Center for Computational Research

Russ Miller, Director

"**Top 10 Worldwide Supercomputing Center**"
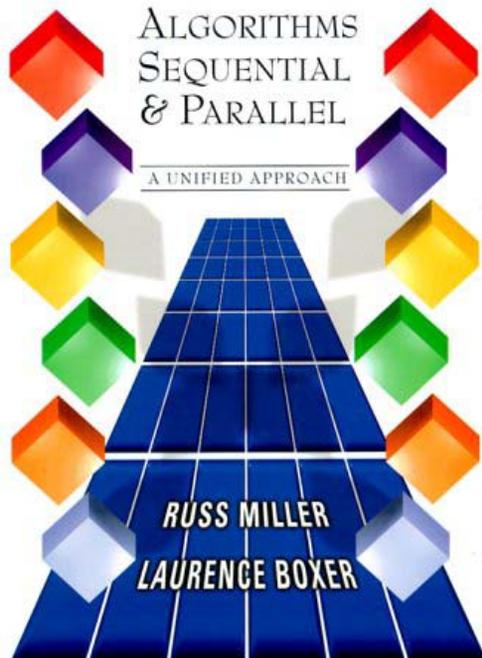   - www.gapcon.com
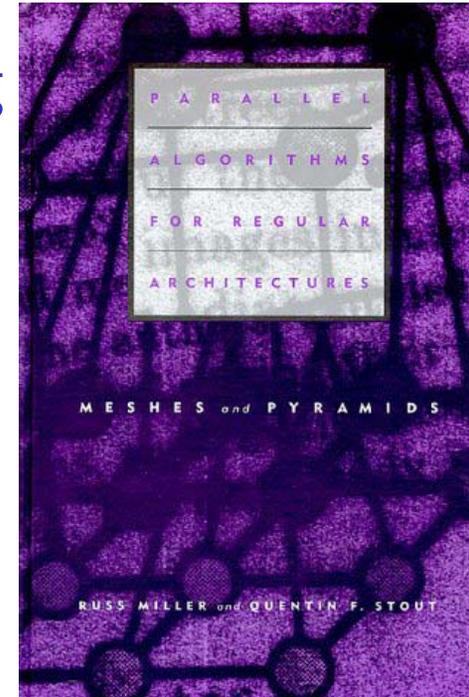
University at Buffalo
The State University of New York

Dr. Russ Miller Biography

- **Director of Supercomputing Center**
- **Professor of Computer Sci & Engineering**
- **Adjunct Professor of Structural Biology**
- **Senior Research Scientist at Hauptman-Woodward**
- **Adjunct Prof of Elec Eng**
- **Consultant**
- **Author**

Big Deal:
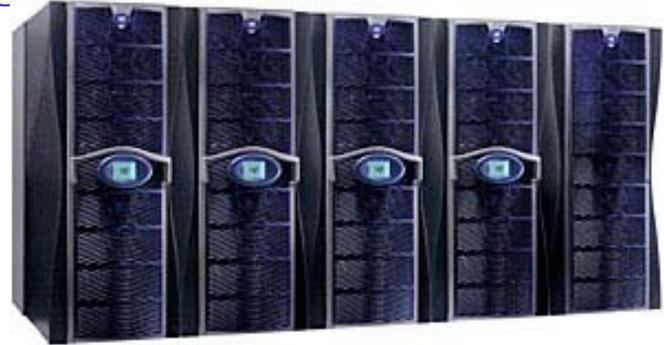# What do you do all day?

- **Research**
- **Teach**
- **Administration**
- **Student Supervision**
- **Play with cool technology (better than PS2)**
- **Faculty operate as entrepreneurs - work on what they want at times that are convenient**

