



# The Supernetwork Sentinel

## Fall 2011

Welcome to the Fall 2011 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. The newsletter's 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 mark the 10<sup>th</sup> anniversary of the founding of the Center. We also announce the receipt of a major new NSF grant and share news about accolades received by the Center Associates, highlight their activities, and note upcoming events. As always, we include a list of our recent Center publications.

Anna Nagurney  
John F. Smith Memorial Professor  
Director – Virtual Center for Supernetworks  
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**Professors Patrick Qiang, Zugang “Leo” Liu, Anna Nagurney, and Jose M. Cruz at the INFORMS Conference at UMass Amherst**

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**Names of all Center Associates can be found on the last page of this newsletter**

### Inside

**Marking Our 10<sup>th</sup> Anniversary – A Milestone**

**Announcing Major New NSF Grant**

**Podcast with Professor Anna Nagurney on *Sustaining the Supply Chain***

**Reflections on the Conference on Risk Management in Operations and Global Supply Chains in Montreal**

**Upcoming Workshop and Conference Highlights**

**Kudos and News**

**Recent Center Publications**

## Marking Our 10<sup>th</sup> Anniversary – A Milestone

In the Fall of 2001, the Virtual Center for Supernetworks was established after the Founding Director, Professor Anna Nagurney, received 3 National Science Foundation grants in 2000 plus an AT&T Industrial Ecology Fellowship in 2001, which proposed the development of such a center. One of the NSF grants was a joint grant with Professor June Dong, who is the co-author with Professor Nagurney, of the book, *Supernetworks: Decision-Making for the Information Age*, which was in press in 2001 and was published in 2002.

During the period 2000-2007, the total value of such grants and awards, which included another AT&T Fellowship, plus two NSF Research Experiences for Undergraduates (REU) awards, as well as a supplement from NSF under the MKIDS (Management of Knowledge Intensive Dynamic Systems) program, was \$946, 885. Our supernetwork team had been selected for the MKIDS program as one of nine teams in the US, along with CMU, Stanford, and Oregon State, for additional funding by NSA through NSF because our research was deemed critical for national security.

In November, 2003, the Virtual Center of Supernetworks was allocated physical space for the Supernetworks Laboratory in Isenberg Room G28 by then Dean Tom O'Brien.

Additional grants and awards have included: a Rockefeller Foundation Bellagio Center grant in 2004 and in 2008, and a grant in 2008 from the International Institute for Education, plus a grant from the Radcliffe Institute for Advanced Study Educational Programs in 2006, as well as two Fulbright awards in 2001-2002 and in 2008, given to Professor Anna Nagurney. Also, funding had been received in this period from UMass Amherst through the Smith Fund. The total value of these grants and awards exceeds \$400,000.

As of September 15, 2011 (see article below), Professor Anna Nagurney is the Co-PI (Co - Principal Investigator) of a major new grant from the National Science Foundation (NSF). The grant for the UMass Amherst component is for over \$909,000 on the full grant of over \$2.7 million. Our expertise in Management Science and Network Economics was essential to us being awarded this grant. This substantial grant will further support research of the Center and its Associates.

Since the 10<sup>th</sup> anniversary of the establishment of the Center takes place this Fall, the Center Director thought that it would be appropriate to

highlight some of the additional achievements of the Center, which she has had the honor of directing since November 2001.

Below are some of the highlights, in concise form, of how this Center has been a leader in research, education, and service.

### Highlights of the Virtual Center for Supernetworks and Its Activities

Over 71,000 visitors have visited the Virtual Center for Supernetworks website.

