown to us. All we know is that those who do get Fellowships cite the freedom to follow their own creative ideas and urges wherever they lead as the key to the highest level of innovation they have achieved. Now, because of the shrinking of our capital, we have for the first time been forced to support only about a third of this remarkable annual group—many fewer than have great potential to affect needed change. What does that mean? Well, of the 543 applicants this year from around the country we have been able to offer support to only 10. And there is no doubt in my mind that there were at least 30 wonderful potential Fellows this year. Will the rest be lost to science or engineering? No, of course they will not, but what might they have done with our help? What work might not be done? Let me speculate a little here. Among the non-Fellows this year a potential Fellow has published 2 first-authored research papers as an undergraduate. He has shaped his own picture of what could be done with, say computing, or internet function, revolutionary new materials or cure for a disease (read what you will here—this is a purposefully fictitious, but highly representative, candidate). He has mapped out his graduate research career, with startling clarity—and truly innovative ideas. He clearly has both sparkling intellect and drive. He might have changed his field completely in the next 5 years. What he may well do now is carry out research in the mold of an agency-vetted, peer-reviewed and grant funded project. Don't misunderstand me. This represents the mode of a great proportion of excellent work in our research establishments, but we really need additional ways to unleash the most creative, radical ideas in the earliest years of a career—we need Hertz Fellowships. The work that he might have done, that may never come, will have to await the freedom to try his unconventional ideas.

We are certainly not the only institution that has been hurt by the economic meat grinder. Our good fortune has been to have the leadership of the President of the Foundation who has worked tirelessly and well for the past 10 years on our behalf. John Holzrichter has done a remarkable job and has managed to keep us doing what we are here for. We also have an all volunteer Board of Directors, many, but not all, of whom are Hertz Fellows. Hertz Fellows, like myself, may be partly driven by our personal understanding from experience and our deep gratitude to the Foundation, but those who are not Hertz Fellows do this out of purer motives—pure intellectual understanding and straight altruism. We have also had the good fortune to have many generous donors.

My message to you then is that it is the best of times for what we are able to do, the people who help us do it, and the remarkable Hertz Fellows across the country, who we watch and encourage and then get out of their way! It is the worst of times because we are now threatened with a weakening of our impact, in a time when this kind of creative catalyst is needed most deeply by the world, and perhaps we are even threatened with worse. I do not say this lightly—and we have absolutely no intention of losing more ground—but the threat is definitely there. I will not shy away from telling you that the Hertz Foundation does good, important work that is most dearly needed now, and that we may not be able to have this impact in the future. I also wish to say clearly that we cannot remotely afford, nor do we remotely accept any descent into silence.

I speak for a large number of Fellows, the Board and many others when I say that we intend to eliminate this economic threat, but we must work together to do so. We need a new level of commitment, a broadening of our base, new ideas, mutual support, and ultimately new financial resources to sustain and increase the impact of the Foundation. So my remarks are both a report to you and an appeal to all of you to draw together and ensure that the future fireworks from new Hertz Fellows will be an increasing part of the technical and scientific future of our nation and our world.

Thank you so much for your kind attention.

Catalyzing the Future: Third Biennial Symposium

“I always feel that when I come here to the biennial symposium that I am living in the future, just for a minute.”

—Eric Wepsic, Hertz Alumni Fellow

“The Hertz Symposium is an intellectual adventure like no other. You hear about pioneering advancements across a broad range of technology from the thought leaders in their fields.”

—Stephen D. Fantone, PhD, Hertz Alumni Fellow and Director



239 Attendees 79 Alumni Fellows 63 In-School Fellows 21 Speakers 2 Panels 83 Posters 2 1/2 Days of Ideas, Innovations, and Real World Applications

Our sincere thank you and appreciation to all the extraordinary Speakers, Symposium Donors, Hertz Fellows and Friends for your contribution to the success of the conference.

Awardees 2009-2010

Paul R. Abel

University of Texas at Austin
Chemical Engineering

Alan T. Deckelbaum

Massachusetts Institute of Technology
Applied Mathematics

Eric V. Eason

University of Colorado at Boulder
Physics

Timothy L. Kovachy

Harvard University
Physics

Amit Lakhanpal

California Institute of Technology/
University of California, Los Angeles
Quantitative Biology

Po-Ling Loh

California Institute of Technology
Applied Mathematics

Arvind Ravi

Massachusetts Institute of Technology
Applied Modern Biology

Daniel A. Roberts

Duke University
Applied Physics

Jeff Thompson

Harvard University
Physics

Darcy D. Wanger

Massachusetts Institute of Technology
Physical Chemistry

Join the Conversation!

<http://catalyzingthefuture.wordpress.com/>
The microsite is an interactive video blog on the posters, panels, and speakers' talks. In addition, the microsite is a resource providing information on our speakers, events, featured articles, video talks, and other useful material.

Check out the Hertz web site for speakers' talks coming soon!
www.hertzfoundation.org

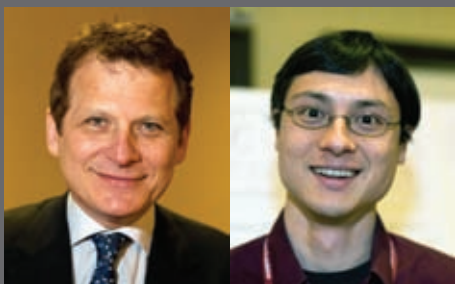
Donor Spotlight: Harry Lucas, Jr.



