The Supernetwork Sentinel

The Newsletter of the Virtual Center for Supernetworks

Summer 2006

Welcome to the Summer 2006 edition of ***The Supernetwork Sentinel***, the newsletter of the Virtual Center for Supernetworks at the Isenberg School of Management, UMass Amherst. ***The Supernetwork Sentinel*** is published in Fall, Winter, and Summer editions. Its purpose is to keep you informed of events, activities, and successes of the Virtual Center for Supernetworks, the Center Associates, and the Supernetworks Laboratory for Computation and Visualization. In this newsletter, we include an essay on a year as a Science Fellow at the Radcliffe Institute at Harvard, events/activities, noteworthy recognitions, new books, as well as an upcoming exploratory seminar. We also have a list of our recent publications.

Anna Nagurney
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Professor Dietrich Braess visits UMass Amherst and the Supernetworks Laboratory

For more information about the Braess Paradox and Braess' Visit, see:
http://supernet.som.umass.edu/cfoto/braess-visit/braessvisit.html

Radcliffe Institute for Advanced Study Certificate Ceremony

Anna Nagurney receives her Radcliffe Institute Certificate

On May 24, 2006, the Radcliffe Institute for Advanced Study at Harvard University held its Certificate Ceremony at the Cronkhite Center in Cambridge, Massachusetts with much pomp, circumstance, and gaiety, complete with the singing of the Radcliffe alma mater. In 2005-2006 there were 51 Fellows and Anna Nagurney was one of 12 Science Fellows. See her essay on the fellowship experience in this newsletter.

Inside

A Year as a Science Fellow -- Reflections on the Radcliffe Institute for Advanced Study at Harvard Unversity

Anna Nagurney

As my year as a 2005-2006 Fellow at the Radcliffe Institute for Advanced Study at Harvard University draws to a close I thought that I would offer some of my reflections as to this unique experience. I was one of a dozen Science Fellows, with fifty-one Fellows total, from disciplines ranging from physics, biology, medicine, material science, computer science, and mathematics in the sciences, to historians, economists, philosophers, independent writers, playwrights, literary scholars, film-makers, political scientists, an anthropologist, a sociologist, a lawyer, a composer, a choreographer, and a linguist, among the "non-scientists." The Radcliffe Institute was founded in 1999 following the merger of Radcliffe College and Harvard University and unlike the former "Bunting Institute" it is not limited to females. This year there are eleven male Fellows; two of whom are spouses of other Fellows, and one of whom is a priest.

The fellowship is a "residency fellowship" and, in order to accept it, I had to turn down a one-semester Fulbright in Canada. Although I hold appointments in the Isenberg School of Management at the University of Massachusetts at Amherst and at its School of Engineering, since I have three degrees in Applied Mathematics from Brown (and one degree in Russian Language and Literature), I became one of the two Mathematics Fellows. The Fellows' offices are in Radcliffe buildings and mine was in Putnam House, which is located on Brattle Street directly across the street from the American Repertory Theater.

In addition to work on one's project, the major fellowship activities this year consist of three lunches per week at the Radcliffe Institute main building, located at 34 Concord Avenue in Cambridge, seminar presentations, and various brunches, wine and cheese parties, teas, and dinners. The Monday lunch each week is preceded by a presentation by a Fellow on his/her fellowship project. The Wednesday afternoon seminars, also given by the Fellows, are open to the public. In addition, this year there were spontaneous get-togethers to, for example, celebrate accomplishments, as well as fellow-instigated panels on writing and trauma.

We are a varied group this year with both academics and non-academics in the "mix." Some are Assistant Professors whereas others hold named Chaired Professorships. Some are parents with young children, whereas others are single. Several of us are spending most of the year away from our spouses (and even children). Fellows come from the Northeast, the Midwest, the South, and the West of the US and this year there are two international Fellows, one from France (Pierrette Cassou-Nogues) and the other from Sri Lanka (Nadira Dharshani Karunaweera). Quite a few of us have rented apartments provided by Radcliffe Housing which means that we see each other outside the formal activities and our office buildings (which are more like cozy houses, some of which even have fireplaces).