75+ # of refereed articles published by the Director and Center Associates during the past decade in such journals as: *Transportation Science*, *Naval Research Logistics*, and *EJOR*, among many others;

30+ # of book chapters published by Director and Center Associates in this period on topics ranging from supply chains to financial networks to energy and sustainability;

4 # of books authored or co-authored by Director and Center Associates in this period;

13 # of journal editorial boards that the Director is serving on, including *Networks*;

20+ # of OpEd pieces, Commentary Pieces, and Letters to the Editor (in *The New York Times*, *The Boston Globe*, *The Chronicle of Higher Ed*, *The Economist*, etc.) written by the Director;

24 # of editions of *The Supernetwork Sentinel*, the center newsletter, since 2003;

20+ # of conferences and workshops involved in organizing, including the most recent UMass Amherst INFORMS one, one at Harvard, the 2011 IEEE Supernetworks conference in Shanghai, and several European conferences;

100+ # of conference presentations given by Director and Center Associates;

4 # of different short courses and tutorials given (at the World Bank, in Executive Ed at Harvard, at NIH, and at ALIO-INFORMS in Buenos Aires);

75 # of speakers from industry (IBM, MITRE, ISO NE, etc), academia (MIT, Harvard, McGill, Illinois, etc.) brought to Isenberg through the UMass Amherst INFORMS Speakers Program, which the Director helped to organize and sponsor;

14 # number of keynote and plenary talks given nationally and internationally by the Director in such countries as Italy, China, Ukraine, Austria, and the US, with upcoming

ones this coming year in the US, in France, and The Netherlands;

8 # of doctoral students who have received their PhDs while serving as Center Associates; all of them have assumed tenure-track appointments at universities. Of these, 1 has now achieved the rank of Full Professor, and another one has achieved tenure, with several more expecting promotions and tenure soon. Present appointments include such major research universities as the University of Connecticut, the University of Sydney, York University, and the Vienna University of Business and Economics (the latter three are ranked internationally).

7 # number of ***national awards*** that students have received as Center Associates (two Judith Liebman Awards from INFORMS, 1 national doctoral dissertation award, 4 national INFORMS student chapter awards);

3 # of Undergraduate Student Center Associates (Cristina Calvaneso, Steven Davis, and Maxfield Raynolds, all Operations Management majors) who have received ***21<sup>st</sup> Century Leaders Awards*** at their graduations, one of the highest distinctions for graduating seniors. A total of 15 undergraduate students have worked as Student Center Associates.

2 # of Center Doctoral Student Associates who have received ***Graduate Fellowships*** from UMass Amherst, a notable distinction;

The above are just ***some of the highlights*** and do not identify the spectrum of individual research and teaching awards received as well as other notable professional society recognitions including Fellow appointment, professional society board membership, etc.



**Professor Nagurney being filmed in NYC**

The Center has been featured on both television and radio programs and the Director has been an invited panelist at notable venues such as the **World Science Festival** in NYC, and will be featured in the PBS ***America Revealed*** program, for which she was filmed in NYC. In

addition, she has been interviewed for several podcasts by INFORMS, the AMS, and Mesh Forum. Some of these are being used in courses at NYU and at Duke.



## **Announcing Major New NSF Grant**

Center Director Professor Anna Nagurney is a Co-PI (Principal Investigator) on a major new National Science Foundation (NSF) grant: **NeTS: Large Collaborative Research: Network Innovation Through Choice**. The PI is Professor Tilman Wolf of the Department of Electrical and Computer Engineering at UMass Amherst. In addition, other collaborators on the project include faculty from North Carolina State University, the University of Kentucky, and RENCI, which is a consortium of universities in North Carolina, including Duke University.

As stated in the Project Summary, the project addresses one of the key problems in the current Internet – how to design a network that ensures long-term innovation inside the network core. The research will provide solutions to fundamental questions on how to enable choice among different service alternatives, how to develop a marketplace for incentive-based competition, and how to handle explicit control and management. The development of a prototype allows for realistic experimentation that includes community involvement and educational uses.

Professor Anna Nagurney expects to fund new doctoral students, as well as new activities through this grant. Her team's contributions will focus on the network economics and management science aspects of this project.



