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# The Supernetwork Sentinel

## The Newsletter of the Virtual Center for Supernetworks

Fall 2003

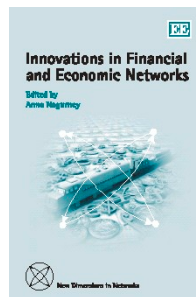


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Welcome to the inaugural edition of **The Supernetwork Sentinel**, the newsletter of the Virtual Center for Supernetworks at the Isenberg School of Management, UMass-Amherst. **The Supernetwork Sentinel** will be published in Fall, Winter, and Summer editions. Its purpose is to keep you informed of events, activities, and successes of the Virtual Center for Supernetworks. In this newsletter we include news items, noteworthy recognitions, essays, and timely stories.

Anna Nagurney  
John F. Smith Memorial Professor  
Director – Virtual Center for Supernetworks

### New Book!



**Innovations in Financial and Economic Networks**, the latest book edited by Professor Anna Nagurney, will be published by Edward Elgar Publishers in October 2003. The book contains contributions by international experts from the World Bank, Princeton University, MIT, U. of Texas, Austin, Imperial College, U. of Florida, UMass-Amherst, U. of Toronto, the University of Amsterdam, Iowa State, among others. The book presents entirely new results: the conceptualization of the stock market as a graph, the evolution of financial systems as networks, the inclusion of electronic transactions in international finance (from a network perspective), new formalisms for the study of supply chains (as fluid models and in a network economic framework), and new applications of agent-based computational trade networks. For more info see:

<http://supernet.som.umass.edu/bookser/ifen.htm>

### Center Website

During the Summer of 2003, a search engine and new features were added to the center's website: <http://supernet.som.umass.edu>

### New Laboratory for Computation and Visualization



Through the tireless efforts of Associate Dean Jane Miller, space reallocation within the Isenberg School of Management building allowed the Virtual Center for Supernetworks to be assigned Room G28 to serve as the new Supernetworks Laboratory for Computation and Visualization.

This past summer, thanks to the efforts of Undergraduate Dean Dennis Hanno and Mr. Mel Rodriguez, undergraduate students from the Talent Advancement Program (TAP) repainted and cleaned the new lab. The director and associates would like to thank Ms. Susan Milne, ISOM's System Manager, for her 24/7 assistance and expertise in helping to set up the lab.

The lab contains high performance computers, networked printers, video transfer equipment, and a WiFi network. The conference area of the lab includes a projector and screen. Journals and books are also housed in the lab for research purposes.

The Grand Opening of the Supernetworks Laboratory will occur in October at a date to be announced.

### Inside

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# **Commentary**

## **The New Era of Supernetworks –The Big Blackout and Why Human Behavior and Decision-Making Count!**

**Anna Nagurney**

We are now in a new era of Supernetworks as the Biggest Blackout in United States history on August 14, 2003 has fundamentally and dramatically illustrated. We as human decision-makers whether scientists, engineers, managers, and/or government officials can no longer study and manage individual network systems such as energy, transportation, and telecommunication networks independently. Moreover, it is insufficient to simply address the physical infrastructure in the form of nodes and links in terms of network design since it is ultimately the behavior of the individuals and the decision-makers on these systems that affect the flows, the congestion, the associated costs, the throughput, and their survivability.

Indeed, the biggest blackout in US history involved not only the severance of physical links in the form of transmission lines but through the coupling of human involvement in the management of the power grids resulted in tremendous losses for some whereas others in neighboring regions and communities were relatively unaffected and, in some instance, even gained, due to the availability of power, fuel, and other products. The loss of power affected not only telecommunication networks in the form of cell phones and even email servers but propagated through transportation networks resulting in the shutdown of airlines, rail lines, and tremendous road congestion in the form of both vehicular as well as pedestrian in New York City. Mail service was affected nationally and water distribution collapsed in Cleveland. Financial networks in the form of ATMs stopped functioning.

The topic of networks and network management is not new and dates to ancient times with such classical examples including the publicly provided Roman road network and the time of day chariot policy, whereby chariots were banned from the ancient city of Rome during particular times of the day.

The topic of networks as a subject of scientific inquiry originates in the paper by Euler in 1736, which is credited with being the earliest paper on graph theory, where a graph in this context is meant an abstract or mathematical representation of a system by its depiction in terms of vertices (nodes) and edges (or arcs) connecting various pairs of vertices. Interestingly, not long thereafter, Quesnay in 1758, in his book, *Tableau Economique*, conceptualized the circular flow of an economy as a network. Monge, who had worked under

Napoleon Bonaparte in providing the infrastructure support for his army, published what is probably the first paper on the transportation network model in 1781.

