

# The Supernetwork Sentinel

## Winter 2016

Welcome to the Winter 2016 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 report on cybersecurity initiatives, hosting a disaster researcher from Denmark, invited seminar presentations, and a new Doctoral Student Center Associate. As always, we also include a list of our recent Center publications. We thank you for your support.

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



**Hosting PhD Fellow Rasmus Dahlberg of the Disaster Research Center at the University of Copenhagen**

### Inside

#### Cybersecurity Initiatives

#### Hosting Disaster Researcher from Denmark

#### Welcome to New Doctoral Student Center Associate

#### Invited Seminars at MIT, Yale, the University of Buffalo, and MITRE

#### Center Director to be Visiting Fellow at Oxford University

#### Guest Speakers

#### Kudos and News

#### Recent Center Publications



**Center Associate Professor Dong Li with the Center Director and the galleys of their new book, *Competing on Supply Chain Quality: A Network Economics Perspective*.**



**UMass Amherst INFORMS Student Chapter End of the Semester Party, December 14, 2015**

## Cybersecurity Initiatives

We are delighted to announce that the Virtual Center for Supernetworks has been designated an affiliate of the [newly established Cybersecurity Institute](#) at the University of Massachusetts Amherst, under the directorship of Professor Brain Levine.

Part of the initiative is the \$4.2 million National Science Foundation grant Scholars for Service (SFS) that the Center Director, Professor Anna Nagurney, is a senior personnel member on. This is a collaboration across four colleges at UMass Amherst, including the Isenberg School of Management.

The past few years, several Center Associates have been very actively engaged in cybersecurity research and we have also been part of two Advanced Cyber Security Center grants. Doctoral Student Shivani Shukla last year was recognized by an award for her poster, joint with the Center Director and Center Associate Professor Patrizia Daniele of the University of Catania in Italy, by the Air Force Association at its Cyber Workshop.

On December 2, 2015, the Center Director gave an invited talk on **Game Theory and Cybercrime** at the UMass Departments of Computer Science and Electrical and Computer Engineering Cyber Security Faculty Lecture Series.



**The Center Director delivering her Game Theory and Cybercrime lecture**

Some recent research of Center Associates on cybersecurity is highlighted in the papers: **Cybersecurity Investments with Nonlinear Budget Constraints: Analysis of the Marginal Expected Utilities**, P. Daniele, A. Maugeri, and A. Nagurney (2016). invited paper for *Operations Research, Engineering, and Cyber Security: Trends in Applied Mathematics and Technology*, Th.-M. Rassias and N.J. Daras. Eds., Springer, and **A Supply Chain Network Game Theory Model of Cybersecurity Investments**

**with Nonlinear Budget Constraints**, A. Nagurney, P. Daniele, and S. Shukla (2015).

## Hosting Disaster Researcher from Denmark

On March 8, 2016, we had the pleasure and honor of hosting Mr. Rasmus Dahlberg, who is a PhD Fellow at the Disaster Research Center at the University of Copenhagen in Denmark. He presented a lecture in the Center Director's Humanitarian Logistics and Healthcare class and also gave a talk in the UMass Amherst INFORMS Speaker Series.

Professor Anna Nagurney had the pleasure of meeting Mr. Dahlberg at [the Dynamics of Disasters conference](#), which she co-organized last summer with Professors Panos M. Pardalos and Ilias Kotsireas in Kalamata, Greece. He was the first speaker and made such a powerful impression that when he said he wanted to visit UMass Amherst she knew that having him come and speak would be a transformative educational experience.

His first presentation, which was given in her 8:30AM Humanitarian Logistics and Healthcare class, was titled: **Offshore is Onshore" Building a Scalable Search and Rescue (SAR) Infrastructure in the Arctic**. [This presentation of Dahlberg can be downloaded here](#).

This presentation focused on how to handle uncertainty and unpredictability in emergency management. He began with a possible crisis of a cruise ship with thousands of passengers sinking between Greenland and Iceland. He has been advising Greenland and Iceland on emergency management. He says such potential disasters keep him awake at night. He mentioned the Costa Concordia which sank in the Mediterranean in January 2012.