This was a year in which President Larry Summers resigned, and in which it seemed that the rain would never end. It was also a year in which a Fellow, Geraldine Brooks, received the Pulitzer Prize for Fiction (propitiously) two days before her prescheduled Radcliffe seminar while a former Fellow, Caroline Elkins, received the Pulitzer Prize for Non-Fiction. Within a week, Radcliffe Fellow Claudia Goldin, a Harvard economist, had been elected into the National Academy of Sciences, and Radcliffe Fellow Mary Waters, a Harvard sociologist, had been elected into the Academy of Arts and Sciences. Several Fellows finished writing their books -- the Becker sisters their co-authored book on string theory, and I my book on supply chain network economics and the dynamics of prices, flows, and profits. Others made major progress on their projects. Sarah Sze has her exhibition now at the corner of 59th Street and 5th Avenue in NYC whereas one of Lee Breuer's theatrical productions is taking place in Greece this month; others having been staged in various locations in the US and in Europe.

We all made new friendships and found common language in our disciplines, struggles, and successes. We listened to one another's seminars, which spanned the spectrum of low to high-technology modes of delivery but kept us captivated throughout as we gained deeper insights into psychomatic illnesses, the evolution of butterflies, the influence of Alexander the Great in the Far East, and the death rituals among the slaves in Jamaica. We learned that we are all, in a sense, writers, in that we prepare journal articles for publication, write books of non-fiction or novels, and/or proposals for funding, etc. Most importantly, we supported each other and laughed, oftentimes, uproariously, as we shared our stories of academic (and other types of) politics, the inner drive to create, and, especially, to try to discover new knowledge. We gathered new strength in an environment unencumbered by committees and many other duties and one in which we reveled in one another's creative accomplishments.

One may ask, why would a scientist not prefer to exclusively work and interact with others from the same discipline or, at the very least, with other scientists? I can say that some of the most interesting questions

after my seminar came from "non-scientists," and some of the presentations that I found very profound and even haunting were by the "non-scientists." I had wanted to somehow recreate the Bellagio Research team residency that I had held in March 2004, where the Rockefeller Foundation funded two of my collaborators and me for a two week period, complete with our own villa at the Bellagio Center on Lake Como, Italy. While there, my research team, consisting of a female pure mathematician and another applied mathematician, interacted with poets, historians, civil rights activists, and a photographer, among others. My research team members have been visiting me for the past several weeks at Harvard, while we continue to break new ground in the modeling and analysis of dynamic networks with applications ranging from congested urban transportation networks to the Internet. We have also met new colleagues at Harvard and have started a new collaboration. The Radcliffe Institute for Advanced Study is the only institute in the US, that I am aware of, that supports simultaneous residency fellowships from different disciplines.

The best experience of the year was in interacting with so many creative and energetic individuals who possess an incredible work ethic and dedication to their projects and the fellowship. The nurturing of our souls and minds through conversation, food, and seminars will have an impact on the Fellows personally that outlasts the fellowship year; I expect that the research and creative outcomes will endure. We were and are a community.

We are not the same individuals who arrived last September at Radcliffe. Having been dropped off by my husband and by my, then eleven year old daughter, Alexandra, at my apartment in Cambridge last September, I had a feeling similar to that of being a "freshman" again with the mixture of anxiety as to the newness of it all, coupled with anticipation and excitement. Would I find congenial Fellows to eat lunch with; would my seminar on dynamic networks be appreciated by a general audience; would I manage without my family beside me? Next week, I will partake in the Radcliffe Institute for Advanced Study graduation ceremony on May 24, at which we will receive our certificates.