What is new about the network systems today is that they are interconnected in the form of Supernetworks. Decision-making on networks can take on many forms; it can be centralized or decentralized; it can be cooperative or competitive. Moreover, supernetworks are of massive dimensions, are increasingly characterized by congestion, and have effects far afield.

The complexity, however, may be captured and harnessed through novel management tools. Indeed, today, it is possible, through advances in scientific models, theories, and computational tools to predict optimal routes on networks from different origins to destinations both from a system-optimized perspective, in which there is a central controller of the network flows, as well as from a user-optimized one, in which users of the network select their optimal routes in what may be viewed as a selfish manner. We know now that in both urban transportation networks as well as in the case of the Internet the addition of a new link may actually make everyone worse off! So careful management is essential.

It is imperative that knowledge surrounding networks and decision-making on them gets disseminated in a timely manner. There is no time for reinventing the wheel.

For more information on this commentary as well as Letters to the Editor and OpEd pieces see <http://supernet.som.umass.edu/commentary.html>



## Netnomics Coeditors Chosen

Professor Anna Nagurney and Professor Hans Amman of the Technical University of Eindhoven in the Netherlands have been appointed Co-Editors of the journal, **Netnomics: Economic Research and Electronic Networks**, by Kluwer Academic Publishers. Topics addressed by the journal include: pricing schemes for electronic services, electronic trading systems, data mining and high frequency data, economic software agents, distributed database applications, supply chains and e-commerce, supernetworks, as well as innovative related topics. For more information see:

<http://www.wkap.nl/prod/j/1385-9587>

## MKIDS News

With the receipt of the National Science Foundation grant under the Management of Knowledge Intensive Dynamic Systems (MKIDS) initiative, the Supernetworks team will be busy this year researching how best to support decision-making in the new networked era of risk and uncertainty.

The Virtual Center will be hosting a Mini-Workshop on September 10, 2003 with presentations by the director and associates. Copies of the presentations are available at <http://supernet.som.umass.edu/visuals.html>

The following week, Professors Anna Nagurney and June Dong will be presenting two talks at the MKIDS Workshop sponsored by NSF and DoD in Baltimore, Maryland, entitled, *Supernetworks: Decision-Making for a New Era and Management of Knowledge Intensive Systems as Supernetworks: Modeling, Analysis, Computations, and Applications*. The latter paper is available at:

<http://supernet.som.umass.edu/dart.html>

## Kudos and Congratulations

Congratulations to **Professor June Dong** for being promoted to the rank of Full Professor in the Department of Management and Marketing in the School of Business at SUNY - Oswego!

**Professor Ding Zhang** of SUNY - Oswego, who serves as a Center Associate, will be spending his sabbatical during the Fall term in Hong Kong.

Congratulations to Doctoral Associate **Jose Cruz** for being selected to participate in the INFORMS 2003 Doctoral Consortium to be held in Atlanta, Georgia, October 10, 2003.

Doctoral Associate **Dmytro Matsypura** traveled to Sweden in June 2003 to participate in a workshop hosted by Professor Lars-Goran Mattsson at the Royal Institute of Technology in

Stockholm, Sweden. While in Sweden, Mr. Matsypura also presented the paper, "Dynamics of Global Supply Chain Supernetworks," co-authored with Professor Nagurney and Jose Cruz at the NECTAR Conference at the University of Umea. The paper is available at:

<http://supernet.som.umass.edu/dart.html>

## Center Associate News

Welcome to **Ms. Tina Wakolbinger**, who hails from Austria and has enrolled in the doctoral program at the Isenberg School of Management at UMass-Amherst with a concentration in Management Science. Ms. Wakolbinger was a student in Professor Nagurney's three courses at the University of Innsbruck in the Spring of 2002, while Professor Nagurney held a Distinguished Chaired Fulbright. She has industrial experience in Austria and is working as a Center Associate with support from the NSF MKIDS program. Welcome, Tina!

The Center welcomes its first undergraduate student associate of the 2003-2004 academic year, **Steven Davis**, who is an Operations Management major at the Isenberg School of Management. Mr. Davis completed Professor Nagurney's Management Science course last semester and is presently enrolled in her Transportation & Logistics course.

**Jeff Spiro** (Summer Undergraduate Associate 2003) has returned to Alfred University to resume his studies in Management Information Systems.

Last year's undergraduate center associates are busy with their new careers.

**Christopher Bardi '03** is working at United Technologies Research Center in East Hartford, Connecticut on Information Technology and Supply Chains.

**Christina Calvanese '03**, one of eleven UMass Leaders of the 21st Century, is working for General Electric in Erie, Pennsylvania, where she had interned previously.

