An International Virtual Institute Concept

Cyber-Infrastructure for the Global Nanotechnology Network

R.P.H. Chang, Northwestern University

Outline

- Introduction
- International Virtual Institute (IVI) Concept
- Global Research Gallery (GRG)
- IVI Functions under Development
- IVI Applications in Progress
  - Nanotechnology Course Development
  - Collaborations in Research and Proposal Preparation
- Evaluation Center
- Conclusion

Introduction

What can a cyber-infrastructure offer in general?

- Global Meeting Place
- Discussion Forum
- Shared Information Resources
- Collaboration Tools and Services
- Data Sharing Platform
- Etc…

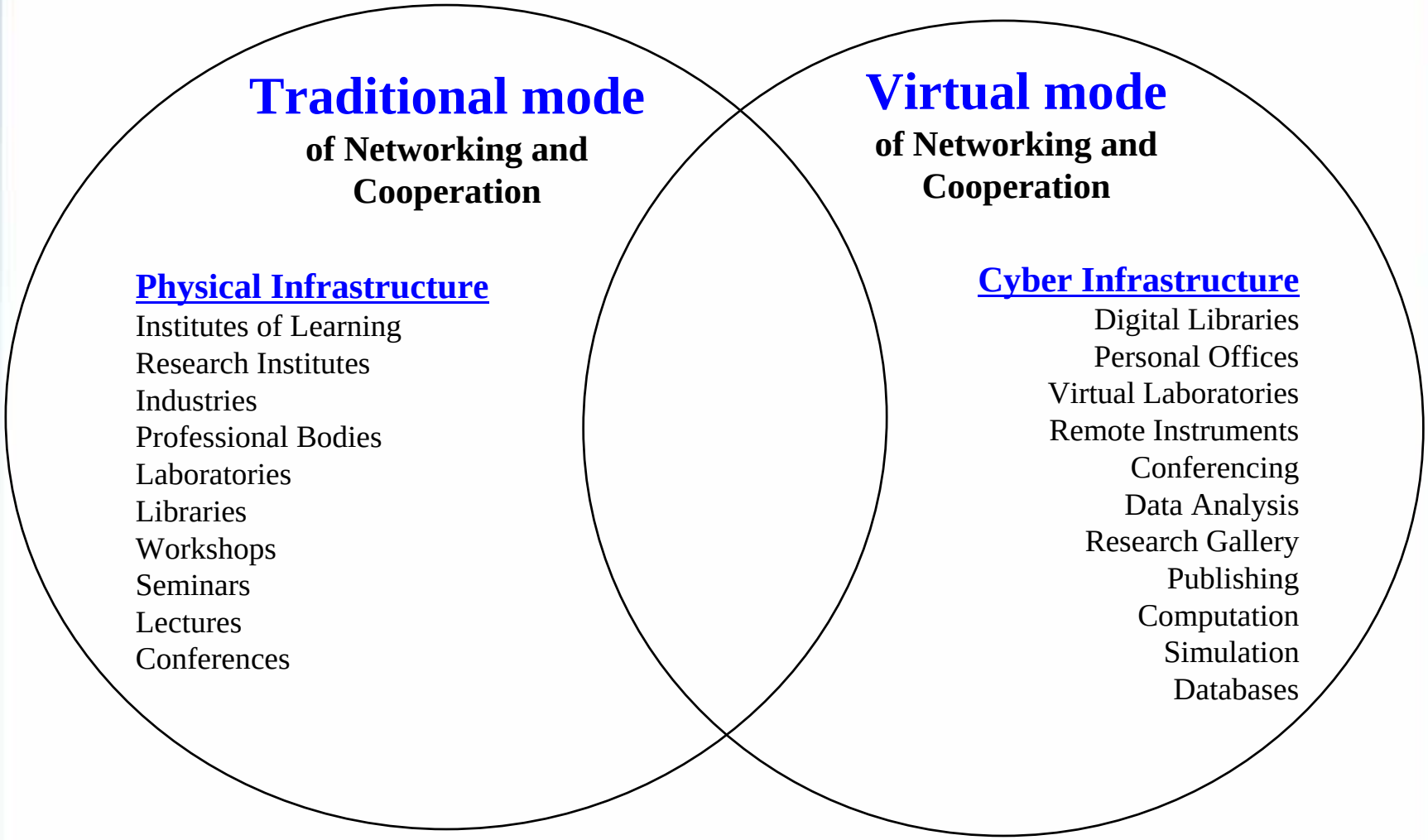
More specifically, how might the GNN use a cyber-infrastructure?

- Develop the Network
- Link to other Networks
- Support Research Collaborations
- Publish & Disseminate Information
- Deliver Services to Members
- Manage Network Operations
- Evaluate and Update Network Services

Summary:

A cyber-infrastructure can ***support the real space activities*** of the GNN and ***enhance traditional modes of interaction*** among its members.

