First results with integrating 2nd generation Berkeley Cartesian automounters into GM/CA CAT beamline controls

Oleg Makarov

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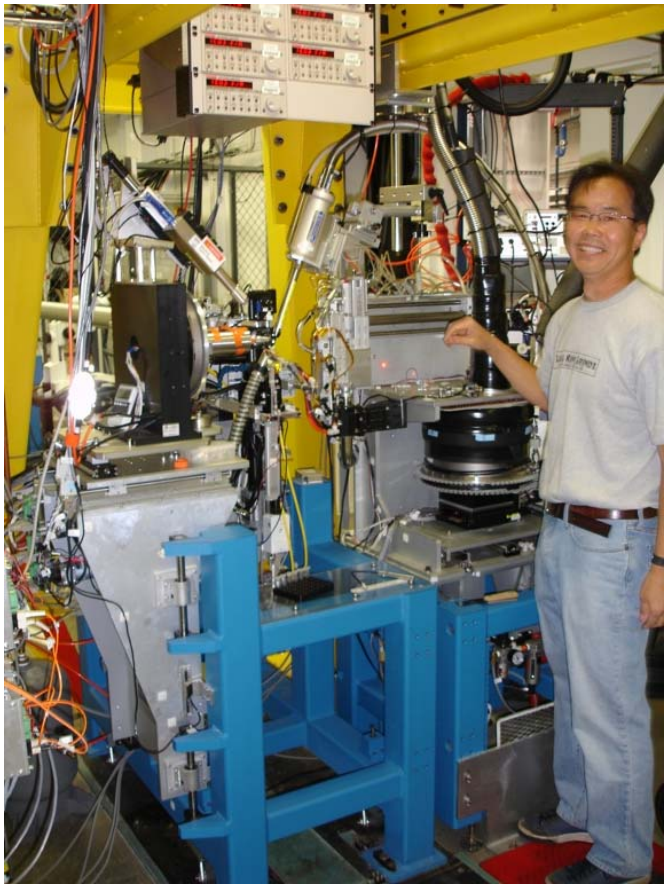
National Institute of General Medical Sciences
NATIONAL CANCER INSTITUTE