**David Soffer '03** is now in Taiwan teaching English and emailed us that the recent typhoon there was spectacular.

## Upcoming Events

Two sessions at the **INFORMS Annual Meeting** in Atlanta, GA, October 19-22, 2003 have been organized by Professor Nagurney.

### Session I: Recycling Network Models

*Electronic Waste Management and Recycling: A Multitiered Network Equilibrium Framework*, Anna Nagurney and Fuminori Toyasaki, UMass - Amherst

*Planning the e-Scrap Reverse Production System under Uncertainty in the State of GA: A Case Study*, Matthew Realf, Jane Ammons, Tiravat Assavapokee, Ken Gilliam, I-Hsuan Hong, Georgia Tech

*Modeling Electronics Recycling Processes: Mixed versus Separated Plastics*, Julie Ann Stuart, Edward Grant, and Pedro Rios, Purdue University

## **Session II: Innovations in Financial and Economic Networks**

*On Structural Properties of the Market Graph*, Vladimir Boginski, Sergiy Butenko, Panos Pardalos, Professor, University of Florida and Texas A&M

*Applications of Fluid Modelling in Distribution Systems*, Soulaymane Kachani and Georgia Perakis, Columbia University and MIT

*A Supply Chain Network Economy: Modeling and Qualitative Analysis*, Ding Zhang, June Dong, and Anna Nagurney, SUNY – Oswego and UMass-Amherst

*Integrated Pension and Corporate Financial Planning: Optimal Contribution Strategies*, Koray Simsek and John Mulvey, Princeton University

*International Financial Networks with Intermediation and Electronic Transactions*, Jose Cruz and Anna Nagurney, UMass-Amherst  
For more information on the conference see:

<http://www.informs.org>

At the **Regional Science Association International 50<sup>th</sup> Annual Meeting** in Philadelphia, November 20-22, 2003, Professor David Boyce of the University of Illinois and Professor Anna Nagurney have organized a special session to mark the 50<sup>th</sup> anniversary of the association. A panel consisting of Professors Boyce, Nagurney, and Hani Mahmassani of the University of Maryland with Professor Martin Beckmann (emeritus of Brown University) will discuss the impact of the classic book **The Economics of Transportation** by Beckmann, McGuire, and Winsten, published in 1956. Through the efforts of Professor David Boyce, the book is now available on the Rand Corporation website; see:

<http://www.rand.org/publications/RM/RM1488.pdf>

Professor Beckmann served on Professor Nagurney's dissertation committee at Brown. For more information on the RSAI Conference, see: <http://www.narsc.org/conference.html>

## **Recent Center Publications**

Copies of center publications may be obtained at <http://supernet.som.umass.edu/dart.html>

**Management of Knowledge Intensive Systems as Supernetworks: Modeling, Analysis, Computations, and Applications**, Anna Nagurney and June Dong

**Networks**, Anna Nagurney (Contribution to the Encyclopedia of Science, Technology, and Ethics, Macmillan Reference USA, 2003)

**Global Supply Chain Networks and Risk Management**, Anna Nagurney, Jose Cruz, and June Dong

**Dynamics of International Financial Networks with Risk Management**, Anna Nagurney and Jose Cruz

**Electronic Waste Management and Recycling: A Multitiered Network Equilibrium Framework for E-Cycling**, Anna Nagurney and Fuminori Toyasaki

**Supply Chain Networks, Electronic Commerce, and Supply Side and Demand Side Risk**, Anna Nagurney, Jose Cruz, June Dong, and Ding Zhang

**A Supply Chain Network Economy: Modeling and Qualitative Analysis**, Ding Zhang, June Dong, and Anna Nagurney (To appear in Innovations in Financial and Economic Networks, Edward Elgar Publishers (2003))

**Multitiered Supply Chain Networks: Multicriteria Decision-Making under Uncertainty**, June Dong, Ding Zhang, Hong Yan, and Anna Nagurney

**International Financial Networks with Intermediation and Electronic Transactions**, Anna Nagurney and Jose Cruz (To appear in Innovations in Financial and Economic Networks, Edward Elgar Publishers (2003).)

## **More Thanks and Acknowledgments**

The Center Director and Associates are indebted to Dean Tom O'Brien and to Professor Nelson Lacey, Chair of the Department of Finance and Operations Management at the Isenberg School of Management, for creating an environment in which multidisciplinary research and education can flourish.

The Center Director and Student Associates thank Ms. Ann Lankarge, Ms. Mary Parker, Ms. Betty Santos, and Ms. Diane Keedy for making the paperwork flow to make the new center lab and associate appointments possible!



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