GNN Activities and Services

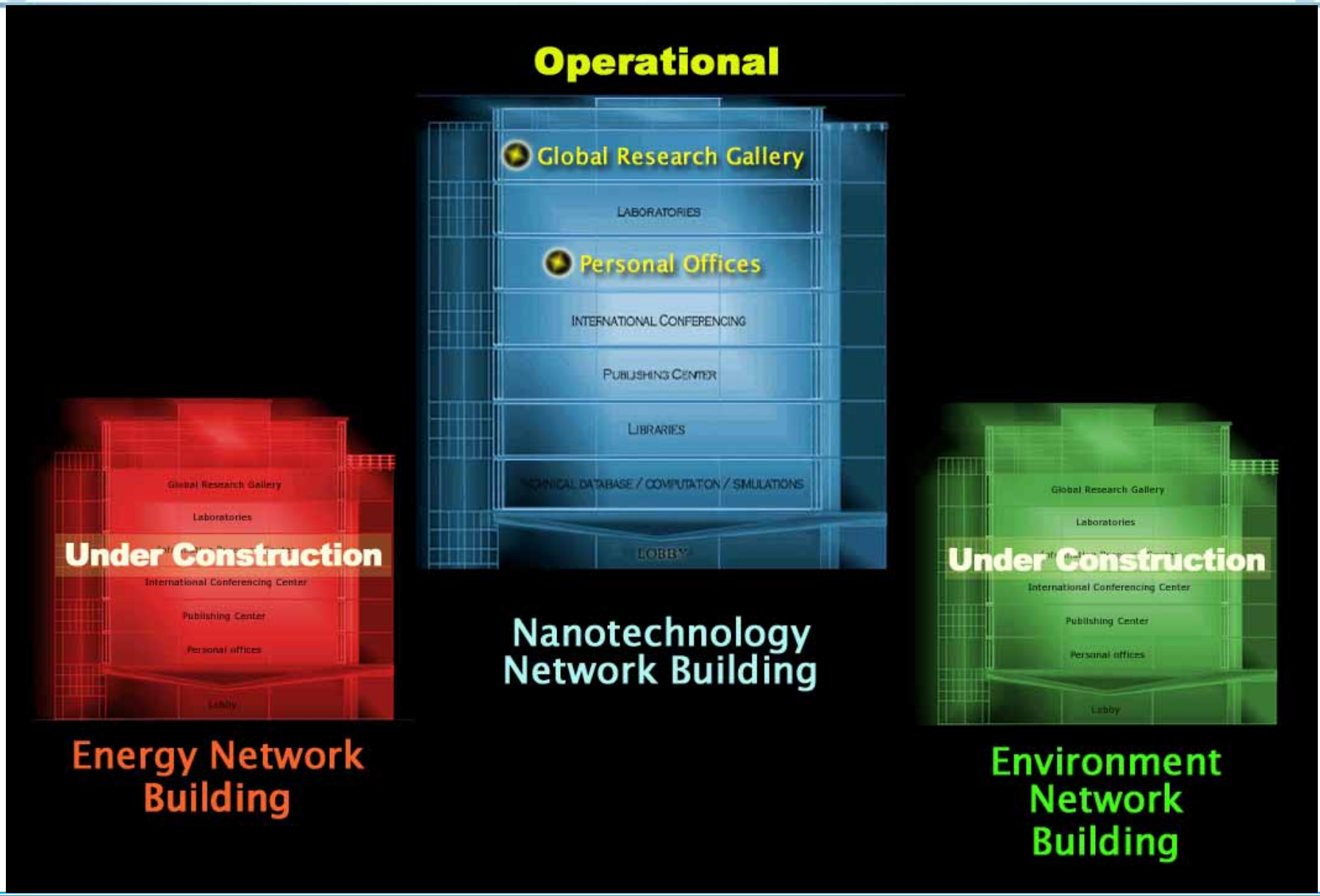


International Virtual Institute Concept

What is the IVI?

- A cyber-infrastructure designed to enhance global collaborations in research and education
- Prototype concept under development at Northwestern
- Conceptual Design: campus buildings in cyberspace, with seamless entry from anywhere in the world.
- Each building has a special topical area: Nanotechnology, Energy, Environment, etc…
- Each floor has a focused function: Global Research Gallery, Information Resource Center, International Conferencing Center, Personal Offices, etc..
- One might envision the GNN housed in a Nano building on this “cyber-campus”

Topical Networks

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Science and Engineering Education
Personal Offices
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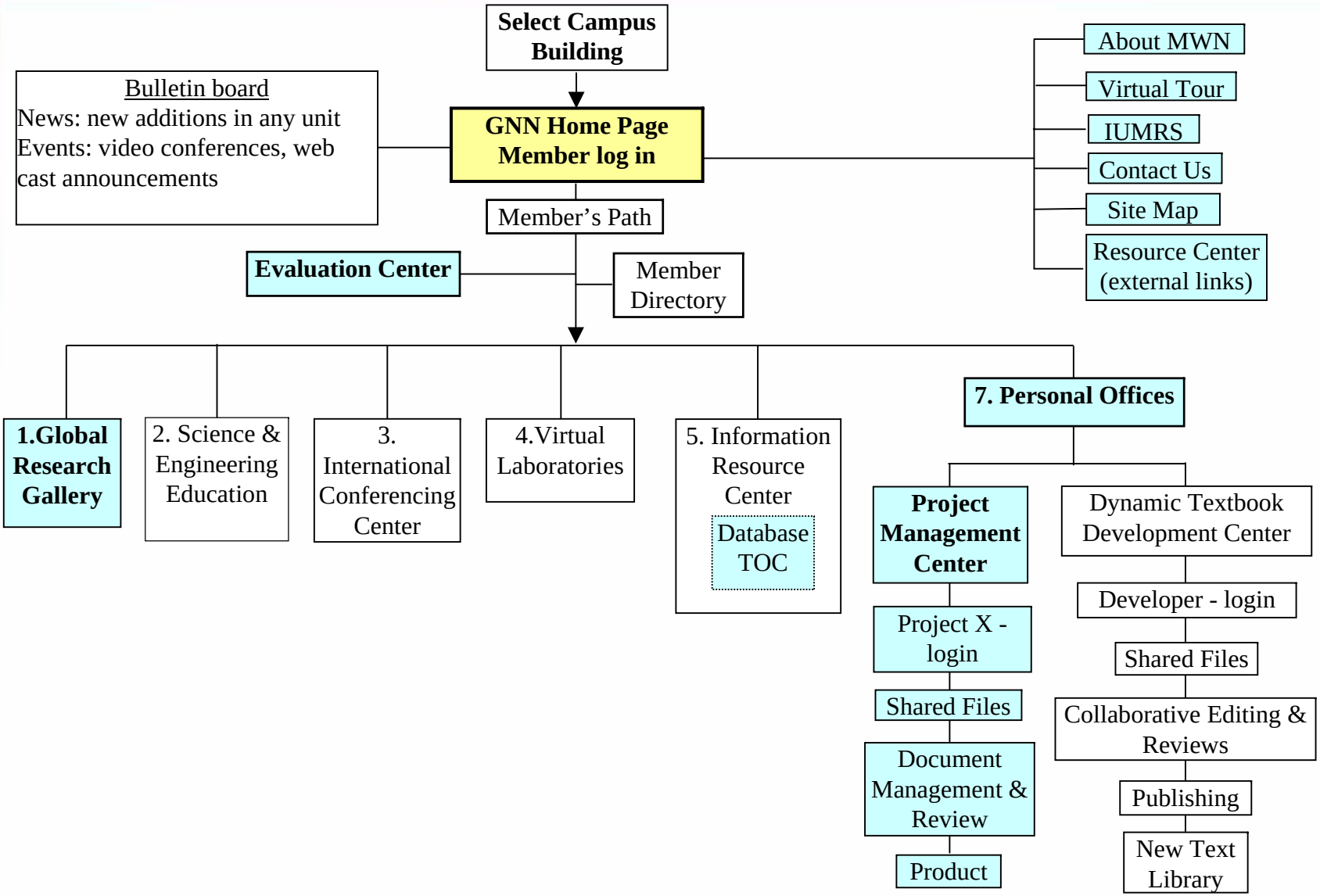
Nanotechnology
Today at IVI
News
Events
Technology Exchange
Information