When it comes to Arctic regions, the survivability of those in such a cruise ship disaster would be questionable. Fishermen know, for example, that, without protective gear, if they fall into such waters, they die in 2 minutes. He spoke of covered lifeboats as well as protective gear but said that what would really work, but which is not popular, would be to have two cruise ships transiting together in proximity. If passengers needed help on one, there should be sufficient capacity on the other to provide rescue and assistance.

He also spoke about Iceland, which has been the site of erupting volcanoes and earthquakes. Now the former US military base in Keflavik is being used as a potential triage site and not just a hangar in which to store blankets. He is working

also on a big Nordic project to mitigate the affects of climate change, which will last until 2020. The Iceland Coast Guard has only 3 helicopters and 3 ships and, of course, Greenland, is even more short of transport equipment. He mentioned one big helicopter which he has flown in, in which 96 mushing dogs were transported once for a dog sled race in the middle of Greenland.

He told us that "safety science is driven by events" and we all know of some major disasters that spurred new policies and actions afterwards. He emphasized Nassim Taleb's work and black swans and not just dealing with risk in terms of probabilities and impacts but also thinking of possibilities and worst case scenarios - just like a cruise ship with 4,000 passengers sinking in the Arctic.

He envisions a Search and Rescue Academy in which practitioners and researchers can be working together, side by side .



**Dahlberg lecturing at the Isenberg School**

His afternoon presentation was: **Bridging the Gap: Preparing for Long-Term Infrastructure Disruptions** and [it can be downloaded here](#).

In this presentation, Dahlberg focused on what is critical infrastructure and emphasized multidisciplinary perspectives. He had a lot of great quotes from anthropologists including that infrastructure is "matter that enables movement of other matter." This brought out vividly that infrastructure may be invisible until it fails - we lose power, a bridge collapses, water is undrinkable, etc. This paper is a chapter in the book **Dynamics of Disasters**, that is a proceedings volume, with additional invited contributions, and is being co-edited by Professors Ilias Kotsireas, Panos M. Pardalos, and Anna Nagurny and is under contract with Springer.



**Dahlberg with his Professor for a Day certificate**

## **Welcoming New Doctoral Student Center Associate**

The Center Director and Center Associates warmly welcome Deniz Besik as a new Doctoral Student Center Associate, who is working with the Center Director. Deniz is from Turkey and received both an undergraduate and a Master's degree from Sabanci University there, both in Industrial Engineering.

Deniz is pursuing a PhD in Management Science at the Isenberg School of Management.

She already has taken a very active role as the Secretary of the award-winning UMass Amherst INFORMS Student Chapter. She is also assisting the Center Director in hosting speakers in both her Humanitarian Logistics class and through the UMass Amherst INFORMS Speaker Series.

Deniz interests lie in networks, especially food supply chain networks, with a focus on quality preservation and deterioration. She is actively researching this area and is also conducting interviews and field research.



**Deniz Besik (second from left) with Guest Speaker Dr. Litvinov of ISO New England**

## Invited Seminars at MIT, Yale, the University of Buffalo, and MITRE

The Center Director had the honor and pleasure of giving multiple invited talks during the winter season.

On December 9, 2015, she had the pleasure of delivering the Pierce Lab Seminar at MIT. Her great host was Professor Carolina Osorio, who is doing fundamental research in transportation with wide impact in practice.

Her seminar, **Supply Chain Networks Against Time: From Food to Pharma**, was given in Room 1-131 at 4PM and although it is the last week of the Fall semester both faculty and students came. Her [presentation can be downloaded here](#).

She also very much enjoyed seeing and having dinner with Professor Jim Orlin of the Sloan School at MIT.



**(l-r) Professors Carolina Osorio, Jim Orlin, Anna and Ladimer S. Nagurney**

On February 17, 2016, Professor Anna Nagurney delivered a Distinguished Lecture at the Yale Institute for Network Science (YINS) and she reprised her MIT presentation. Given the composition of the affiliated faculty, postdocs, and students of YINS, which include not only MDs but also PhDs from disciplines such as computer science, sociology, operations research, electrical and computer engineering, biology, public health, as well as other (all lovers of networks), she wanted to make sure that the topics she covered would appeal to such a broad audience. She was hosted by Professor Daniel Spielman of Yale who is the Co-Director of YINS and is a Macarthur Fellow, and got a chance to meet with Co-Director Professor Nicholas Christakis.