OUTLINE

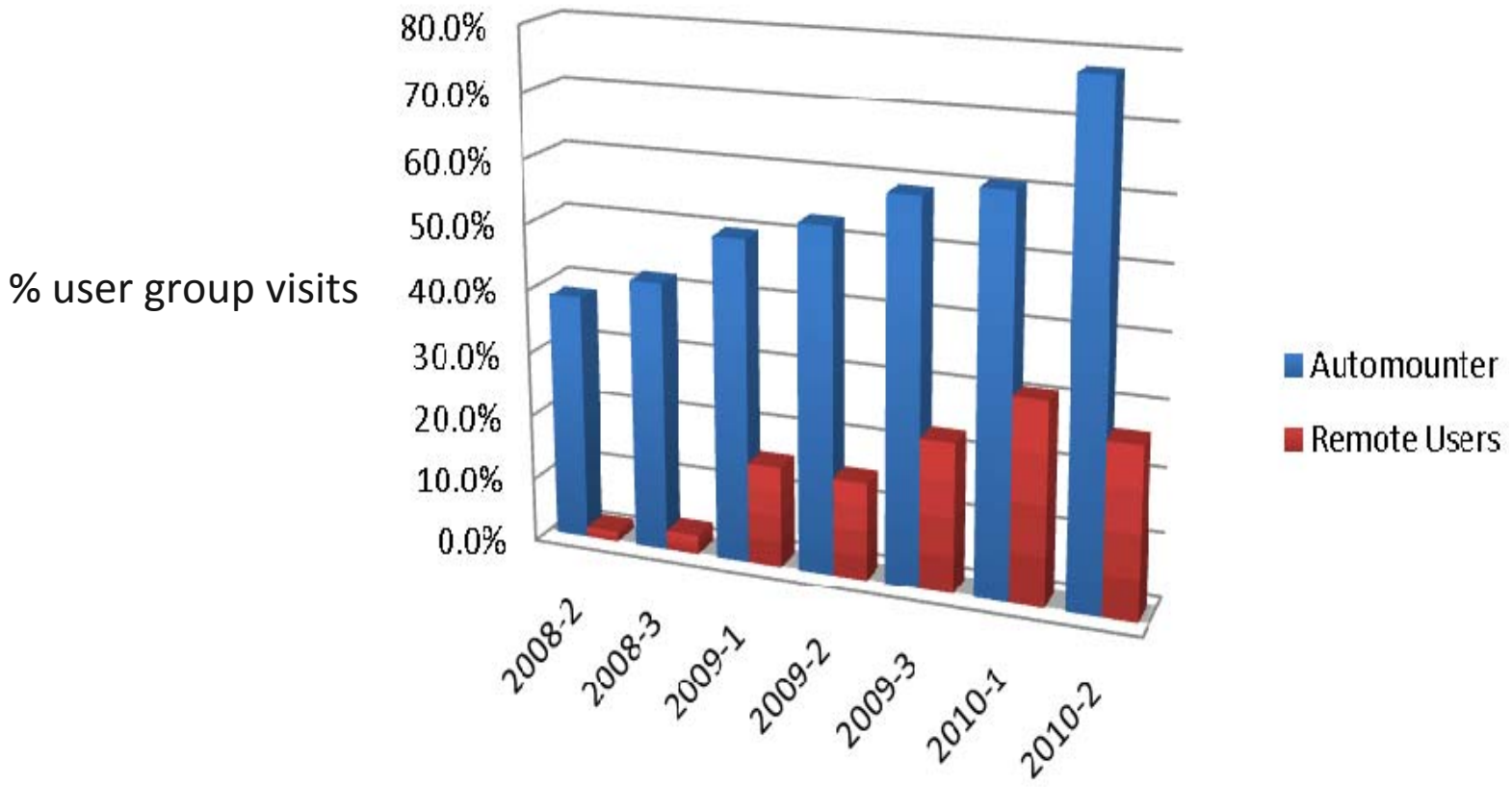
- Introduction
- Berkeley automounter of the second generation
- BAM2 software solution
- BAM2 integration into beamline control system
- Future plans

Introduction

- High-throughput macromolecular crystallography
  - Automated data collection
  - Automated sample changing
  - Automated data processing