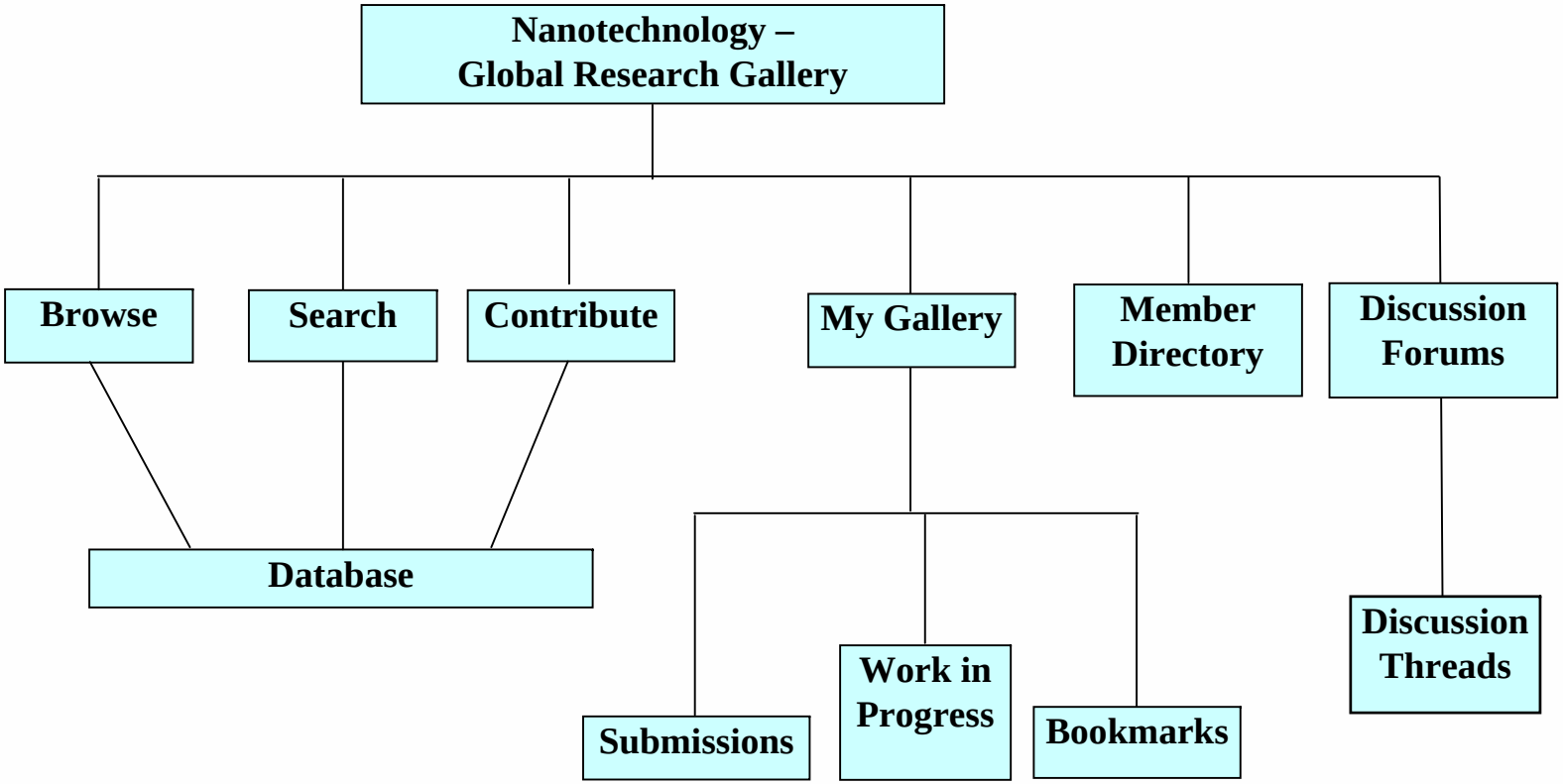
Features Overview:

- Global Research Gallery
- Personal Office/Project Management System
- International Conferencing Center
- Information Resource Center
- Virtual Laboratories
- Evaluation Center
- Others