CCR General Information

- **High-Performance Computing and High-End Visualization**
  - ❑ **70 Research Groups in 27 Depts**
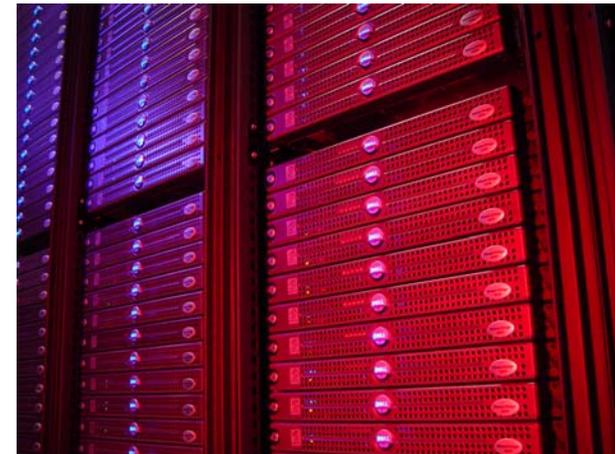 - ❑ **25 Companies and Institutions**
- **Sample Areas**
  - ❑ **Computational Chemistry**
  - ❑ **Ground Water Modeling**
  - ❑ **Geophysical Mass Flows**
  - ❑ **Urban Visualization and Simulation**
  - ❑ **Medical Imaging**
  - ❑ **Networked Multimedia**
- **Training**
  - ❑ **Workshops**
  - ❑ **Courses**
  - ❑ **Degree Programs**

Computational Resources

- **Dell Linux Cluster - #22 in world!**
  - ❑ **600 P4 Processors (2.4 GHz)**
  - ❑ **600 GB RAM; 40 TB Disk**
- **Dell Linux Cluster - #187 in world**
  - ❑ **4036 Processors (PIII 1.2 GHz)**
  - ❑ **2TB RAM; 160TB Disk; 16TB RD**

- **SGI Origin2000 → Origin3800**
  - ❑ **64 Processors (400 MHz)**
  - ❑ **32 GB RAM; 400 GB Disk**
- **IBM RS/6000 SP**
  - ❑ **78 Processors**
  - ❑ **26 GB RAM; 640 GB Disk**
- **Sun Microsystems Cluster**
  - ❑ **48 Sun Ultra 5s (333MHz)**
  - ❑ **16 Dual Sunblades (750MHz)**
  - ❑ **30 GB RAM, Myrinet**
- **SGI Intel Linux Cluster**
  - ❑ **150 PIII Processors (1 GHz)**
  - ❑ **75 GB RAM, 2.5 TB Disk Storage**
- **Apex Bioinformatics System**
  - ❑ **Sun V880 (3), 6800, 280R (2), PIIIs**
  - ❑ **Sun 3960: 7 TB Disk Storage**
- **HP/Compaq SAN**
  - ❑ **25 TB Disk; 250 TB Tape**

Visualization Resources

- **Fakespace ImmersaDesk R2**
  - ❑ **Portable 3D Device**
- **VREX VR-4200 Stereo Imaging Projector**
  - ❑ **Portable projector works with PC**
- **Tiled-Display Wall**
  - ❑ **20 NEC projectors; Dell PCs; Myrinet; 15.7M pixels**
- **Access Grid Node**
  - ❑ **Group-to-Group Communication**
  - ❑ **Commodity components**
- **SGI Reality Center 3300W**
  - ❑ **Dual Barco's on 8'×4' screen**

Bioinformatics in Buffalo

"This Center [of Excellence in Bioinformatics] will, through the University of Buffalo's Center for Computational Research, create academic and industrial partnerships …"
- NYS Gov. George S. Pataki, January 2001

Gov. Pataki

Congressman Reynolds   Senator Clinton

Bioinformatics in Buffalo

- **Center for Advanced Bioengineering & Biomedical Technologies**
  - ❑ **$1M/yr NYS**
  - ❑ **Medical Technologies for Product Development & Commercialization**
- **WNY STAR Center in Disease Modeling & Therapy Discovery**
  - ❑ **UB, HWI, RPCI, Kaleida**
  - ❑ **$15.3M NYS**
  - ❑ **Software, device development, and drug therapies**
- **Buffalo Center of Excellence in Bioinformatics**
  - ❑ **UB, HWI, RPCI**
  - ❑ **$61M NYS**
  - ❑ **$3M Federal Government**
  - ❑ **$151M Corporate Funding**
  - ❑ **$53M/yr Peer-Reviewed Grants**

Peace Bridge Visualization

■ **Proposed Options**
- ❑ **Relocate US plaza**
- ❑ **Build a 3-lane companion span, rehab existing bridge**
- ❑ **Build a six lane signature span**

PHOTO AND STORY BY BRUCE JACKSON

StreetScenes® Demo

- *StreetScenes*® is a Virtual Reality (VR) software solution for 3D visualization of surface traffic
- 3D model of proposed soccer stadium in Rochester
- Used *StreetScenes*® to import output file from Synchro traffic simulation