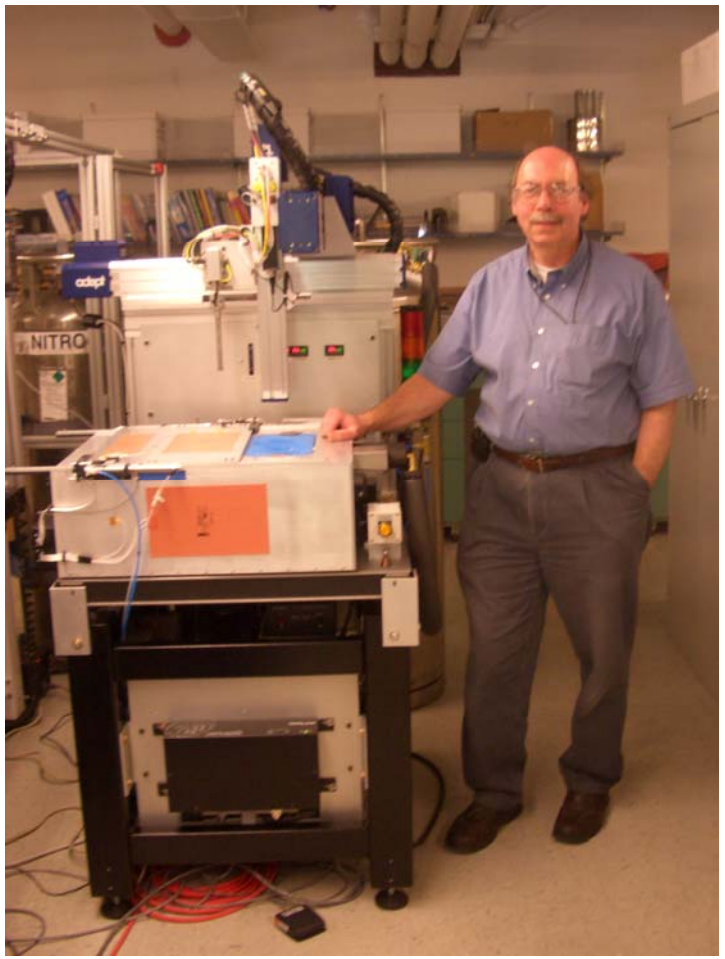


Use of the automounter and remote operations

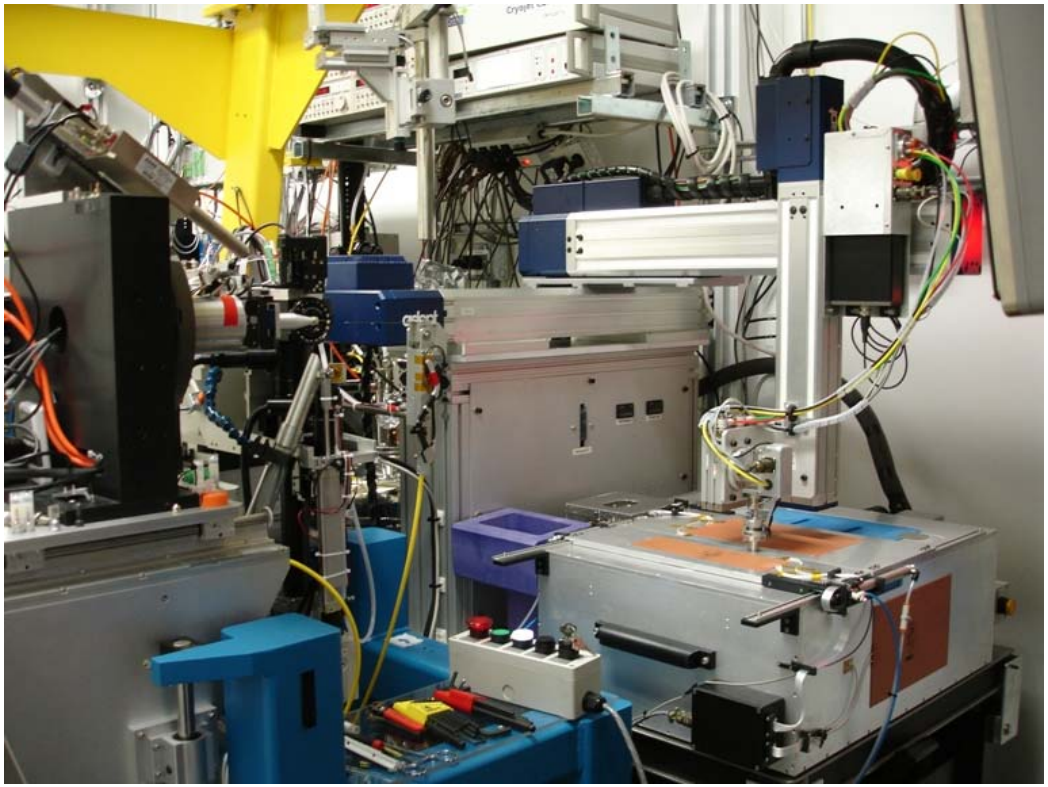


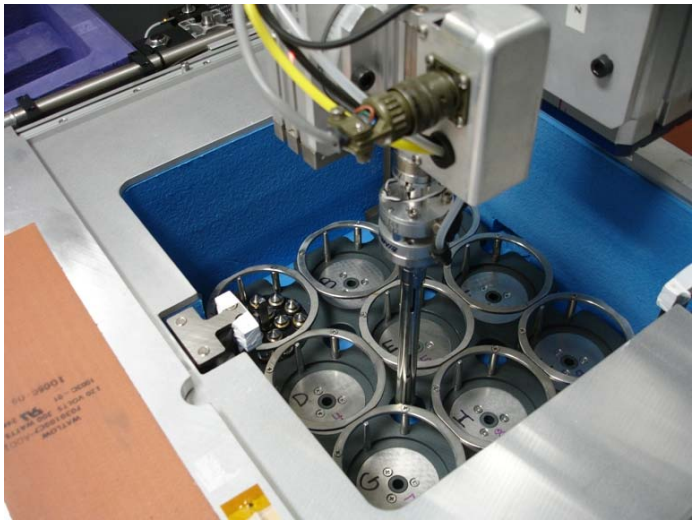
Berkeley automounter of the second generation

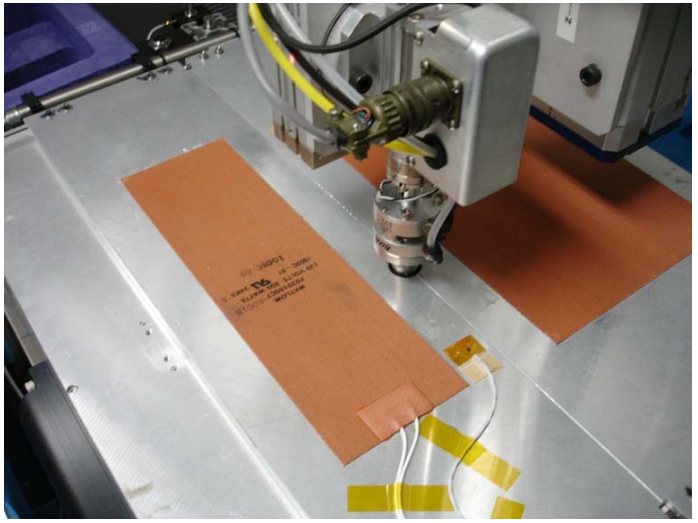
- Adept Python linear XYZ Cartesian module
  - Flexibility in motion
- Pneumatic gripper and rotation stage
  - Same as in the first robot generation
- Force sensor and touch probe
  - Automated alignment
- Stationary foam Dewar with heated lid
  - No maintenance