International Virtual Institute (IVI) Concept



Global Research Gallery (GRG) Concept

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Select to view a poster by category and sub-category. More options are listed in the Index Category.
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Index Category
Select Category:
Types of Materials
Select sub-Category:
Biomaterials
Go
Reset
Types of Materials > Metals and Alloys
Title
Author
Date
1. Three Dimensional Reconstruction of Metallic Microstructures Dimitris Kammer 01/31/2003
2. Cybersteel 2020: Design of Blast-Resistant Naval Hull Plate Steel Arup Saha 01/31/2003
3. Design of Nanodispersion Strengthened TiNi-base Shape Memory Alloys Jin-Won Jung 01/23/2003
4.
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1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100


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Last Name:
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Primary Research Area:
– Select One –
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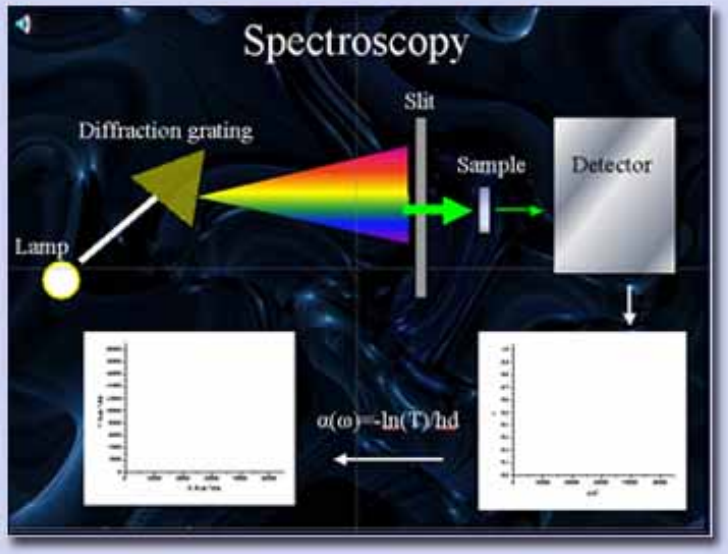
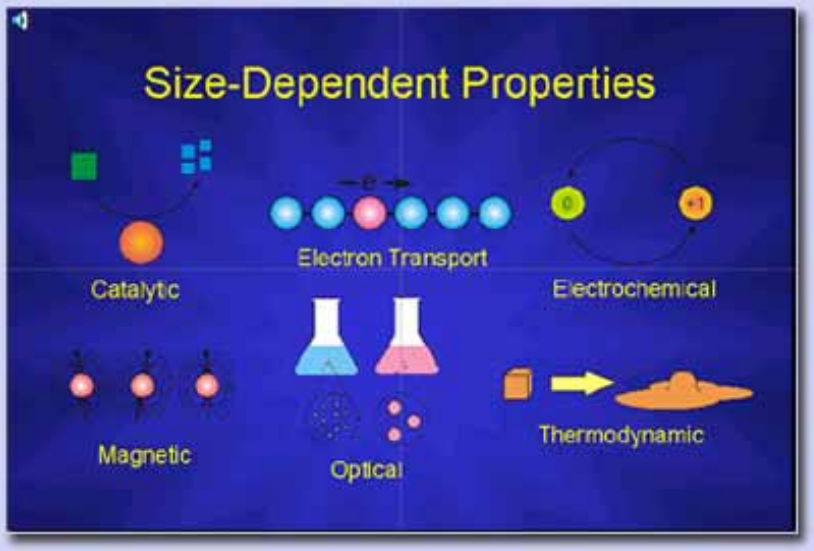
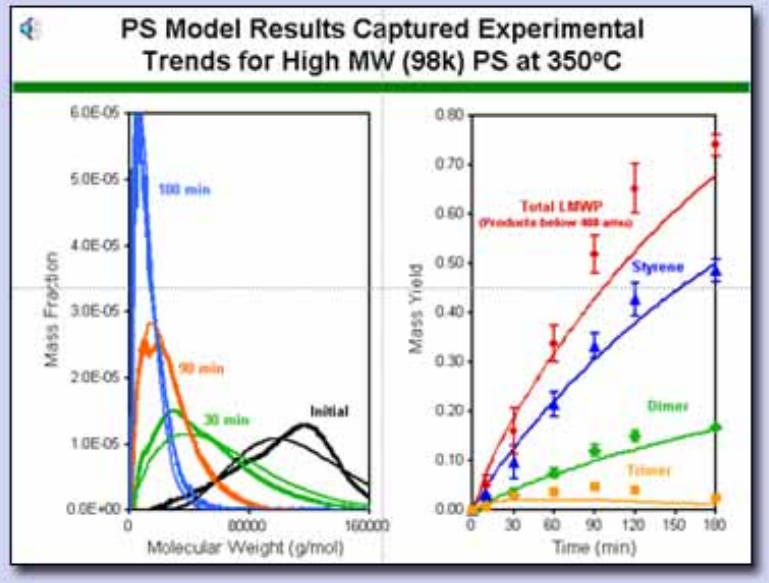
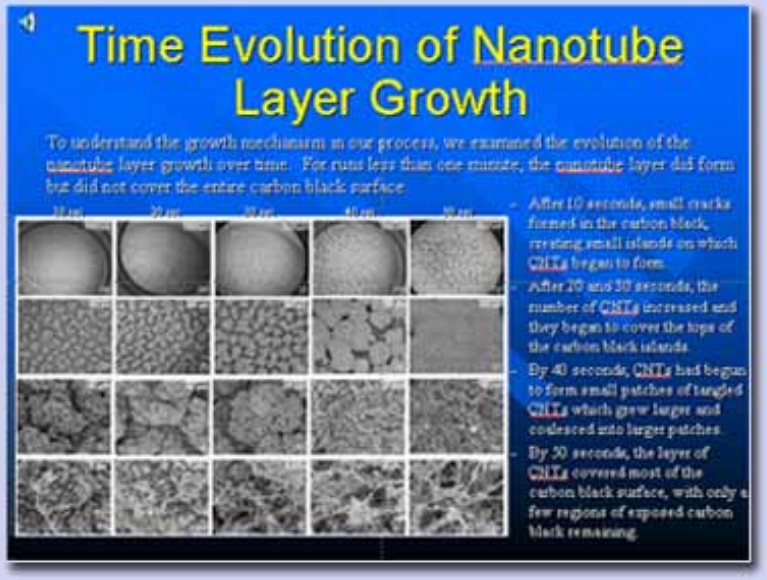
Nano Posters