**Min Yu, Amir Masoumi, and Dong "Michelle" Li in the Supernetworks Lab**



## Podcast with Professor Anna Nagurney on *Sustaining the Supply Chain*



Professor Anna Nagurney had the pleasure of being interviewed by Mr. Michael Breen of the American Mathematical Society (AMS) for a podcast for the series [Mathematical Moments](http://www.ams.org/mathmoments).

Mr. Breen had attended her presentation at the American Association of the Advancement of Science (AAAS) meeting last February in Washington DC, where she spoke on the [Mathematics and Collective Behavior panel](#) that was organized by Dr. Warren Page.

The interview was on ***Sustaining the Supply Chain*** and focused on the research of the Supernetwork Team on humanitarian logistics and disaster management. It is now featured on the AMS website, along with an accompanying poster.

The link to the poster is at:  
<http://www.ams.org/samplings/mathmoments/mathmoments>

and you can directly access the podcast interview at:  
<http://www.ams.org/mathmoments/mm90-relief-podcast>

The Isenberg School has made a note of the podcast [on its website](#).

The series *Mathematical Moments* highlights, in a graphic and informative way, the myriad ways in which mathematics illuminates our world and contributes to society. Plus, through such a series, one can engage others, including students, as well as the public, on timely topics.

## Reflections on the Conference on Risk Management in Operations and Global Supply Chains



**Professor Mehmet Gumus opening up the conference at McGill**

Professor Anna Nagurney gave an invited talk at the [INTRIM \(Integrated Risk Management in Operations and Global Supply Chains\) Conference](#) that took place at lovely McGill University in Montreal, Canada, July 31- August 1, 2011. She spoke on ***Medical Nuclear Supply Chain Design: A Tractable Network Model and Computational Approach***, co-authored with Center Associate Professor Ladimer S. Nagurney. [Their presentation](#) was based on [their paper](#). This health care topic was also the subject of their [published Op-Ed piece](#).



**Professor Anna Nagurney with fellow conferees at coffee break time**

Many thanks to the organizers for putting together such an interesting set of presentations, all delivered in a single track, along with delicious coffee breaks, lunches, etc.

Professor Anna Nagurney especially enjoyed the originality of the problems that are being tackled and the challenges faced by industries in capturing system-wide risk. The organizers of



the conference were Professors Mehmet Gumus and Saibal Roy.

## Upcoming Workshop and Conference Highlights

Center Associates will be having a very busy Fall 2011 semester. In addition to the courses at various universities that they will be teaching on three different continents, given their affiliations, they will also be speaking at a variety of venues.

This year, the Statistical and Applied Mathematical Sciences Institute (SAMSI), which is a partnership of [Duke University](#), [North Carolina State University](#), the [University of North Carolina at Chapel Hill](#), and the [National Institute of Statistical Sciences](#), in collaboration with the [William R. Kenan, Jr. Institute for Engineering, Technology and Science](#), has as its theme: **Uncertainty Quantification**.

SAMSI is organizing a yearlong series of events under this theme and Center Director Professor Anna Nagurney will be taking part in its [Engineering and Renewable Energy Workshop](#) in September 2011. She will deliver a keynote talk entitled, **Sustainability**, with a focus on methodology.

In addition, Professor Anna Nagurney will be a keynote speaker at [NetGCoop 2011](#), the International Conference on Network Games, Control, and Optimization, which will take place in Paris, France, October 12-14.



**Some of the Center Associates, including Professor Trisha Anderson (on the left) at the INFORMS Conference in Austin, Texas**

The major annual conference at which Center Associates have been convening annually is the [INFORMS Annual Conference](#), which, this year, takes place in Charlotte, North Carolina, November 13-16.

Center Associate Professor Jose M. Cruz of the University of Connecticut has organized a session for this conference, **Sustainable and Responsible Supply Chain Management** in which he will be speaking, along with several other Center Associates. This session is part of the Manufacturing & Service Operations Management / Sustainable Operations Cluster.

