

Remote Instrumentation and the STaRBURSTT CyberInstrumentation Consortia

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STaRBURSTT CyberInstrumentation Consortium



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When Should One Go Remote?

- Instrument Type
- Purchase & Operating Costs
- Nature of Institution
- Use of Instrument
- Expertise
- Critical Mass
- Demand
- Capacity Utilization

• Representative Cases

- High Resolution - FT Mass Spectrometer
- Superconducting NMR
- X-Ray Diffractometer
- ESR Spectrometer
- LC Mass Spectrometer
- GC Mass Spectrometer
- Mössbauer Spectrometer
- IR Spectrometer
- pH Meter

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When Should One Go Remote?

- Instrument Type
 - Common vs. **Esoteric**
 - Minor vs. Major

• Representative Cases

- High Resolution - FT Mass Spectrometer**
- Superconducting NMR
- X-Ray Diffractometer
- ESR Spectrometer
- LC Mass Spectrometer
- GC Mass Spectrometer
- Mössbauer Spectrometer**
- IR Spectrometer
- pH Meter

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When Should One Go Remote?

- Purchase Costs
 - Hundreds of Thousands of Dollars to Tens or Hundreds of Dollars
- Operating Costs
 - at Least 10% of Purchase Costs
- Representative Cases
 - **High Resolution - FT Mass Spectrometer**
 - **Superconducting NMR**
 - **X-Ray Diffractometer**
 - **ESR Spectrometer**
 - LC Mass Spectrometer
 - GC Mass Spectrometer
 - Mössbauer Spectrometer
 - IR Spectrometer
 - pH Meter

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When Should One Go Remote?

- Nature of Institution
 - Major Research University
 - BS/MS University
 - Liberal Arts College
 - **Community College**
 - High School
- Representative Cases
 - High Resolution - FT Mass Spectrometer
 - Superconducting NMR
 - X-Ray Diffractometer
 - ESR Spectrometer
 - LC Mass Spectrometer
 - **GC Mass Spectrometer**
 - Mössbauer Spectrometer
 - **IR Spectrometer**
 - pH Meter

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When Should One Go Remote?

- Use of Instrument
 - **PhD** Graduate Research
 - **MS** Graduate Research
 - Undergraduate Research
 - Undergraduate Instruction

- Representative Cases

- High Resolution - FT Mass Spectrometer
- Superconducting NMR (**Solid State NMR**)
- X-Ray Diffractometer
- ESR Spectrometer
- LC Mass Spectrometer
- GC Mass Spectrometer
- Mössbauer Spectrometer
- IR Spectrometer
- pH Meter

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When Should One Go Remote?

- Expertise
 - **Interpretational Expertise**
 - Operational Expertise
 - Instructional Expertise
 - **Maintenance Expertise**

- Representative Cases

- High Resolution - FT Mass Spectrometer
- Superconducting NMR
- X-Ray Diffractometer
- ESR Spectrometer
- LC Mass Spectrometer
- GC Mass Spectrometer
- Mössbauer Spectrometer
- IR Spectrometer
- pH Meter

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When Should One Go Remote?

- Critical Mass
 - Institutional
 - Regional
 - Delocalized
- Representative Cases
 - **High Resolution - FT Mass Spectrometer**
 - Superconducting NMR
 - X-Ray Diffractometer
 - ESR Spectrometer
 - LC Mass Spectrometer
 - GC Mass Spectrometer
 - **Mössbauer Spectrometer**
 - IR Spectrometer
 - pH Meter

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When Should One Go Remote?

- Demand
 - Continuous & Current
 - Pent Up
 - **Unexpected**
- Representative Cases
 - High Resolution - FT Mass Spectrometer
 - Superconducting NMR
 - **X-Ray Diffractometer**
 - ESR Spectrometer
 - LC Mass Spectrometer
 - GC Mass Spectrometer
 - **Mössbauer Spectrometer**
 - IR Spectrometer
 - pH Meter

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When Should One Go Remote?

- Capacity Utilization
 - Spread Out in Time or **Episodic**?
 - Total **Annual Utilization**
- Representative Cases
 - **High Resolution - FT Mass Spectrometer**
 - Superconducting NMR
 - **X-Ray Diffractometer**
 - ESR Spectrometer
 - LC Mass Spectrometer
 - GC Mass Spectrometer
 - **Mössbauer Spectrometer**
 - IR Spectrometer
 - pH Meter

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STaRBURSTT CyberDiffraction Consortium



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STaRBURSTT CyberInstrumentation Consortium?