Global Research Gallery









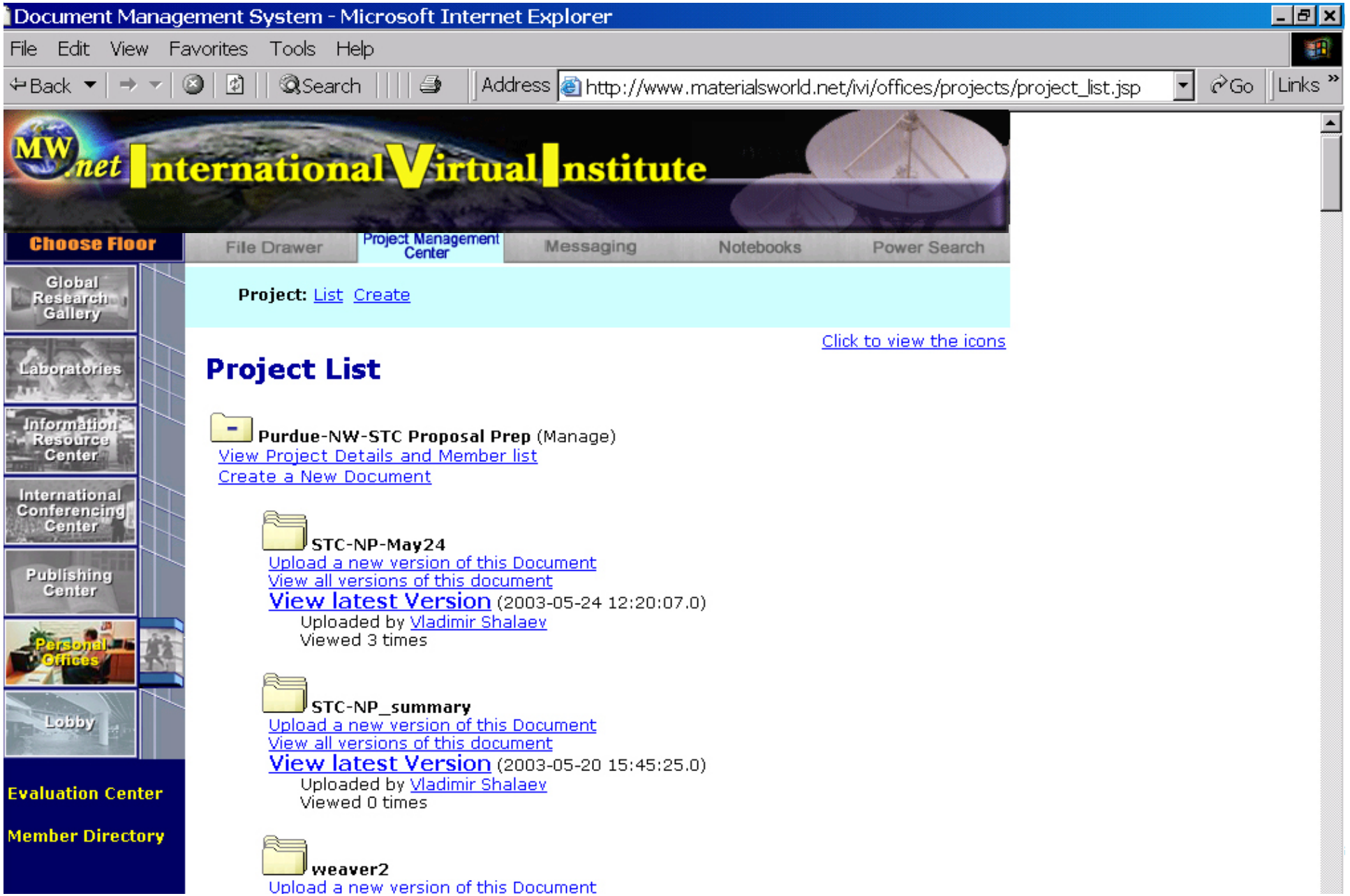
Applications to the GNN:

- Support Research Collaborations
  - Display Current Research Results
  - Discussion Forums
  - Searchable Database
- Platform for Educational Exchanges
- Support Role as Nano Clearinghouse
- Etc….

Conceptual Functions Under Development

- Personal Office
  - Project Management System
- International Conferencing Center
  - Video Conferencing, Workshops, Lectures
- Information Resource Center
  - Database
  - Publishing Function (Educational Content, etc…)
  - E-Library
- Virtual Labs & Equipment

Personal Office



Applications to the GNN:

This system will allow GNN members to collaborate on:

- Research Proposals
- Planning Documents
- Journal Articles
- Educational Content
- Etc.