Buffalo Niagara Medical Campus

- **Eight (8) Block radius in Downtown Buffalo**
- **Urban planning**
  - ❑ **Rapidly explore changes in building design/location**
  - ❑ **Public involvement - Meetings, CDs, Videos, etc**
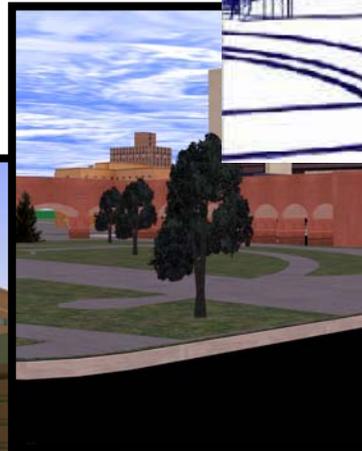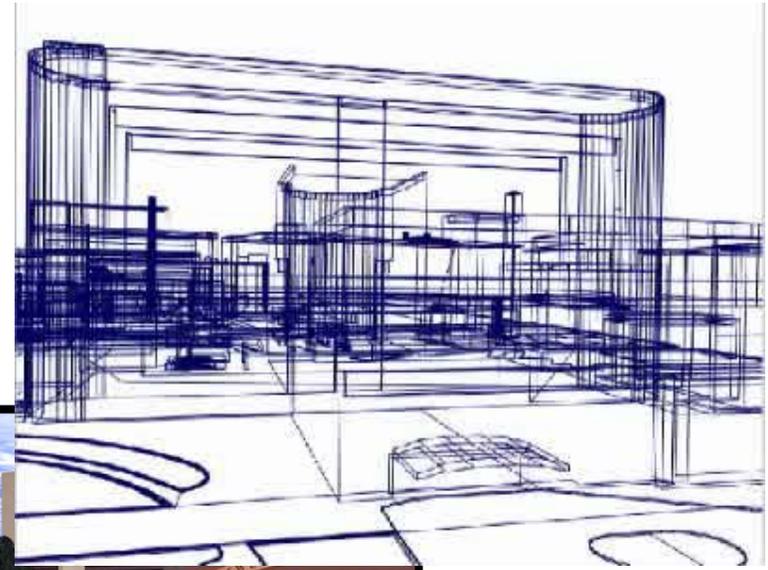
3D Medical Visualization App

