
The Supernetwork Sentinel

The Newsletter of the Virtual Center for Supernetworks

Fall 2007



Welcome to the Fall 2007 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 article by Professor Anna Nagurney on an upcoming conference sponsored by the Rockefeller Foundation that she is organizing. We also share and celebrate the achievements of our hard-working Center Associates, whose research is being recognized internationally. As always, we provide a list of our recent publications as well as upcoming events.

We wish everyone a wonderful 2007-2008 academic year!

Anna Nagurney
John F. Smith Memorial Professor
Director – Virtual Center for Supernetworks
<http://supernet.som.umass.edu>



Above: Center Associate Professor Jose Cruz [l] and Professor Anna Nagurney[r] with Professor Iqbal Agha, Chairman of the UMass Dept. of Finance and Operations Management, at the INFORMS Conference in Puerto Rico, July 2007

Right: Professor Nagurney at the CEF Conference in Montreal, Canada, June 2007

Top Right: Bellagio Center on Lake Como, Italy



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The Rockefeller Foundation to Host Bellagio Center Conference on *Humanitarian Logistics: Networks for Africa*

Anna Nagurney

In the Summer of 2007, I was deeply honored when notified that my proposal to the Rockefeller Foundation; <http://rockfound.org> to organize a conference on "Humanitarian Logistics: Networks for Africa," was approved for May 2008 through the Foundation's Bellagio Study and Conference Center program. The conference will take place at the Foundation's Bellagio Center on Lake Como in Italy. As we work through finalizing the conference which will convene 19 leading academicians and practitioners from four different continents to tackle the challenging topic of the conference, I thought that it would be timely to outline some of the underlying themes that will be discussed in depth.

Logistics networks, in times of need, provide the essential infrastructure for the movement of goods: water, food, fuel, clothing, housing, medicines, and other basic supplies, as well as services: relief and medical workers, engineers and technicians, security officials, critical expertise, etc. Recent historical events in the form of natural disasters, wars and uprisings, and the spread of diseases, among others, have presented major challenges for the timely delivery of essentials to needy and suffering populations. The discipline of "humanitarian logistics," which is still in its infancy, in terms of academic scholarship and transfer to other relevant organizations, will be the focus of this specially themed conference. An accompanying theme of the conference will be "networks for Africa" since no continent struggles with and endures more crises where appropriate emergency and disaster preparedness and new linkages through enhanced humanitarian logistics can make a distinctive difference.

This conference will convene academics at the frontiers of logistics research, including supply chain research, along with members of leading humanitarian agencies and NGOs, in order to focus on the major research and practical needs of humanitarian logistics at a time of increasing risk and uncertainty. The conference will push the knowledge of both research and practice in an intense, collaborative setting. It will convene individuals from the continents of Europe, Africa, North and South America to exchange expertise and to build bridges for the enhanced future of humanitarian logistics. Since education is a necessary vehicle for the transfer of research into practice, the establishing of partnerships across the continents for education on humanitarian logistics will also be a primary topic of the conference.

To-date, invited speakers that have confirmed their participation in the conference on humanitarian logistics include representatives from the International Federation of the Red Cross and the Red Crescent Societies, World Vision, Oxfam, CARE Kenya, the International Telecommunication Union, the Council for Scientific and Industrial Research, South Africa, and leading academics from Imperial College in the United Kingdom, INSEAD, the Swedish School of Economics and Business Administration in Finland, the University of Nairobi and the University of Johannesburg in Africa, the Georgia Institute of Technology, the University of Florida, the University of Connecticut, Auburn University, and the University of Massachusetts at Amherst in the US. The Fritz Institute and IBM will also be represented.

The timeliness for such a conference cannot be more opportune -- the new generation is seeking outlets for social responsibility whereas academicians and professionals are increasingly aware of the needs of the world at large and the suffering of many of its citizens.

The Bellagio Conference Center will provide an ideal, centralized forum for convening the conference on humanitarian logistics.

Challenges of Humanitarian Logistics for Africa

Humanitarian logistics faces the novel challenges of being high-stakes; often involving "life or death;" of being characterized by zero lead times in terms of the event and the need for humanitarian assistance, which dramatically affects the availability of the inventory of goods, their procurement, as well as their distribution. In addition, many humanitarian operations lack effective performance measurements/metrics and may have varying levels of enabling technology for communication and decision-making, resulting in supplies not reaching the destinations in a timely and effective manner, thereby, adding to the human suffering. At the same time, humanitarian supply or "relief" chains have similarities to their classical or commercial counterparts in that both are characterized by such basic concepts as demand, distribution networks, inventory control, strategic and operational goals. Hence, there are synergies between humanitarian supply chains and commercial or corporate supply chains that need to be deeply examined, understood, and learned from. The state-of-the-art in humanitarian logistics is decades behind that of commercial logistics. This conference will aim to bring these two knowledge networks closer.