International Conferencing Center Concept

Multiple levels of interactive Video communication:

- The 1st level uses the Access Grid
- The 2nd level of video communication integrates video conferencing with the Access Grid, using H.323 over IP, H.320 over ISDN dial-up
- The Access Grid is an internet-based communication system allowing groups to collaborate at a distance using:
  - Rich audio
  - Multiple video streams
  - Presentation resources

International Conferencing Center Concept

International Conferencing Center Concept

- Access Grid Nodes are located throughout the world, primarily at:
  - Research universities
  - National laboratories
  - Corporate research divisions
- In the early stages of its expansion, the AG already has more than 150 sites worldwide
- To find a node in your region, visit :
  - US: http://www.accessgrid.org
  - Europe: http://euroag.accessgrid.org/
  - Asian Pacific: http://www.ap-accessgrid.org/

Additional Modes of Conferencing:

- Webcast with RealVideo/MS Media Server
- Web conferencing
- Audio conferencing linked with video conference
- Integrated solution between some of the above

Applications to the GNN:

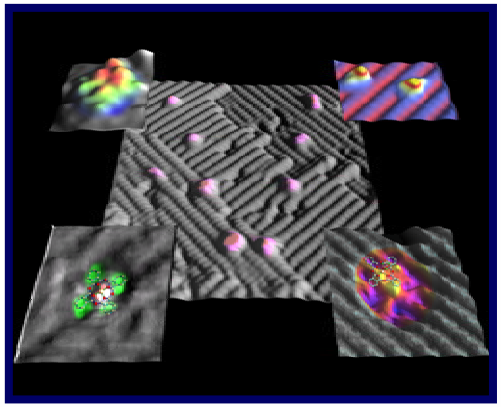
- Network Development
- Research Collaborations
- Educational Exchange
- Ongoing Network Management
- Etc…

Information Resource Center

- Information repository & knowledge management center for the IVI
- Database index in Nano topics
- E-library: access to on-line journals, etc.
- Publishing function: members can write individually or collaborate with other members on journal articles, educational content, etc…

Nanotech Course Development

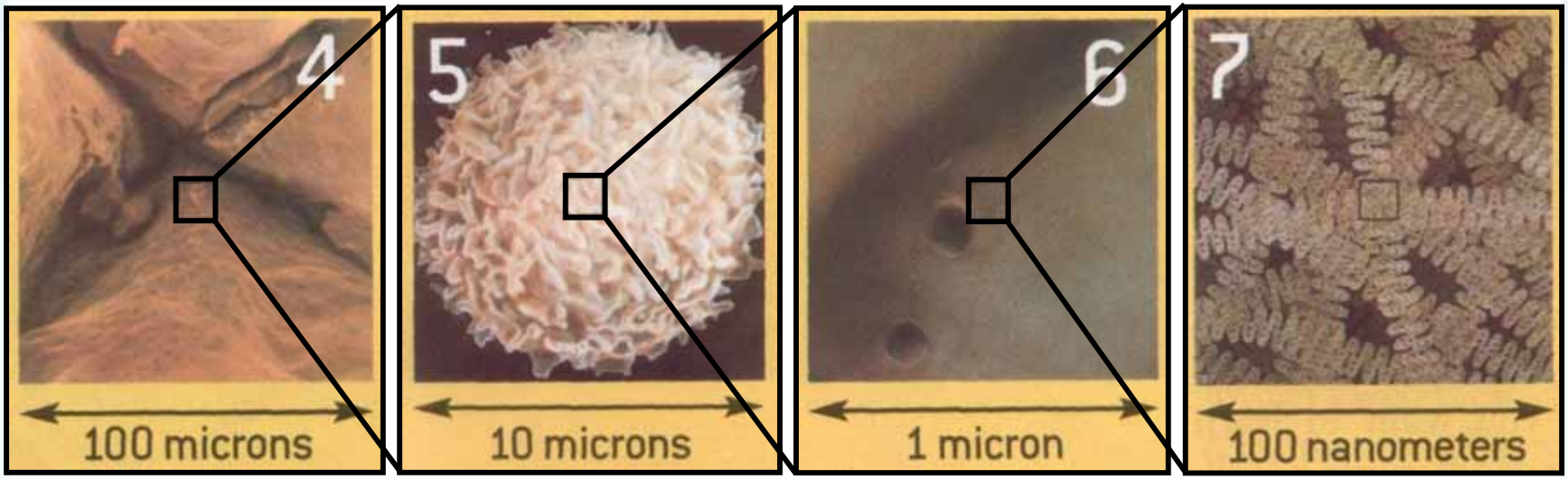
Materials Science and Engineering 395: NANOMATERIALS