Thank you, the Radcliffe Institute, for the incredible experience and thank you, Radcliffe Fellows, for your wonderful humanity. If only there were more such institutes in the US!

For the Radcliffe Institute for Advanced Study homepage, see: http://radcliffe.edu

For the list of the 2005-2006 Fellows, see: http://www.radcliffe.edu/fellowships/current/index.php

This essay will also be appearing in *ORMS Today*.

The UMass Amherst INFORMS Student Chapter

The UMass Amherst Student Chapter had another outstanding semester. Through its seminar speaker series, it brought to campus such notable speakers as: Professor Barabasi of Indiana University, Professor Ed Kaplan of Yale, Professor Georgia Perakis of MIT, Professor Vernon Hsu of George Mason University, Professor David Lazer of the Kennedy School of Government at Harvard, and Dr. Irv Lustig of Ilog. In addition, Dr. Rina Dechter, a Science Fellow with Anna Nagurney at Radcliffe also came to speak as well as Professor Dietrich Braess of the renowned Braess (1968) paradox! This was the first time that Professor Braess had spoken about the discovery of his paradox in the United States. Additional information on Professor Braess' visit as well as links to his original article and the translation in *Transportation Science* by Braess, Nagurney, and Wakolbinger can be found at: http://supernet.som.umass.edu/cfoto/braess-visit/braessvisit.html

The various activities of the student chapter, including presentations of seminar speakers and photos, can be found on the chapter's website: http://student.som.umass.edu/informs/

Kudos and Congratulations

Congratulations to Center Associate Professor June Dong for receiving the 2006 SUNY Chancellor's Award for Excellence in Scholarly and Creative Activities! This is a state-wide award over all the New York State Universities. An article from the *Oswego Daily News* with additional information can be found at: http://supernet.som.umass.edu/media/dong050906.htm

Student Center Associate Tina Wakolbinger successfully defended her doctoral dissertation proposal on May 26, 2006. Her dissertation title is: **A Dynamic Theory for the Integration of Social and Economic Networks with Applications to Supply Chain and Financial Networks**. Tina also was awarded a $10,000 Graduate Fellowship from the University of Massachusetts at Amherst.

Tina Wakolbinger after her proposal defense

Center Associate Ke "Grace" Ke took part in the Young Researcher's Roundtable at the INFORMS Conference on Practice held in Miami, Florida, April 30 - May 2, 2006.

Center Associate Dr. Fuminori Toyasaki received his doctorate at Graduate ceremonies at UMass Amherst on May 27, 2006. Professor Nagurney was chair of his dissertation committee and his dissertation title was: **A Unified Complex Network Framework for Environmental Decision-Making with Applications to Green Logistics and Electronic Waste Recycling**. Dr. Toyasaki is presently a Research Associate on the Faculty of Management at McGill University in Montreal, Canada. He continues to conduct research on topics related to green logistics and environmental decision-making.

New Books !!!

Anna Nagurney's new book, **Supply Chain Network Economics: Dynamics of Prices, Flows, and Profits**, is being published by Edward Elgar Publishing in the **New Dimensions in Networks** series and will be available in July 2006.

Center Associate Patrizia Daniele's new book **Dynamic Networks and Evolutionary Variational Inequalities** will also be published in 2006 in the **New Dimensions in Networks** series by Edward Elgar Publishing. For more information about books in this series, see: http://supernet.som.umass.edu/newdimne.html

More Center Associate News

Patrizia Daniele spent March - May 2006 as a Visiting Scholar in the Division of Engineering and Applied Sciences (DEAS) at Harvard University and collaborated with Anna Nagurney and Professor David Parkes of Harvard University. They completed a joint paper, "The Internet, Evolutionary Variational Inequalities, and the Time-Dependent Braess Paradox."

Professors Patrizia Daniele, Nagurney, and David Parkes at Putnam House at the Radcliffe Institute

Professor Monica-Gabriela Cojocaru also was a Visiting Scholar at DEAS April - May 2006.