Moreover, there are unique challenges that suggest that enhanced methodologies and technology-based decision support tools may make a difference in providing essentials in times of disasters and crises. For example, in the case of humanitarian logistics and the accompanying supply or relief chains, the demand is generated from "random" events that are, typically, unpredictable in terms of date of occurrence, geographical locations, and scope of impact. This is quite different from the demand in commercial supply chains, which tends to be relatively stable and predictable across space and time. Furthermore, the challenges in capturing the demand for supplies in uncertain and risky environments continue with the determination of distribution network configurations not being well-defined. In addition, the information that is available in times of crises and disasters is often-times not reliable, not complete, and difficult to obtain for the stakeholders.

At the conference we will examine and scope out the specific challenges facing humanitarian logistics on the continent of Africa, given its unique history, geography, and myriad cultures, stressed by poverty, disease, lack of resources, diversity of climate, lack of critical infrastructure in terms of: roads, warehouses, telecommunication and power lines, healthcare centers, and, in places, serious civil strife, wars, and unrest.

One of the principal goals of the conference will be to develop new partnerships for humanitarian logistics and education with a focus on creating networks for Africa.

The Virtual Center for Supernetworks is deeply gratified to be able to lead in the organization of this conference.



The UMass Amherst INFORMS (Institute for Operations Research and the Management Sciences) Speaker Series lineup for Fall 2007 is now available. The talks take place on scheduled Fridays at the Isenberg School of Management in Room 112 from 11:00AM-12:00PM (except where noted), and are open to the public.

The series is organized by the UMass Amherst INFORMS Student Chapter, whose Speaker Series Coordinator is Ms. Trisha Woolley and whose Faculty Advisor is Anna Nagurney, the John F. Smith Memorial Professor. This is the seventh semester of this Speaker Series, which is multidisciplinary in nature.

The schedule for Fall 2007:

Dr. Brenda Dietrich, the Director of Mathematical Sciences at IBM in Yorktown Heights, will open the series on September 14, 2007. She will speak on "Services Science: A New Opportunity for Operations Research." Dr. Dietrich is the President of INFORMS and an IBM Fellow.

Dr. Stavros Siokos, Managing Director of Citigroup in London, the United Kingdom, and a UMass PhD '98, will deliver his talk, "Latest Trends of Global Equity Trading: The New

Technology, the Players, and the New Legislation -- Differences Between the US and the Rest of the World," on September 28. His talk is joint with the Finance Seminar Series at the Isenberg School.

Professor Elaine Chew of the Viterbi School of Engineering at the University of Southern California and a 2007-2008 Science Fellow at the Radcliffe Institute for Advanced Study at Harvard University will speak on "Music and Operations Research -- The Perfect Match" on October 19.

Professor David Jensen of the Department of Computer Science at UMass Amherst and the Director of the Knowledge Discovery Lab will speak on "Learning and Exploiting Statistical Dependence in Networks," on October 26.

Dr. Joanne Hill, Managing Director of Goldman Sachs, will deliver her talk, "Investment Strategy Design Meets Capital Markets -- The Fit and Misfit of Operations Research," on November 2 at 1:30PM in Room 210. Her seminar is joint with the Finance Seminar Series at the Isenberg School of Management.

Professor Sundar Krishnamurty of the Department of Mechanical and Industrial Engineering at UMass Amherst will speak on November 16. His talk is entitled, "Decision Model Development in Engineering Design."

Professor Arnold Barnett, the George Eastman Professor of Management Science at the Sloan School of Management at MIT, will conclude the Fall Speaker Series on December 7, with his talk, "Is it Really Safe to Fly?"

For more detailed information on the series: <http://supernet.som.umass.edu/informs/speakernew.html>

For information on the UMass Amherst INFORMS Student Chapter and additional activities, see: <http://student.som.umass.edu/informs/>

Support for this series is provided by the Isenberg School, the Department of Finance and Operations Management, and the John F. Smith Memorial Fund.

Nagurney and Qiang's Research on Network Efficiency and Vulnerability Continues to Attract Media Attention

Professor Anna Nagurney and Patrick Qiang's research on network efficiency/performance measurement and the identification of critical nodes and links and their rankings has received major attention recently in the press. Articles on their research, based on interviews conducted with Professor Nagurney, have appeared in *NetworkWorld*, *ComputerWorld*, *LinuxWorld*, and *WebWeek*, and have also been translated into other languages, including Swedish. Professor Nagurney has also been interviewed on the major study by the German press and, in addition, by the local press in the *Daily Hampshire Gazette*. Highlights of the research have appeared in *ScienceDaily.com*. Please see: <http://supernet.som.umass.edu/media/media.htm> for additional information on media coverage.