In another session, also in the same cluster, Center Associate Professor Patrick Qiang of Penn State Malvern will be presenting his latest research, joint with Center Associates Professors Ke Ke of Central Washington University, Trisha Anderson of Texas Wesleyan University, and June Dong of SUNY Oswego, on closed loop supply chains (see Kudos and News below for more information).

Center Associate Professor Zugang "Leo" Liu of Penn State Hazleton will be presenting two papers at this conference, one joint with Dr. Cruz, and the other with Professor Anna Nagurney.

Center Associate Professor Dmytro Matsypura, who is at the University of Sydney, will be traveling from Australia to present his [latest research on financial networks](#).

In addition, Center Director Professor Anna Nagurney, besides presenting papers with other Center Associates will be speaking on two panels: [Becoming an O.R./Analytics Newsmaker](#), and [Leaders Give Professional Advice to Women and Men](#). Prior to the INFORMS Conference, she will be taking part in the [58<sup>th</sup> Annual North American Meetings of the Regional Science Association International \(RSAI\)](#) at which she will deliver two papers co-authored with Center Associate Professor Ladimer S. Nagurney of the University of Hartford on the dynamics of predator-prey networks and on medical nuclear supply chain design. She serves as a [Councillor-at-Large of NARSC](#).

## Kudos and News

Congratulations to Center Associate Professor June Dong! She co-edited the conference volume, *Proceedings of the 2011 IEEE International Conference on Supernetworks and System Management*, IEEE Press, Beijing, China. In addition, she was named an Oriental Scholar from Shanghai High Education Department.

Doctoral Student Center Associate Min Yu also presented at this conference.



**Professor June Dong (in bright blue) and Min Yu (in light blue) with other participants, including Professor Hani S. Mahmassani of Northwestern University, in Shanghai, China at the 2011 IEEE Conference on Supernetworks**

Congratulations also to Center Associates Professor Zugang "Leo" Liu" and Professor Jose M. Cruz. Their paper, **Modeling and Analysis of the Multiperiod Effects of Social Relationship on Supply Chain Networks**, has been published in the *European Journal of Operational Research* (2011), **214**, 39-52. Also, their joint paper, **Computational Grid Networks Market Design: QoS, Reliability, and Risk Management**, has been conditionally accepted in *Decision Support Systems*.

In addition, Dr. Liu's paper, **Supply Chain Networks with Global Outsourcing and Quick-Response Production Under Demand and Cost Uncertainty**, (2011), co-authored with Professor Anna Nagurney, has been conditionally accepted for publication in a special issue of the *Annals of Operations Research* devoted to the memory of Professor Cyrus Derman.

Center Associate Professor Tina Wakolbinger is, as of May 15, 2011, a Full Professor of Supply Chain Services and Networks at the Vienna University of Economics and Business. Her paper with Professor Fuminori Toyasaki of York University in Canada, entitled, **Impacts of Funding Systems on Humanitarian Operations**, appears in the new book, *Humanitarian Logistics: Meeting the Challenge of Preparing for and Responding to Disasters* (2011), M. Christopher and P. Tatham, Editors, Kogan Page, pp. 33-46.

Dr. Wakolbinger's paper with Center Associate Professor Jose Cruz, **Supply Chain Disruption Risk Management Through Strategic Information Acquisition and Sharing and Risk-Sharing Contracts**, was published in the *International Journal of Production Research*

(2011), **49**, 4063-4084. In addition, her paper with M. Amini, M. Racer, and M. Nejad, **Alternative Supply Chain Production-Sales Policies for New Product Diffusion: An Agent-Based Modeling and Simulation Approach**, has been accepted in the *European Journal of Operational Research*.

Finally, Dr. Wakolbinger's paper with R. Banai, **A Measure of Regional Influence with the Analytic Network Process**, is forthcoming in *Socio-Economic Planning Sciences*.

We congratulate Dr. Wakolbinger on her publication success!