Mark C. Hersam
Assistant Professor
Northwestern University

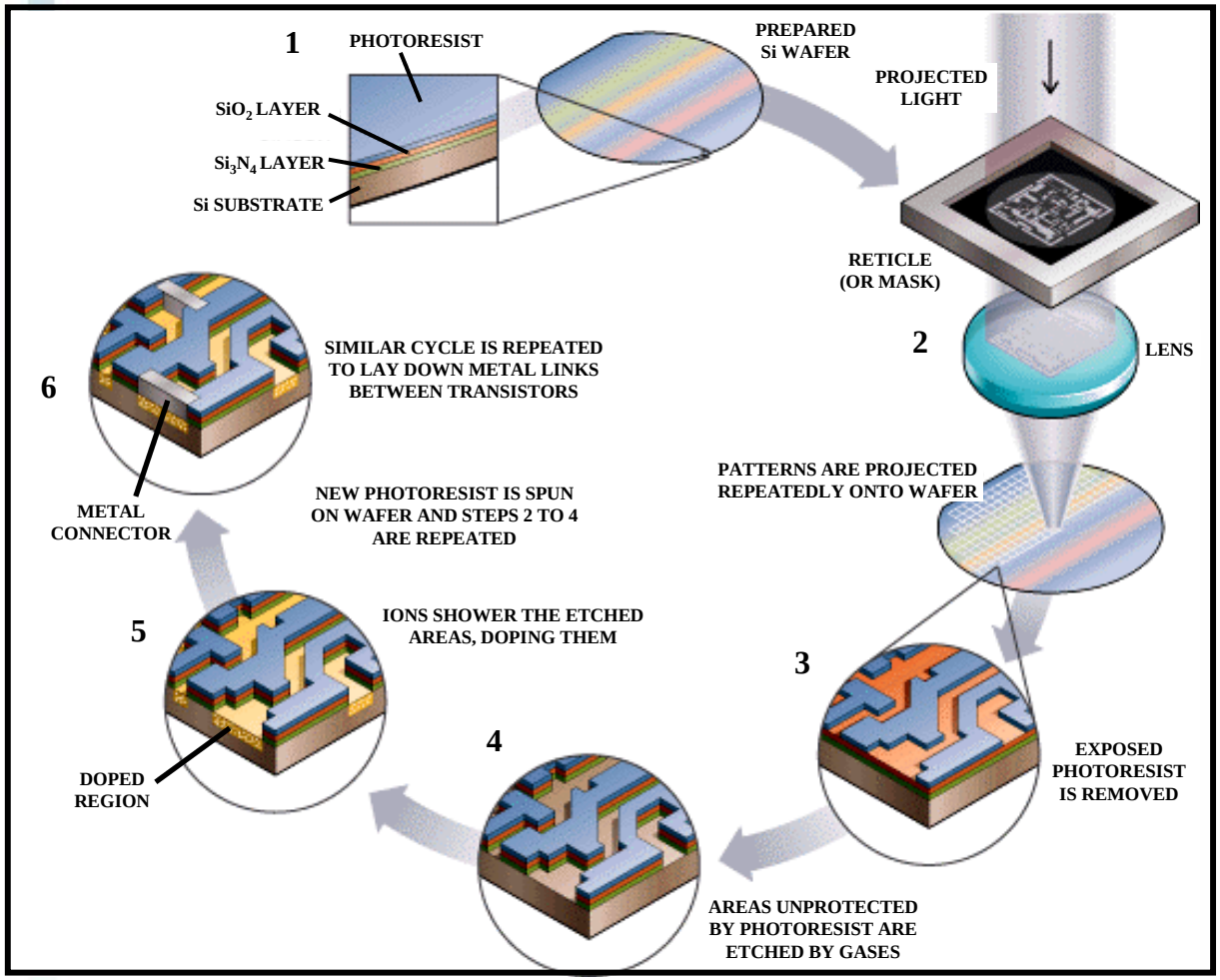
What is a Nanometer?

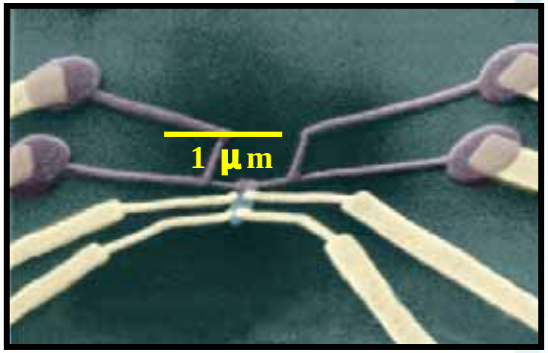
Consider a human hand:



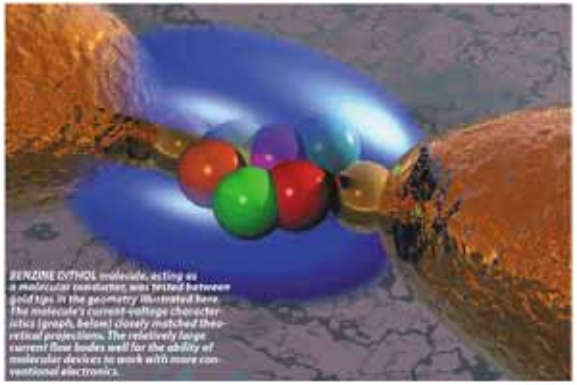
Skin **White Blood Cell** **DNA**

Beam Lithographies





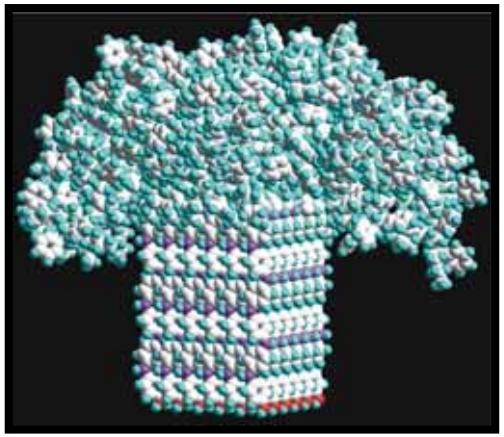
Ferromagnetic/superconducting devices (e-beam lithography)



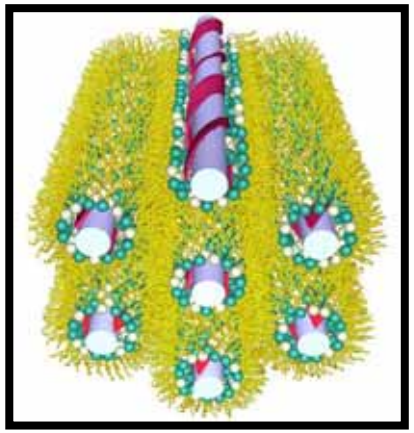
Molecular electronics (e-beam lithography)

Molecular Self-Assembly

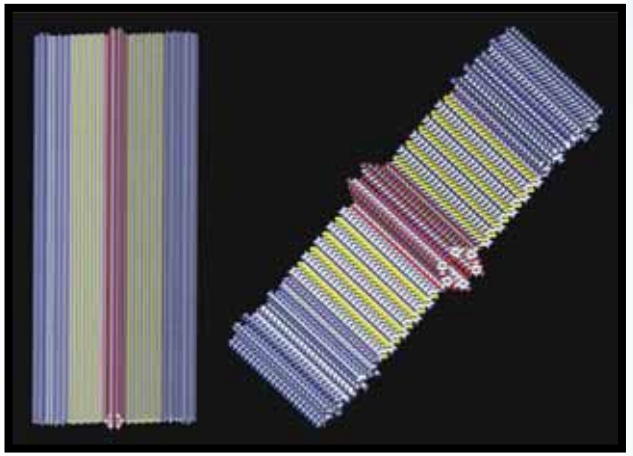
- Spontaneous organization of molecules into stable, structurally well-defined aggregates (nanometer length scale).
- Molecules can be transported to surfaces through liquids to form self-assembled monolayers (SAMs).