- **Collaboration with Children's Hospital**
  - **Leading miniature access surgery center**
- **Application reads data output from a CT Scan**
- **Visualize multiple surfaces and volumes**
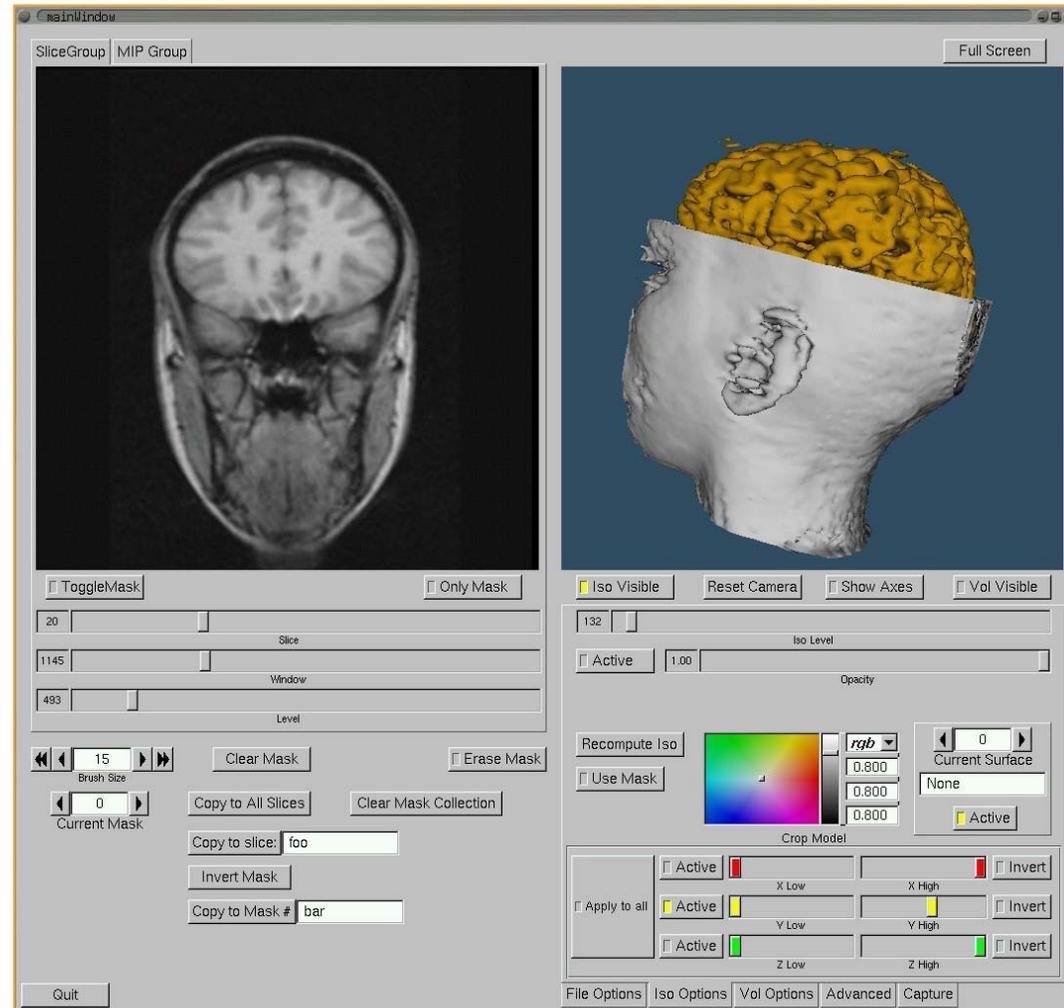- **Export images, movies or CAD representation of model**
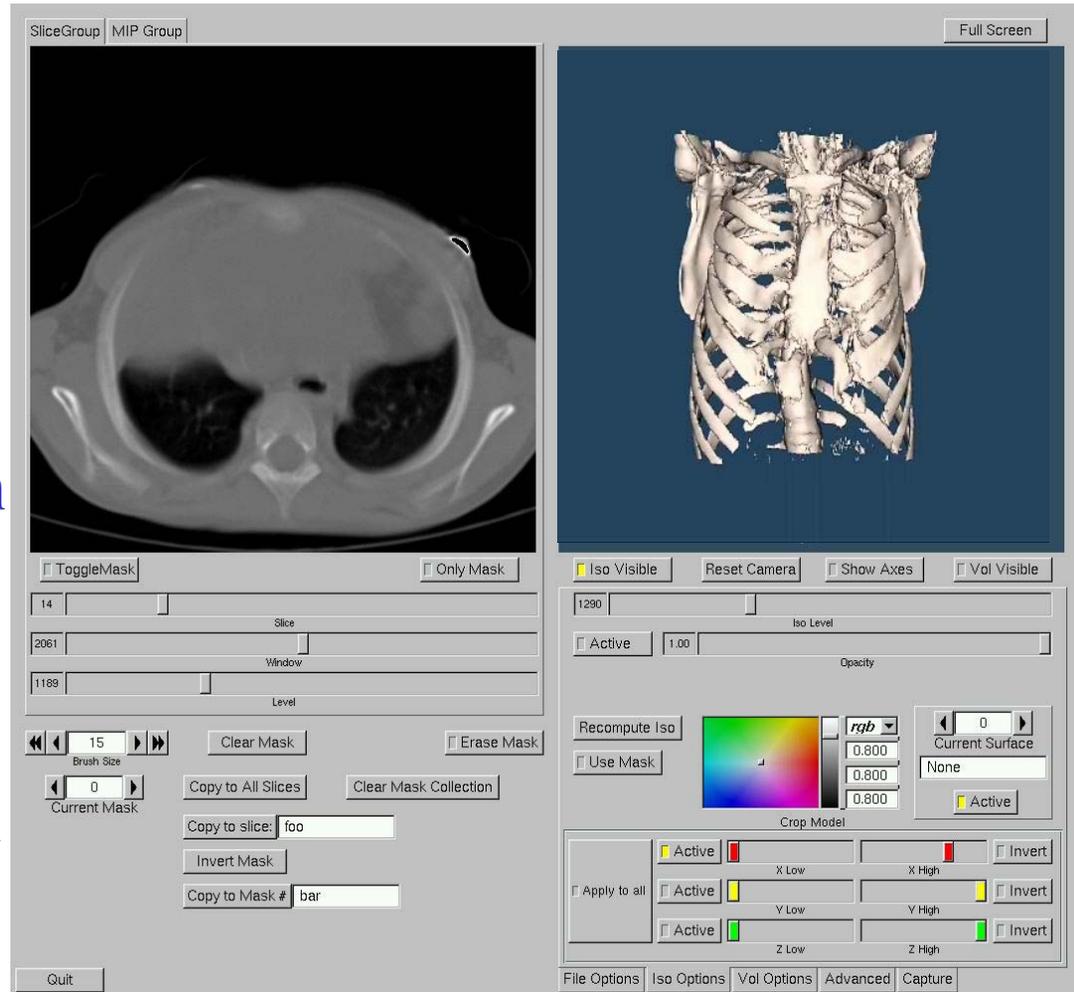
Multiple Sclerosis Project