The first papers on this topic co-authored by Nagurney and Qiang and based on their major study, which was funded by the National Science Foundation, under the Management of Knowledge Intensive Dynamic Systems program, have recently been published in *Europhysics Letters* and in the *2007 POMS Proceedings*. Additional papers with various extensions are now in press in *Optimization Letters* and the *Journal of Global Optimization*. The authors have applied their results to congested urban transportation networks, electric power supply chains, as well as to a dynamic model of the Internet. For additional information on these and other articles, see: <http://supernet.som.umass.edu/dart.html>

Kudos, Congratulations, and News

One of the highlights of the summer of 2007 was the INFORMS Puerto Rico Conference, which took place, July 8-11, 2007. Professor Anna Nagurney organized an invited session at the conference entitled **Supply Chains and the Environment** and invited speakers included Center Associate Dr. Jose M. Cruz of the School of Business at the University of Connecticut in Storrs and David Hammond of the University of

Portsmouth in England. The conference venue in Puerto Rico was fantastic and it allowed for many wonderful conversations and discussions. While in Puerto Rico, Professor Nagurney was interviewed by *bloomberg.com* on congestion pricing.

Congratulations to Center Associate, Dr. Tina Wakolbinger, who received her PhD from UMass Amherst last May and is now an Assistant Professor at the Fogelman School of Economics and Business at the University of Memphis in Tennessee. Professor Wakolbinger writes that she is enjoying her faculty position and teaching at the University of Memphis very much.

Congratulations to Doctoral Center Associate, Qiang "Patrick" Qiang, who was selected to participate in the **Future Academician Colloquium** to be held prior to the 2007 INFORMS (Institute for Operations Research and the Management Sciences) Annual Meeting in November, 2007. In addition, Patrick received a fellowship from the organizers of the World Conference on Transport Research (WCTR), to participate and speak at the conference, which was held in Berkeley, California, June 24-28, 2007. His presentation was based on the paper, **A Transportation Network Efficiency Measure that Captures Flows, Behavior, and Costs with Applications to Network Component Importance Identification and Vulnerability**, co-authored with Professor Anna Nagurney.

Professor Hani S. Mahmassani with Patrick Qiang at the WCTR Conference in Berkeley



Kudos to Doctoral Center Associate, Zungang "Leo" Liu, who completed a major study this past summer, which was funded, in part, by the National Science Foundation, on the modeling an empirical analysis of electric power supply chains and fuel markets. A paper based on the study and entitled, **An Integrated Electric Power Supply Chain and Fuel Market Network Framework: Theoretical Modeling with Empirical Analysis for New England**, Z. Liu and A. Nagurney (2007) is available at: <http://supernet.som.umass.edu/dart.html>

Center Associate Professor Ding Zhang, who is the MBA Director at the School of Business at SUNY Oswego spent the summer in China establishing linkages between his university and several Chinese universities. He also conducted research with colleagues at the Fudan University in Shanghai.

Center Associate Professor June Dong has completed a multi-year National Science Foundation project, **Decentralized Decision-Making in Complex Network Systems**, with Professor Anna Nagurney. Professor Patricia L. Mokhtarian of the University of California at Davis was also a Co-PI on this grant. This project was originally a three year project, beginning in 2001, with additional support provided beginning in 2004 to Professors Nagurney and Dong under the **Management of Knowledge Intensive Dynamic Systems Program**.

Professor Anna Nagurney has been selected in 2007 as an RSAI (Regional Science Association International) Fellow and will participate in the induction ceremony to be held at the RSAI Meeting in Savannah, Georgia, November 7-10, 2007. More information on RSAI can be found at: <http://www.regionalscience.org/htm>

The list of previously inducted RSAI Fellows is at: <http://www.regionalscience.org/CompNAwards/rsaifellowsaward.htm> and includes esteemed and dear friends of the Virtual Center for Supernetworks.

For online presentations of the Center Director and Associates at a variety of forums, see: <http://supernet.som.umass.edu/visuals.html>

Upcoming Talks, Conferences & Events

The Center Director, Professor Anna Nagurney, and Center Associates will be presenting at several forthcoming seminars, conferences and events.



On September 27, 2007, Professor Anna Nagurney will be a panelist at the conference:

Mind the Gap! Career Summit on Women & Technology; for more information, see: <http://mindthegap.eventbrite.com/>

On October 5, 2007, Professor Anna Nagurney will deliver the Warren Lecture at the University of Minnesota in Minneapolis.

The 2007 INFORMS Annual Meeting will take place in Seattle, Washington, November 4-7. Doctoral Center Associates: Zugang "Leo" Liu, Patrick Qiang, and Trisha Woolley will be presenting papers there.