Harry Lucas Jr. and Peter Scherpelz

In 2006, Harry Lucas, Jr. established a named Hertz Fellowship supported by The Educational Advancement Foundation in honor of Professor R. L. Moore. Its purpose is to support a Hertz graduate student who is interested in learning and using the “Inquiry Based Learning” techniques in mathematics teaching and related fields. The R. L. Moore Fellowship honors this renowned professor of mathematics who taught at the University of Texas in Austin from 1920 to 1969, and developed this powerful teaching method.

Peter Scherpelz is the recipient of the Hertz Foundation R. L. Moore Fellowship. He is a first year graduate student in Physics at the University of Chicago, focusing on the properties of quantum entanglement and physical methods of its realization. Peter believes that his graduate work could contribute to the realization of a quantum computer that will perform many computations more efficiently than standard computers. In addition, his work with the Mathematics Department at Chicago on Inquiry Based Learning is providing him with additional insights into mathematical methods of use in his teaching and theoretical physics research.



\$20,000 Challenge Gift

Please join Fellows Michael Ansour and Jeff Gore (above) in supporting the Foundation. They will match any new and renewed gifts to the Foundation—up to \$20,000. Become a member of our Hertz donor family.

Mathematics, Mosquitoes, and Malaria

Philip Eckhoff, Hertz In-School Fellow, Princeton University, Applied Math



I grew up on the north coast of Haiti and saw first-hand many of the problems facing the developing world, including public health, conflict, and governance. I had malaria many times growing up, volunteered at a clinic for treating children with TB, and saw friends lose parents to HIV/ AIDS. I also lived through many changes of government, some peaceful, some not, and the international embargo and military intervention in the mid-90's.

After returning to the States and graduating from the University of Texas-Austin in mathematics and aerospace engineering in 2004, I was privileged to receive a Hertz Fellowship to study applied mathematics at Princeton. My graduate research is with Phil Holmes applying dynamical systems to neuroscience. Specifically, I study effects of neuromodulation with norepinephrine on decision-making task performance, with models ranging from larger networks of spiking neurons to low-dimensional models. With my experiences growing up and my love of math, the obvious question was how to use math to solve developing world problems. Mathematical epidemiology seemed a great answer, and I began studying these models and applications to malaria my first year. I set this aside to focus on research with my advisor at first, but the freedom provided by the Hertz Fellowship soon allowed me to be spending much of my time studying mathematical epidemiology on my own.

I first heard about the Intellectual Ventures malaria modeling project at the Hertz Foundation Princeton Gathering in October 2007, just days after Bill and Melinda Gates announced a new campaign to globally eradicate malaria. Working on such a project was a dream job, and after flying out to visit Intellectual Ventures in Bellevue, WA, I began intensive malaria modeling, while still working towards my PhD in mathematical neuroscience. Our modeling work is focused on rational design of a malaria eradication campaign and uses Monte Carlo simulation with sufficient spatial, temporal, and demographic resolution to answer the questions raised by such an endeavor.

Upon PhD completion this May, I will be working full time at Intellectual Ventures on their eradication of infectious disease modeling project, now expanding beyond malaria to other developing world health issues. Intellectual Ventures is a great environment for innovation, making progress in novel technologies to fight malaria and other vector-borne diseases, better thermoses for vaccines, and other areas of global good. My preparation for this work was made possible by the freedom to innovate provided by the Hertz Fellowship.

Help us make a difference—invest in tomorrow's leaders.

John F. Holzrichter, Hertz Fellow, President; Susan Overman, VP of Development



The Hertz Foundation is more capable than at any time in its history to select and enable young applied science and engineering leaders to fulfill their potential and help solve the Nation's major problems. With so many government and private fellowships diminishing in their size, duration, freedom of action, and selectivity, the Hertz Foundation's approach is more important than ever.

Our governance is now public charity compliant (and excellent), and our indirect costs are carefully managed. All of your gifts can go directly to supporting one or more Fellows, can go for general fund use, or can be tailored to your special needs.

As the end of the fiscal year approaches, we ask that you consider **a special and/or additional gift for the Hertz Fellowship Program**. The economic downturn has had a significant impact on us all. For the Foundation, it has meant that we could only select 10 Hertz Fellows this year from an extraordinary talent pool of over 25.

Thank you Hertz Interviewers

The strength and uniqueness of the Hertz selection process is based on its technical interviews, which are carried out by carefully selected alumni Hertz Fellows and other distinguished scientists and engineers. Tom Weaver, Hertz Fellow and Senior Fellowship Interviewer, continues to lead the entire process to find the remarkable applied scientists and engineers who show the most promise to positively change our world.

Congratulations and our sincere appreciation to the 2009 Pre-Selection Committee and Hertz Interviewers!

- 543 Applicants**
- 157 First Round Interviews**
- 33 Exceptional Hertz Interviewers**
- 50 Finalists**
- 10 New Hertz Fellows**



Hertz Fellows with flag carried by Fellow and NASA pilot Col. Eric Boe on Space Shuttle Endeavour, November 14, 2008.

Networking for Success

The Hertz Foundation Mentoring Program

In response to numerous requests from Hertz Fellows, the Foundation has set up a Mentoring "Network for Success". The purpose is to provide professional development support and guidance in the form of a "one-on-one" relationship in an atmosphere of mutual respect, friendship, and advocacy among in-school, early-career, and later-career Hertz Fellows and friends. If you are interested in participating as a Mentor, a Mentee, or both, please fill out the application available on our website and submit your application to be reviewed and matched.

Do you have News to Share?

Please contact Robin Roth at robin@hertzfoundation.org or by phone **925.373.1642**.

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Cover Images (left to right): James Wray, Cornell University, *Mapping hydrated minerals in a possible ancient lake deposit on Mars*; Matthew Pellucione, Stanford University, *Longitudinal resistivity of a bilayer two dimensional electron system*.

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