**Professor Anna Nagurney being introduced by Professor Ed Kaplan of Yale who is also the INFORMS President**



**Enjoying dinner after the presentation in New Haven**

On March 11, 2016, at the beginning of the UMass Amherst spring break, the Center Director was at the University of Buffalo to deliver the Praxair Seminar in the Department of Industrial and Systems Engineering. Her fabulous host there was Professor Chase Murray.



**Professor Anna Nagurney speaking at the University of Buffalo**

A highlight was getting the opportunity to discuss drones with Professor Murray and to fly one!

On March 14, 2016, the Center Director traveled to the MITRE Corporation in Bedford, MA, where

she was hosted by Dr. Les Servi, who is also an INFORMS Fellow. The title of her presentation was: **From Cybercrime in Financial Services to Cybersecurity Investments and Network Vulnerability**. [Her presentation can be downloaded here.](#)

Her visit began with a sumptuous lunch.



**Enjoying the lunch before the presentation**

Dr. Servi has two degrees from Brown University, and received his PhD from Harvard University. The lecture was streamed also to MITRE in Mclean, VA. Another highlight was meeting Harriet Goldman at MITRE, who also is an Applied Math Brown University alumna.

The discussions surrounding cybersecurity following the talk were fascinating and new research ideas were generated.

Dr. Les Servi will be coming to the Isenberg School of Management to speak in our UMass Amherst INFORMS Speaker Series on March 25, 2016. The topic of his presentation will be *Cybersecurity Workforce Optimization*.



**(l-r) Harriet Goldman, Dr. Les Servi, and the Center Director**

## **Center Director to be Visiting Fellow at Oxford University**

The Center Director will be a Visiting Fellow at All Souls College at Oxford University for the trinity term 2016. This is a distinct honor and she is very much looking forward to this great opportunity. While there she will be continuing

her research on competitive supply chain networks, with a focus on quality of the products.

All Souls College is a special college at Oxford University since the focus is on research and scholarship. Last summer, prior to the EURO Conference in Glasgow, Scotland, and after the Dynamics of Disasters conference in Kalamata, Greece, she visited Oxford and got to see her apartment complex and All Souls College and even got to meet the porter, who determines who can enter the All Souls College grounds.

## **Guest Speakers**

This winter, we had hosted two terrific speakers in our UMass Amherst INFORMS Speaker Series, which the Center Director helps the award-winning UMass Amherst INFORMS Student Chapter to organize.



**Dr. Renee Pratt at the Isenberg School after her lecture**

On February 19, 2016, Dr. Renee Pratt of the Department of Operations and Information Management of the Isenberg School spoke on **Information Technologies in Healthcare: Innovation, Implementation, and Interoperability**. In her lecture she spoke of the challenges surrounding electronic records in healthcare. Dr. Pratt has had a Fulbright in Germany and her energy and insights were very much appreciated by the audience.

On March 4, 2016, Professor Michael Johnson of UMass Boston spoke on **Community Based Operations Research: Data Analytics and Decision Modeling for Community Development and Social Change**. Professor Johnson is a very active INFORMS member and a proponent of Pro Bono Analytics. It was terrific to have him come and speak in our Speaker Series.

During his lecture, the audience learned that Community-Based Operations Research (CBOR) is an extension of multiple traditions in Operations Research and the Management Sciences to produce research for local change; that it attempts to incorporate critical thinking, evidence-based policy design and prescriptive

decision modeling, and that it also aims for social justice.



**Enjoying lunch with Professor Michael Johnson at the University Club before his lecture**

Special thanks to Zana Cranmer, doctoral candidate in Industrial Engineering at UMass Amherst, who is the President of the UMass Amherst INFORMS Student Chapter, this year, for her outstanding help in assisting with the organization of this speaker series and other chapter activities!



**Some of the audience after Professor Johnson's lecture**

In addition to speakers in the UMass Amherst INFORMS Speaker series, Professor Anna Nagurney has hosted multiple guest lecturers in her Humanitarian Logistics and Healthcare class at the Isenberg School of Management. Special thanks are extended to Mr. Jeff Hescocock, the Director of Emergency Management at UMass Amherst and to Mr. Thomas Lynch, the Director of Security at Baystate Medical Center in Springfield, MA, as well as to Mr. Johnson of the Red Cross, for sharing their expertise with the students. We have already acknowledged Mr. Rasmus Dahlberg in this newsletter.