Center Associates Professors Patrick Qiang, Ke Ke, Trisha Anderson, and June Dong have had their paper, **The Closed-loop Supply Chain Network with Competition, Distribution Channel Investment, and Uncertainties**, accepted for publication in *Omega*.

Also, kudos to Professor Patrick Qiang for his essay on **Infrastructure Protection and Disaster Planning** that was featured on his campus' website in preparation for Hurricane Irene. His paper, **Fragile Networks: Identifying Vulnerabilities and Synergies in an Uncertain Age**, with the Center Director, is scheduled to be published in a special double volume issue of the *International Transactions in Operational Research* in January 2012.

Congratulations are also in order to Center Associate Professor Dmytro Matsypura, whose paper with his colleague, V. G. Timkovsky, **Margining Option Portfolios by Network Flows**, has been accepted for publication in *Networks*.

In addition, Professor Matsypura received the Wayne Lonergan Outstanding Teacher Award (Early Career) from the University of Sydney in 2011. Congratulations to Professor Matsypura for both his teaching and research accomplishments!



**Dr. Matsypura receiving the Outstanding Teaching Award from Mr. Wayne Lonergan**

Center Associate Professor Patrizia Daniele of the University of Catania, Italy is organizing a special session on Variational Analysis and Equilibrium Problems for the [9th AIMS Conference on Dynamical Systems, Differential Equations and Applications](http://supernet.isenberg.umass.edu/dart.html), which will take place in Orlando, Florida, July 1-5, 2012.

In addition, Professor Daniele has been invited to be a Guest Editor of a special issue of *Abstract and Applied Analysis* on *Variational Analysis and Applications*. She will also be a lead editor for another special issue of that journal.

Center Associate Professor Ladimer S. Nagurney's paper, co-authored with the Center Director, **Dynamics and Equilibria of Ecological Predator-Prey Networks as Nature's Supply Chains**, has been accepted for publication in *Transportation Research E*. He also received an Educational Technology Grant from the University of Hartford Provost's Office. The purpose of the grant is to investigate the use of e-Readers, such as the Kindle or Nook in the engineering classroom. During the Fall 2011 semester, he will be using Kindle in parts of his courses.

We congratulate Doctoral Student Center Associate Min Yu, who has been accepted in the Future Academician Colloquium at the 2011 INFORMS Annual Meeting, which will take place in Charlotte, North Carolina, in November. She has also been accepted into the DSI Doctoral Colloquium, which will take place in Boston, also in November.

Min's paper, co-authored with Professor Anna Nagurney, **Fashion Supply Chain Management Through Cost and Time Minimization from a Network Perspective**, is the lead chapter in the new book, *Fashion Supply Chain Management: Industry and Business Analysis* (2011), T.-M. Choi, Editor, IGI Global, Hershey, Pennsylvania, pp. 1-20.

Also, congratulations are in order to Min and Doctoral Student Center Associate Amir H. Masoumi for their paper, **Supply Chain Network Operations Management of a Blood Banking System with Cost and Risk Minimization**, co-authored with Professor Anna Nagurney, which has been accepted for publication in *Computational Management Science*.

We congratulate Doctoral Student Center Associate Dong "Michelle" Li on her successful passing of the core exam in Management Science with the completion of her paper, **Pharmaceutical Supply Chain Network Operations Management with Cost and Risk Minimization**.

## Recent Center Publications

Please also see our center articles at: <http://supernet.isenberg.umass.edu/dart.html>

**The Closed-loop Supply Chain Network with Competition, Distribution Channel Investment, and Uncertainties**, Q. Qiang, K. Ke, T. Anderson, and J. Dong (2011), to appear in *Omega*.

**Supply Chain Network Operations Management of a Blood Banking System with Cost and Risk Minimization**, A. Nagurney, A. Masoumi, and M. Yu (2010), to appear in *Computational Management Science*.

**Supply Chain Networks with Global Outsourcing and Quick-Response Production Under Demand and Cost Uncertainty**, Z. Liu and A. Nagurney (2011), conditionally accepted in the *Annals of Operations Research*.