At the RSAI North American Meeting in Savannah, Georgia, November 7-10, Professor Anna Nagurney will be speaking on joint work with Patrick Qiang.

On November 28, 2007 Professor Anna Nagurney is scheduled to deliver an invited seminar at Cornell University in Ithaca, New York.

For more information on the talks, conferences, and events, see: <http://supernet.som.umass.edu/conferences.html>

Recent Center Publications

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

A Network Efficiency Measure for Congested Networks, A. Nagurney and Q. Qiang, *Europhysics Letters* (2007), **79**, 38005, p1-p5.

Dynamic Electric Power Supply Chains and Transportation Networks: An Evolutionary Variational Inequality Formulation, A. Nagurney, Z. Liu, M.-G. Cojocaru, and P. Daniele *Transportation Research E* (2007), **43**, pp. 624-646.

The Internet, Evolutionary Variational Inequalities, and the Time-Dependent Braess Paradox, A. Nagurney, D. Parkes, and P. Daniele, *Computational Management Science* (2007), **4**, pp. 355-375.

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* (2007), **4**, pp. 243-281.

Sustainable Supply Chain and Transportation Networks, A. Nagurney, Z. Liu, and T. Woolley, *International Journal of Sustainable Transportation* (2007), **1**, 29-51.

Modeling of Electric Power Supply Chain Networks with Fuel Suppliers via Variational Inequalities, D. Matsypura, A. Nagurney, and Z. Liu, *International Journal of Emerging Power Systems* (2007), **8**, issue 1, article 5.

A Transportation Network Efficiency Measure that Captures Flows, Behavior, and Costs with Applications to Network Component Importance Identification and Vulnerability, A. Nagurney and Q. Qiang, *Electronic Proceedings of the 2007 POMS Meeting, May 4-7, Dallas, Texas*.

Projected Dynamical Systems, Evolutionary Variational Inequalities, Applications, and a Computational Procedure, M.-G. Cojocaru, P. Daniele, and A. Nagurney, in *Pareto Optimality, Game Theory, and Equilibria*, A. Chichuluun, A. Migdalas, P. M. Pardalos, and L. Pitsoulis, editors, Springer, Berlin, Germany (2007), pp. 169-188.

Statics and Dynamics of Global Supply Chain Networks with Environmental Decision-Making, A. Nagurney, J. Cruz, and F. Toyasaki, in *Pareto Optimality, Game Theory, and Equilibria*, A. Chichuluun, A. Migdalas, P. M. Pardalos, and L. Pitsoulis, editors, Springer, Berlin, Germany (2007), pp. 611-646.

An Evolutionary Variational Inequality Formulation of Supply Chain Networks with Time-Varying Demands, A. Nagurney and Z. Liu, in *Network Science, Nonlinear Science and Game Theory Applied to the Study of Infrastructure Systems*, T. L. Friesz, Editor, Springer, Berlin, Germany (2007), pp. 267-302.

A Network Equilibrium Framework for Internet Advertising: Models, Qualitative Analysis, and Algorithms, L. Zhao and A. Nagurney, *European Journal of Operational Research*, in press.

A Network Efficiency Measure with Application to Critical Infrastructure Networks, A. Nagurney and Q. Qiang (2007), *Journal of Global Optimization*, in press.

A Unified Network Performance Measure with Importance Identification and the Ranking of Network Components, Q. Qiang and A. Nagurney (2007), *Optimization Letters*, in press.

Dynamics of Supply Chain Networks with Corporate Social Responsibility Through Integrated Environmental Decision-Making, Jose M. Cruz (2006), *European Journal of Operational Research*, in press.

An Efficiency Measure for Dynamic Networks with Application to the Internet

and Vulnerability Analysis, A. Nagurney and Q. Qiang (2007).

An Integrated Electric Power Supply Chain and Fuel Market Network Framework: Theoretical Modeling with Empirical Analysis for New England, Z. Liu and A. Nagurney (2007).

Special Welcome

The Center Director and Center Associates would like to take the opportunity to welcome our new Interim Dean, Dr. Tony Butterfield, who assumed this two year position on September 1, 2007. A special welcome also to Dr. Ray Pfeiffer who is taking Dr. Butterfield's place as PhD Director. Dr. Butterfield served as the Isenberg School of Management's (ISOM) doctoral program director for many years. We acknowledge Dr. Soren Bisgaard who served as the Interim Dean of ISOM this past year. For the news release, see:

http://www.isenberg.umass.edu/news/D_Anthony_Butterfie_390/

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Dr. Stavros Siokos
Dr. Tina Wakolbinger
Dr. Ding Zhang

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Zugang "Leo" Liu
Qiang "Patrick" Qiang
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If you would like to be put on our email list, contact supernet@som.umass.edu

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