Anna Nagurney's essay, "Getting There from Here: The Route to Sustainable Transportation is Paved with Knowledge and Creativity," appears in the Spring 2006 issue of **UMass Magazine**. In the essay, Anna discusses the relationships between transportation and energy consumption and provides a prescription for reducing our dependence on oil and associated emissions. For the full contents of this issue, which includes a link to her essay and its expanded version, see: http://www.umassmag.com/Spring_2006/

Center Associate Ding Zhang is spending the summer at Fudan University in Shanghai, China and is collaborating with Dr. Daoli Zhu, the chairman of the Department of Management Science at Fudan. They are jointly researching supernetworks and supply chains with a focus on applications in China.

Center Associate, Dr. Stavros Siokos of Citigroup, is Co-Chair of the Computing in Economics and Finance Conference in Limassol, Cyprus, June 22-24, 2006. Dr. Siokos is the Managing Director of Citigroup and is based in London, England. Anna Nagurney is serving on the Scientific Committee of this conference. Professors Erricos Kontoghiorghes, Manfred Gilli, and Berc Rustem are also Co-Chairs of this conference.

Center Associate Jose M. Cruz has completed his second year as an Assistant Professor in the School of Business at the University of Connecticut at Storrs. He has been teaching undergraduate and MBA courses in Production and Operations Management.

2006 POMS Conference in Boston

Student Associates with Nagurney at POMS

The Center Associates were well-represented at the Seventeenth Annual POMS Conference held in Boston, Massachusetts, April 28-May 1, 2006. The papers that they presented were: "Global Supply Chain Network Dynamics with Multicriteria Decision-Makers under Risk and Uncertainty," Anna Nagurney and Dmytro Matsypura, "Modeling Power Plant Portfolios and Pollution Taxes in Electric Power Supply Chain Networks: A Transportation Network Equilibrium Transformation," Kai Wu, Anna Nagurney, Zugang Liu, and John Stranlund, and "Dynamic Supply Chains, Transportation Network Equilibria, and Evolutionary Variational Inequalities," Anna Nagurney and Zugang Liu.

International Conferences

Center Associates will be very busy this summer presenting papers at international conferences. The paper, "Optimal Endogenous Carbon Taxes for Electric Power Supply Chains with Power Plants," Anna Nagurney, Zugang Liu, and Trisha Woolley will be presented at the Computing in Economics and Finance Conference, Limassol, Cyprus, June 22-24, 2006. The paper, "Equilibria, Supernetworks, and Evolutionary Variational Inequalities," Anna Nagurney and Zugang Liu will also be presented at this conference.

In addition, collaborator Professor Lan Zhao of SUNY at Old Westbury will be presenting the paper, "A Network Equilibrium Framework for Internet Advertising: Models, Qualitative Analysis, and Algorithms," joint with Anna Nagurney, at the IFORS Conference in Hong Kong, June 25-28, 2006.

The paper, "Static and Dynamic Transportation Network Equilibrium Reformulations of Electric Power Supply Chain Networks with Known Demands," Anna Nagurney, Zugang Liu, Monica-Gabriela Cojocaru, and Patrizia Daniele will be presented at the 21st European Conference on Operations Research in Reykjavik, Iceland, July 2-5, 2006.

For visuals of these and other presentations, see: http://supernet.som.umass.edu/visuals.html

Upcoming Exploratory Seminar

Anna Nagurney and David Parkes of the Division of Engineering and Applied Sciences at Harvard University have received funding from the Radcliffe Institute Educational Programs to conduct an Exploratory Seminar on the theme of Dynamic Networks. This exploratory seminar will be held at the Radcliffe Institute for Advanced Study, October 20-21, 2006 in Cambridge, Massachusetts. The list of invited speakers has been deterrmined and more information will appear in the **Fall 2006 Supernetwork Sentinel**.