Supramolecular rodcoil "mushrooms"



Polythiophene wires



Supramolecular rodcoil nanoribbons

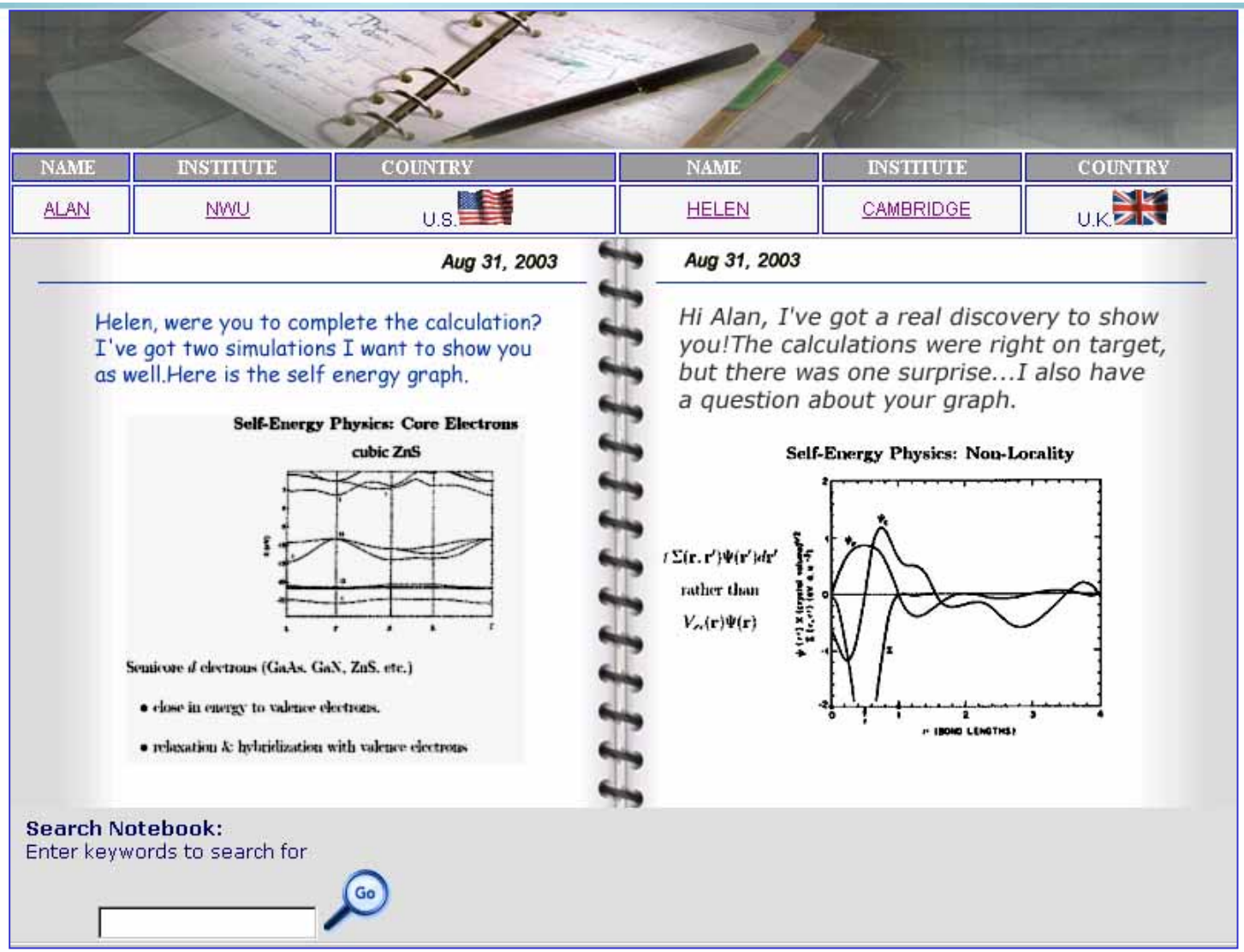
Examples of Collaborations

The IVI has supported active collaborations between Northwestern University and other US & overseas institutions.

- Video conferences
- Joint research project planning
- Joint proposal preparations
- Student exchanges
- Joint course development
- Shared lab notebooks support long-distance facilities sharing

Examples of Collaborations

Virtual Labs and Equipment



R&D collaboration via shared lab notebooks.

Evaluation Center Concept

Established Evaluation Guidelines:

- Front-end Analysis
- Formative Evaluation
  - Internal testing and focus group field tests.
  - Generate feedback through annual meetings and workshops
  - Launch Prototype IVI will generate more feedback from the materials community in all sectors.
- Summative Evaluation

This evaluation process will help the GNN to:

- Continue our dynamic development process
- Involve a large cross-section of community in field tests and development of services
- Ensure ongoing quality assurance
- Implement innovation

Conclusion

The IVI can serve as a practical and effective cyber-infrastructure for GNN:

- Development
- Activities & Services
- Evaluation
- Evolution

Plans & Implementation

- Submit research posters to the GRG
- Consult IVI for workshop report after this workshop
- Use IVI to continue our interactions here
- Visit Evaluation Center and give us your comments
- Participate in the development of the IVI

Effective November 1, 2003,
please e-mail us at
mri@northwestern.edu to obtain
a log-in ID for all the above items.

Discussion Points

- Experience with existing networks
- Desirable features
- Cyber-infrastructure
- Real space infrastructures
- Potential benefits of a GNN
- Identify regional collaborators
- Strategic questions
- Plans for the next workshop in Europe