## Kudos and News

Congratulations to Doctoral Student Center Associate Sara Saberi who has accepted a tenure track Assistant Professorship at the Foisie School of Business at the Worcester Polytechnic Institute (WPI), which is located between Amherst and Boston. She received an outstanding job offer and we expect her to thrive with the excellent colleagues and research emphasis there.

Congratulations to Center Associate Professor Trisha Anderson of Texas Wesleyan University of her receipt of the 2016 Engaging Educator Award! The Engaging Educator Award goes to professors for going above and beyond to engage our students with research and the community. Dr. Anderson connects her students with global companies (such as TTI, Lockheed Martin and Fed Ex so that they can get a first-hand look at production management. You can see her receipt of the award on [youtube](#) from the President of her university.

Congratulations also to Professor Trisha Anderson of the School of Business at Texas Wesleyan University for her publication: **The Amazon Tax & E-Tailer Supply Chains: An Empirical Study Of Internet Sales Tax Law And Strategic Distribution Models**, with Kevin McGarry, which appeared in the *Franklin Business & Law Journal* (2015), **2015 (4)**.

Center Associate Professor Patrizia Danieke has organized an invited session for the EURO conference, which will take place in Poznan, Poland in July, Center Associate Professor Tina Wakolbinger of the Vienna University of Economics and Business has also organized an invited session for this conference. EURO will again serve as a wonderful reunion venue for several of the Center Associates.

Congratulations also to Professor Tina Wakolbinger on the successful doctoral defense of her first PhD student, Thomas Nowak! Thomas Nowak successfully defended his dissertation on March 14, 2016. His dissertation includes 4 papers, a co-authored paper with Professor Wakolbinger, Professor Fuminori Toyasaki of York University in Canada, and the Center Director, published in the *International Journal of Production Economics* (IJPE), one paper published in the *European Journal of Operational Research*, one paper under second revision in CEJOR and one paper under review in IJPE.

The title of his dissertation is: **Reverse Logistics Decision-Making Under Uncertainty: A Producer's Perspective**. It's wonderful to see the academic family tree growing!

Congratulations to Center Associate Professor Jose M. Cruz of the School of Business at the University of Connecticut on his receipt of the grant: Social Responsibility Investments: Financial Networks, Transaction Cost, and Risk Effects, Northeast Utility Chair Grant, \$11,000, May 2015-January 2016.

We are delighted to announce that the paper: [Competitive Food Supply Chain Networks with Application to Fresh Produce](#), Min Yu and Anna Nagurney, *European Journal of Operational Research* (2013), **224(2)**, 273-282, has been selected as one of two papers by the Editors of the *European Journal of Operational Research*, to be presented in a special session with the Editors of this journal at EURO in Poznan. Given the thousands of papers that are published in this top level journal, this is quite the honor. Congratulations to Center Associate Professor Min Yu from the University of Portland for this distinct honor! This paper has received a lot of citations and is impactful.

Congratulations to Center Associate Professor Dmytro Matsypura of the University of Sydney Business School in Australia on the publication of his paper with L. Pauwels, **Does Portfolio Margining Make Borrowing More Attractive?**, *International Review of Financial Analysis* (2016), **43**, 128-34.

Congratulations to Center Associate Professor Ding Zhang of the School of Business at SUNY Oswego on the publication of his paper, joint with M. Liu and Z. Zhang, **A Dynamics Allocation Model for Medical Resources in the Control of Influenza Diffusion**, *Journal of Systems Science and Systems Engineering* (2015), **24(3)**, 276-292.