Center Publications

Copies of these (and other) center articles may be found at:
http://supernet.som.umass.edu/dart.html

Financial Engineering of the Integration of Global Supply Chain Networks and Social Networks with Risk Management, A. Nagurney, J. Cruz, and T. Wakolbinger, to appear in *Naval Research Logistics*.

Evolution Variational Inequalities and Projected Dynamical Systems with Application to Human Migration, A. Nagurney and J. Pan, *Mathematical and Computer Modelling* (2006), **43**, 646-657.

Global Supply Chain Network Dynamics with Multicriteria Decision-Making under Risk and Uncertainty, A. Nagurney and D. Matsypura, *Transportation Research E* (2005), **41**, 585-612 (special issue on Global Logistics).

Supernetworks, A. Nagurney, Invited Chapter for **Handbook of Optimization in Telecommunications**, P. M. Pardalos and M. G. C. Resende, Editors, Springer, New York (2006).

The Evolution and Emergence of Integrated Social and Financial Networks with Electronic Transactions: A Dynamic Supernetwork Theory for the Modeling, Analysis, and Computation of Financial Flows and Relationship Levels, A. Nagurney, T. Wakolbinger, and L. Zhao, *Computational Economics* (2006), **27**, 353-393

On the Relationship Between Supply Chain and Transportation Network Equilibria: A Supernetwork Equivalence with

Computations, A. Nagurney, *Transportation Research E* (2006), **42**, 293-316.

Modeling Generator Power Plant Portfolios and Pollution Taxes in Electric Power Supply Chain Networks: A Transportation Network Equilibrium Transformation, K. Wu, A. Nagurney, Z. Liu, and J. Stranlund, *Transportation Research D* (2006), **11**, 171-190.

Statics and Dynamics of Global Supply Chain Networks with Environmental Decision-Making, A. Nagurney, J. Cruz, and F. Toyasaki, **Pareto Optimality, Game Theory and Equilibria**, A. Migdalas, P. M. Pardalos, and L. Pitsoulis, Editors, Springer, Berlin, Germany (2005), in press.

A Network Modeling Approach for the Optimization of Internet-Based Advertising Strategies and Pricing with a Quantitative Explanation of Two Paradoxes, L. Zhao and A. Nagurney (2004), to appear in *Netnomics*.

Double-Layered Dynamics: A Unified Theory of Projected Dynamical Systems and Evolutionary Variational Inequalities, M.-J. Cojocaru, P. Daniele, and A. Nagurney (2004), *European Journal of Operational Research,* in press.

Static and Dynamic Transportation Network Equilibrium Reformulations of Electric Power Supply Chain Networks: A Transportation Network Equilibrium Transformation, A. Nagurney, Z. Liu, M.-G. Cojocaru, and P. Daniele (2005), to appear in *Transportation Research E*.

Optimal Endogenous Carbon Taxes for Electric Power Supply Chains with Power Plants, A. Nagurney, Z. Liu, and T. Woolley, to appear in *Mathematical and Computer Modelling.*

Financial Networks with Intermediation and Transportation Network Equilibria: A Supernetwork Equivalence and Reinterpretation of the Equilibrium Conditions with Computations, Z. Liu and A. Nagurney, *Computational Management Science* (2006), in press.

A Network Equilibrium Framework for Internet Advertising: Models, Qualitative Analysis, and Algorithms, L. Zhao and A. Nagurney (2005), submitted.

Sustainable Supply Chain Networks and Transportation, A. Nagurney, Z. Liu, and T. Woolley (2006), submitted.

Special Thanks to Dean Tom O'Brien

The Center Director and Associates extend their sincerest appreciation to Dean Tom O'Brien for all of his support. We wish Dean O'Brien all the very best as he steps down from serving as the Dean of the Isenberg School of Management for 19 wonderful years!

In closing, the Center Director and its Associates wish everyone a wonderful summer! We thank everyone for their support!

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