- Science Teaching and Research Brings Undergraduate Research Strength Through Technology
- Centered at:
 - BS/MS Comprehensive Universities
 - Liberal Arts Colleges
 - Community Colleges
 - Research Universities (Typically in Adjunct/Ancillary Roles)
 - Historically Black Colleges & Universities
 - Hispanic Serving Institutions
- 10Years of Ongoing Collaboration Between Core Faculty

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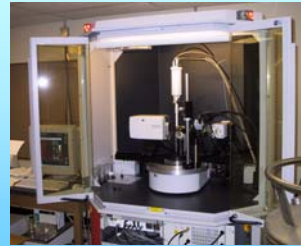
STaRBURSTT CyberInstrumentation Consortium?

- *Current* Primary Nodes:
 - Youngstown State University, Allen D. Hunter,
 - California State University Fullerton, Katherine Kantardjieff,
 - Central Connecticut State University, Guy Crundwell,
 - Illinois State University, Gregory Ferrence,
 - Southeastern Missouri University, Marcus Bond.
- *Current* Secondary Nodes:
 - Muskingum College, Paul Szalay,
 - The College of Wooster, Virginia Pett,
 - Columbus Community College, Larry Mayer,
 - East Los Angeles College, Laura Ramirez,
 - Harold Washington College of the City Colleges of Chicago, Thomas Higgins,
 - Central State University, Suzanne Selem,
 - Howard University, Ray Butcher.

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YSU is a **Primary Node** and the **Home Institution** of **STaRBURSTT CyberDiffraction Consortium**

- Tim Wagner, Allen Hunter, Matthias Zeller, & Ray Hoff
- 2 Siemens P4 Single Crystal Diffractometers
- 1 Bruker-AXS APEX Single Crystal CCD Diffractometer
- 1 Bruker-AXS D8 Powder Diffractometer
- Databases & Software



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A Single Crystal Diffractometer on Each (PUI) Campus – **Why Not?**

- Purchase Costs
- Operating Costs
- Operation & Maintenance Expertise

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A Single Crystal Diffractometer on Each (PUI) Campus - Why?

- “Hands On” Access
 - Quick
 - Assured
- High Impact
 - Teaching
 - Research
- Instrument Operation & Data Analysis Tools
 - Has Rapidly Become Easier for Novices
- Data Reliability Assessment Tools
 - Have Improved Steadily

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Conventional Instrument Consortia Are Not the Answer

- Transportation Issues
- Instrument Time
 - Quantity of Time Desired
 - Quality of Time
- What is Instrument Efficiency at a PUI?
- *cf.* Ohio NMR/MS/X-Ray/etc., Consortia

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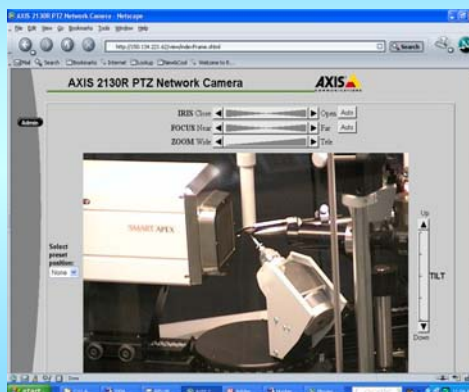
Remote Access Consortium Advantages & Challenges

- Remote Access Advantages
 - Virtual Space \approx Real Space for Current Students
 - Aggregate Demand Justifies More/Better Instruments
- Remote Access Challenges
 - Security Issues
 - Cost Allocation
 - Training of New Users \ll Need for Trained Users
 - STaRBURSTT Core Function

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Remote Diffractometer Control

- Sample Submission
 - Initial Visit
 - Mail/FEDEX
 - Manual Mounting



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 - Steven J. DiMuzio & Bill Snyder
 - **Tim Wagner & Ray Hoff**
 - Paul Szalay, Muskingum College
 - Alan Jircitano, Laura Hoistad-Straus, & Ed Zovinka
 - Guy Crundwell & Barry Westcott
 - Marcus Bond & Katherine Kantardjieff
 - Crystallographic Community
 - Bruker AXS