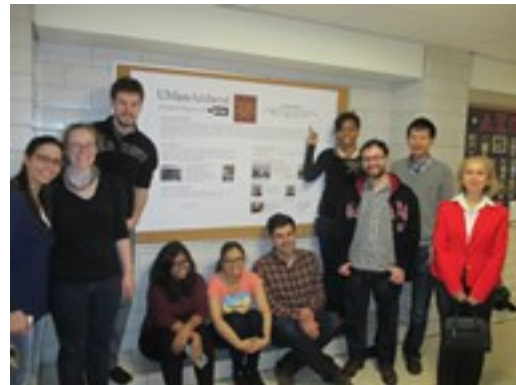
Center Associate Professor Zugang "Leo" Liu of Penn State University Hazleton is spending this semester on sabbatical. Congratulations to him for his receipt of a sabbatical.

Center Associate Professor Patrick Qiang of Penn State University Malvern will be on sabbatical next year and will be spending a greater part of his sabbatical conducting research in China!

This year Center Associate Professor Ladimer S. Nagurney of the University of Hartford is on sabbatical in the Department of Electrical and Computer Engineering at UMass Amherst. He has been conducting research on the Braess paradox in macroscopic electrical circuits. He will be speaking on this research at the EURO conference in Poland this summer. In addition, he has received good news that he has been awarded a Vincent Coffin grant for work on software-defined radio from the University of Hartford.

Congratulations to Center Associate Professor Dong "Michelle" Li for a very successful first semester as a tenure-track Assistant Professor at the School of Business at Arkansas State University! She and Professor Anna Nagurney are eagerly awaiting the publication of their new book with Springer: *Competing on Supply Chain Quality: A Network Economics Perspective*.

The Center Director will be giving an invited talk on cybersecurity at the Heinz School of Public Policy at Carnegie Mellon University in Pittsburgh on April 4, 2016. She will also be giving a keynote talk at Analytics Day at the University of Waterloo in Canada on April 14, 2016.



**The Center Director with some members of the UMass Amherst INFORMS Student Chapter**

## Recent Center Publications

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

**Cybersecurity Investments with Nonlinear Budget Constraints: Analysis of the Marginal Expected Utilities**, P. Daniele, A. Maugeri, and A. Nagurney (2016). invited paper for *Operations Research, Engineering, and Cyber Security: Trends in Applied Mathematics and Technology*, Th.-M. Rassias and N.J. Daras. Eds., Springer.

**Freight Service Provision for Disaster Relief: A Competitive Network Model with Computations**, A. Nagurney (2016), to appear in *Dynamics of Disasters*, I.S. Kotsireas, A. Nagurney, and P.M. Pardalos, Eds., Springer International Publishing Switzerland.

**A Supply Chain Network Game Theory Model of Cybersecurity Investments with Nonlinear Budget Constraints**, A. Nagurney, P. Daniele, and S. Shukla (2015).

**A Mean-Variance Disaster Relief Supply Chain Network Model for Risk Reduction with Stochastic Link Costs, Time Targets, and Demand Uncertainty**, A. Nagurney and L.S. Nagurney (2015), to appear in *Dynamics of Disasters*, I.S. Kotsireas, A. Nagurney, and P.M. Pardalos, Eds., Springer International Publishing Switzerland.

**Towards Pricing Mechanisms for delay Tolerant Services**, L. Marentes, T. Wolf, A. Nagurney, and Y. Donoso, *International Journal of Computers Communications & Control* (2016), **11(1)**, 77-89.

**A General Multitiered Supply Chain Network Model of Quality Competition with Suppliers**, D. Li and A. Nagurney, *International Journal of Production Economics* (2015), **170**, 336-356.

**Supply Chain Performance Assessment and Supplier and Component Importance Identification in a General Competitive Multitiered Supply Chain Network Model**, D. Li and A. Nagurney (2015), in press in the *Journal of Global Optimization*.

**A Game Theory Model of Cybersecurity Investments with Information Asymmetry**, A. Nagurney and L.S. Nagurney, *Netnomics* (2015), **16(1-2)**, 127-148.

**A Supply Chain Game Theory Framework for Cybersecurity Investments Under Network Vulnerability**, A. Nagurney, L.S. Nagurney, and S. Shukla, in *Computation, Cryptography, and Network Security*, N.J. Daras and M.T. Rassias, Editors, Springer International Publishing (2015), 381-298.

**Supply Chain Network Competition in Price and Quality with Multiple Manufacturers and freight Service Providers**, A. Nagurney, S. Saberi, S. Shukla, and J. Floden, *Transportation Research E* (2015), **77**, 248-267.