- **Collaboration with Buffalo Neuroimaging Analysis Center (BNAC)**
 - **Developers of Avonex, drug of choice for treatment of MS**
- **MS Project examines patients and compares scans to healthy volunteers**

Multiple Sclerosis Project

- **Compare caudate nuclei between MS patients and healthy controls**
- **Looking for size as well as structure changes**
  - ❑ **Localized deformities**
  - ❑ **Spacing between halves**
- **Able to see correlation between disease progression and physical structure changes**
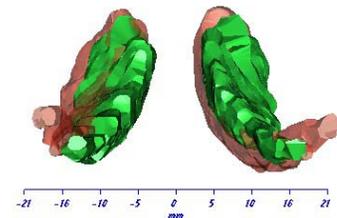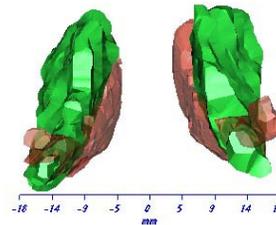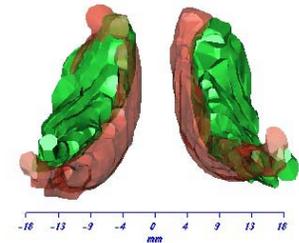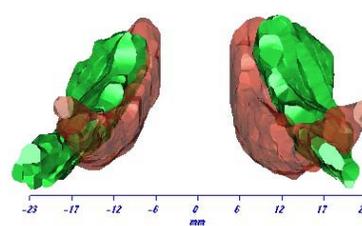
WNY Biomedical Advances

- **PSA Test (screen for Prostate Cancer)**
- **Avonex: Interferon Treatment for Multiple Sclerosis**
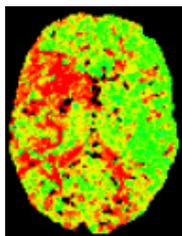- **Artificial Blood**
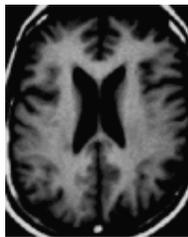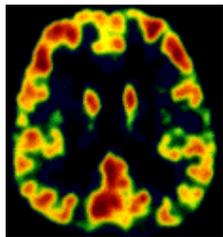- **Nicorette Gum**
- **Fetal Viability Test**
- **Implantable Pacemaker**
- **Edible Vaccine for Hepatitis C**
- **Timed-Release Insulin Therapy**
- **Anti-Arrythmia Therapy**
  - **Tarantula venom**

- **Direct Methods Structure Determination**
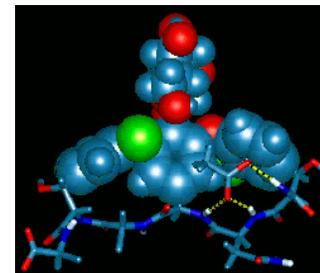 - **Listed on "Top Ten Algorithms of the 20th Century"**
  - **Vancomycin**
  - **Gramacidin A**
- **High Throughput Crystallization Method: Patented**
- **NIH National Genomics Center: Northeast Consortium**
- **Howard Hughes Medical Institute: Center for Genomics & Proteomics**

Outreach

A Career in Computing?

- **Professor of CSE**
  - **Math & Science**
  - **Computer Science**
  - **Ph.D. (4+5 yrs)**
  - **Original Research**
  - **Communication Skills**

  - **[$80 - 200K]**

- **Systems Analyst**
  - **Major**
    - **Computer Science or**
    - **Info Technology**
  - **Well-Rounded**
  - **B.S. (4 yrs)**

  - **[$40 - 120K]**

You are the future!!

Contact Information

← **Photo**

Computer Generated
↓

www.ccr.buffalo.edu

miller@buffalo.edu