**Dynamics and Equilibria of Ecological Predator-Prey Networks as Nature's Supply Chains**, A. Nagurney and L. S. Nagurney (2011), to appear in *Transportation Research E*.

**Supernetworks: The Science of Complexity**, A. Nagurney, *Journal of University of Shanghai for Science and Technology* (2011), in press.

**Spatial Price Equilibrium and Food Webs: The Economics of Predator-Prey Networks**, A. Nagurney and L. S. Nagurney, in the *Proceedings of the 2011 IEEE Conference on Supernetworks and System Management*, F. Y. Xu and J. Dong, Editors, IEEE Press, Beijing China, pp 1-6.

**Sustainable Fashion Supply Chain Management Under Oligopolistic Competition and Brand Differentiation**, A. Nagurney and M. Yu, (2010), to appear in the *International Journal of Production Economics*, Special issue on Green Manufacturing and Distribution in the Fashion and Apparel Industries.

**Fragile Networks: Identifying Vulnerabilities and Synergies in an Uncertain Age**, A. Nagurney and Q. Qiang, *International Transactions in Operational Research* (2011), in press.

**Supply Chain Network Design for Critical Needs with Outsourcing**, A. Nagurney, M. Yu, and Q. Qiang, *Papers in Regional Science* (2011), **90**, 123-142.

**Supply Chain Outsourcing Under Exchange Rate Risk and Competition**, Z. Liu and A. Nagurney, *Omega* (2011), **39**, 539-549.



**Fashion Supply Chain Management Through Cost and Time Minimization from a Network Perspective**, A. Nagurney and M. Yu (2011), in *Fashion Supply Chain Management: Industry and Business Analysis* (2011), T.-M. Choi, Editor, IGI Global, Hershey, Pennsylvania, pp 1-20.

**Modeling and Analysis of the Multiperiod Effects of Social Relationship on Supply Chain Networks**, J. M. Cruz and Z. Liu, *European Journal of Operational Research* (2011), **214**, 39-52.

**Multiproduct Humanitarian Healthcare Supply Chains: A Network Modeling and Computational Approach**, A. Nagurney, M. Yu, and Q. Qiang (2011), submitted.

**Medical Nuclear Supply Chain Design: A Tractable Network Model and Computational Approach**, A. Nagurney and L. S. Nagurney (2011), submitted.

**A Bi-Criteria Measure to Assess Supply Chain Network Performance for Critical Needs Under Capacity and Demand Disruptions**, Q. Qiang and A. Nagurney (2010), to appear in *Transportation Research A*, Special issue on Network Vulnerability in Large-Scale Transport Networks.

**Multiperiod Competitive Supply Chain Networks with Inventorying and a Transportation Network Equilibrium Reformulation**, Z. Liu and A. Nagurney (2010), revised and resubmitted to *Optimization and Engineering*.

**Risk Reduction and Cost Synergy in Mergers and Acquisitions via Supply Chain Network Integration**, Z. Liu and A. Nagurney (2010), to appear in the *Journal of Financial Decision Making*.

**The Center Director and the Center Associates thank you for your support!**

#### **Center Director**

Dr. Anna Nagurney  
John F. Smith Memorial Professor

#### **Center Associates**

Dr. Jose M. Cruz  
Dr. Patrizia Daniele  
Dr. June Dong  
Dr. Ke "Grace" Ke  
Dr. Zegang "Leo" Liu  
Dr. Dmytro Matsypura  
Dr. Ladimer S. Nagurney  
Dr. Qiang "Patrick" Qiang  
Dr. Padma Ramanujam  
Dr. Stavros Siokos  
Dr. Tina Wakolbinger  
Dr. Trisha Woolley  
Dr. Ding Zhang  
Dr. Lan Zhao

#### **Doctoral Students**

Dong "Michelle" Li  
Amir Masoumi  
Min Yu

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