**A Multiproduct Network Economic Model in Financial Services**, A. Nagurney, *Service Science* (2015), **7(1)**, 70-81.  
**Design of Sustainable Supply Chains for Sustainable Cities**, A. Nagurney, *Environment & Planning B* (2015), **42(1)**, 40-57.

**A Supply Chain Network Game Theory Model with Product Differentiation, Outsourcing of Production and Distribution, and Quality and Price Competition**, A. Nagurney and D. Li, *Annals of Operations Research* (2015), **228(1)**, 479-503.

**An Integrated Disaster Relief Supply Chain Network Model with Time Targets and Demand Uncertainty**, A. Nagurney, A.H.

Masoumi, and M. Yu, in *Regional Science Matters: Studies Dedicated to Walter Isard*, edited by P. Nijkamp, A. Rose, and K. Kourtit, Springer International Publishing Switzerland (2015), 287-318.

**Fashion Supply Chain Network Competition with Ecolabelling**, A. Nagurney, M. Yu, and J. Floden, in *Sustainable Fashion Supply Chain Management: From Sourcing to Retailing*, T.-M. Choi and T.C.E. Cheng, Editors, Springer (2015), 61-84.

**A Game Theory Model for a Differentiated Service-Oriented Internet with Duration-Based Contracts**, A. Nagurney, S. Saberi, T. Wolf, and L.S. Nagurney, in *Proceedings of ICS 2015: Operations Research and Computing: Algorithms and Software for Analytics*, B. Borchers, J. P. Brooks, and L. McLay, Editors, INFORMS (2015), 15-29.

**Securing the Sustainability of Global Medical Nuclear Supply Chains Through Economic Cost Recovery, Risk Assessment, and Optimization**, Anna Nagurney, Ladimer S. Nagurney, and Dong Li, *International Journal of Sustainable Transportation* (2015), **9(6)**, 405-418.

**A Mean-Variance Disaster Relief Supply Chain Network Model for Risk Reduction with Stochastic Link Costs, Time Targets, and Demand Uncertainty**, A. Nagurney and L.S. Nagurney (2015), presented at the Dynamics of Disasters conference, June 29-July 2, 2015, Kalamata, Greece.

**A Network Economic Game Theory Model of a Service-Oriented Internet with Price and Quality Competition in Both Content and Network Provision**, S. Saberi, A. Nagurney, and T. Wolf, *Service Science* (2014), **6(4)**, 229-250.

**Supply Chain Network Competition in Time-Sensitive Markets**, A. Nagurney, M. Yu, J. Floden, and L. S. Nagurney, *Transportation Research E* (2014), **70**, 112-127.

**A Cournot-Nash-Bertrand Game Theory Model of a Service-Oriented Internet with Price and Quality Competition Among Network Transport Providers**, A. Nagurney and T. Wolf, *Computational Management Science* (2014), **11(4)**, 475-502.

**Spatial Price Equilibrium with Information Asymmetry in Quality and Minimum Quality Standards**, A. Nagurney, D. Li, and L.S. Nagurney, *International Journal of Production Economics* (2014), **158**, 300-313.



**The Center Director and Center Associates thanks you for your support!**

**The Center Director**

Dr. Anna Nagurney  
John F. Smith Memorial Professor

**Center Associates**

Dr. Trisha Anderson  
Dr. Jose M. Cruz  
Dr. Patrizia Daniele  
Dr. June Dong  
Dr. Ke "Grace" Ke  
Dr. Dong "Michelle" Li  
Dr. Zugang "Leo" Liu  
Dr. Amir H. Masoumi  
Dr. Dmytro Matsypura  
Dr. Ladimer S. Nagurney  
Dr. Qiang "Patrick" Qiang  
Dr. Padma Ramanujam  
Dr. Stavros Siokos  
Dr. Tina Wakolbinger  
Dr. Min Yu  
Dr. Ding Zhang  
Dr. Lan Zhao

**Doctoral Students**

Deniz Besik  
Sara Saberi  
Shivani Shukla

**Center Website:**

<http://supernet.isenberg.umass.edu>  
If you would like to be put on our email list,  
contact: [supernet@isenberg.umass.edu](mailto:supernet@isenberg.umass.edu)