Berkeley automounter of the second generation



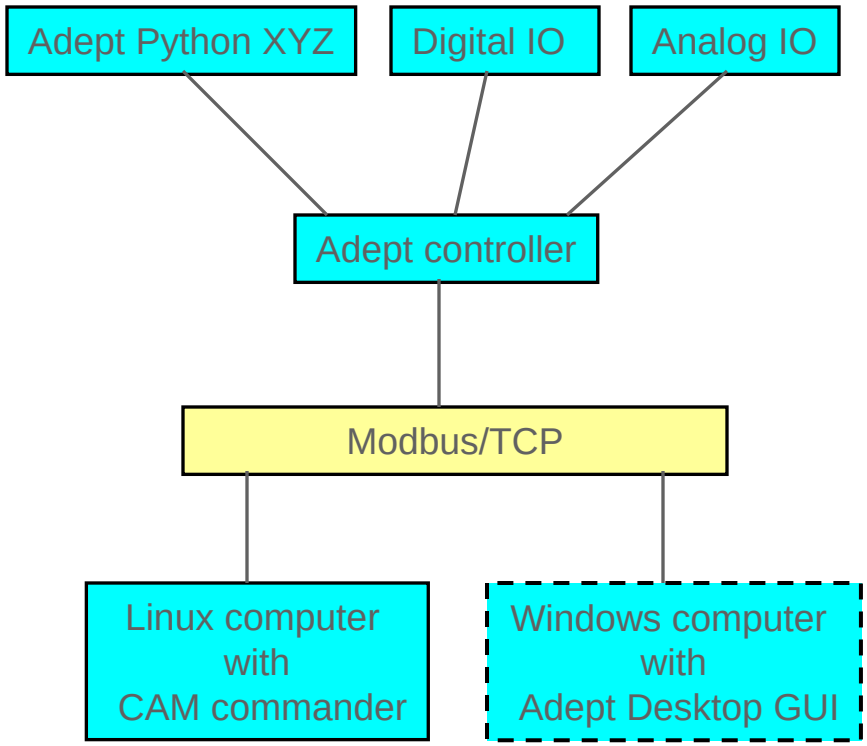




...installed at the 23BM-B experimental station

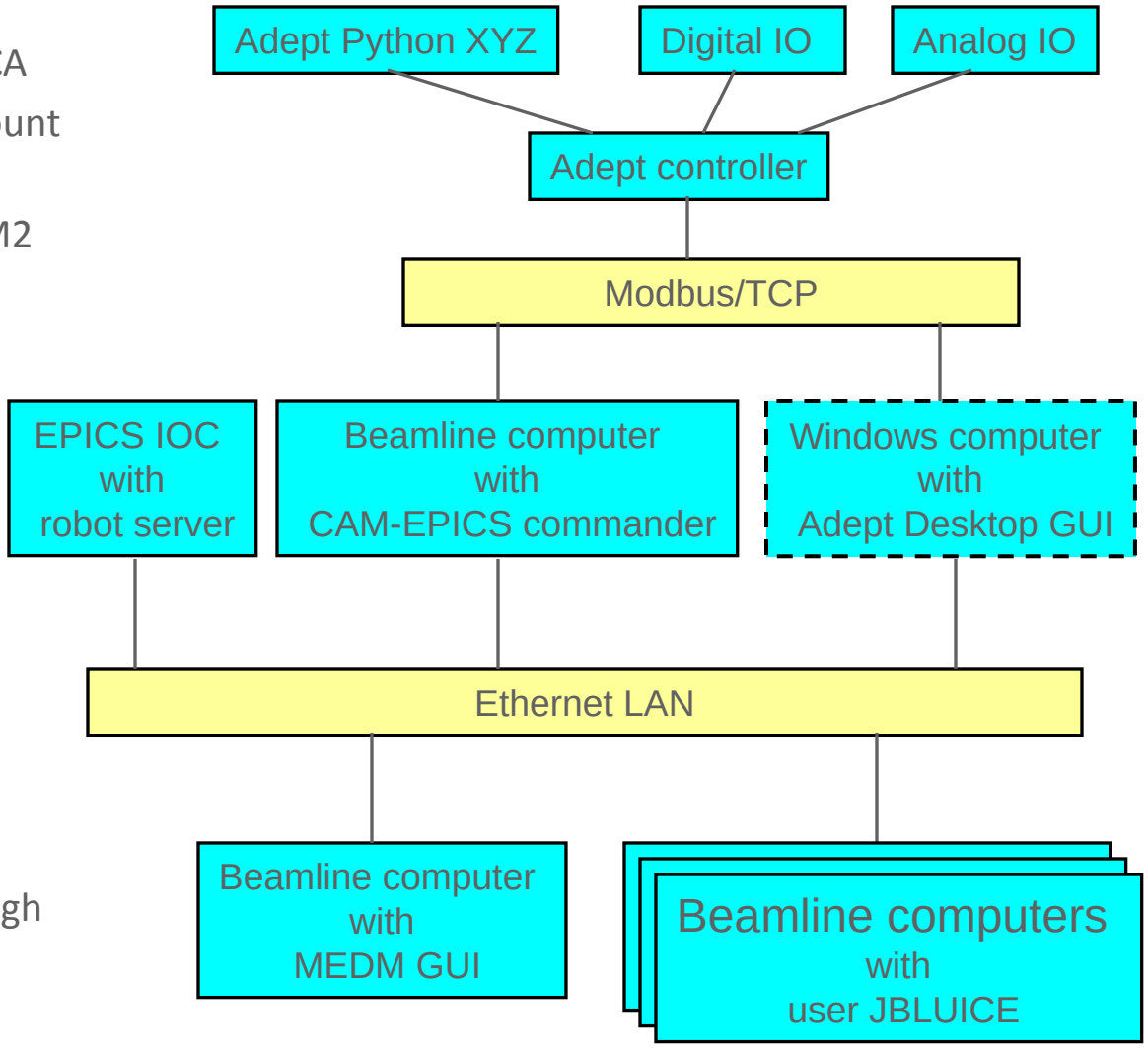
BAM2 software solution

- The Adept V+ real-time and multi-tasking operating system
  - Executes low-level commands
- Adept Desktop
  - Windows-based GUI
  - Connects over Modbus/TCP
- Java-based “CAM-commander” control program
  - Developed with Java NETBeans IDE
  - Connects to Adept controller over Modbus/TCP
  - Provides command line interface



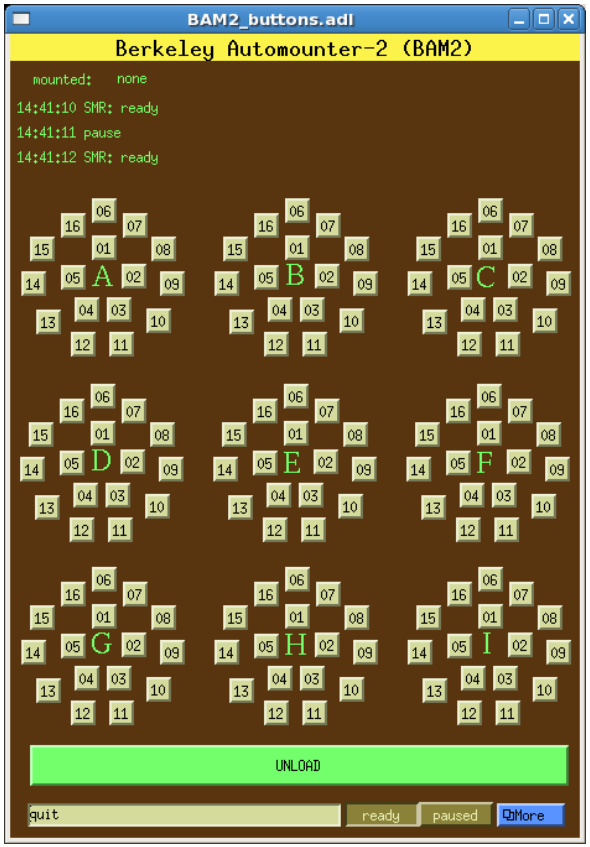
BAM2 integration into beamline control system

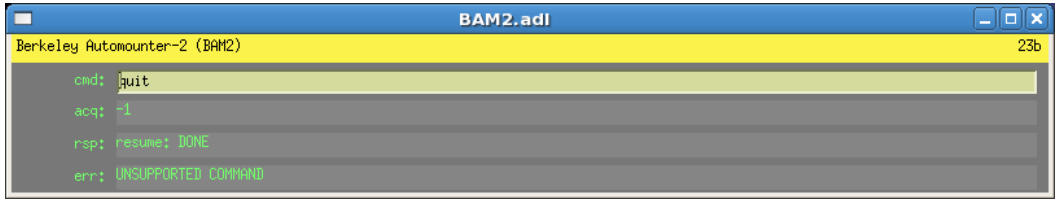
- EPICS robot server
  - Receives commands via CA
  - Moves goniometer to mount position
  - Relays commands to BAM2 interface PVs
- EPICS interface PVs:
  - <bl>:BAM2:cmd
  - <bl>:BAM2:ack
  - <bl>:BAM2:rsp
  - <bl>:BAM2:err
- "CAM-EPICS commander" control program
  - Receives commands and provides responses through EPICS interface PVs



BAM2 integration into beamline control system

- MEDM screens for BAM2
  - Dewar layout screen
  - BAM2 commands
  - Sample history
  - BAM2 interface PVs





Future plans

BAM2

- Optimize robot control program for faster operation
- Incorporate robot control program into the robot EPICS server
- Move robot to the 23ID-B beamline after integration with beamline controls and commissioning
- Add support for Rigaku packs

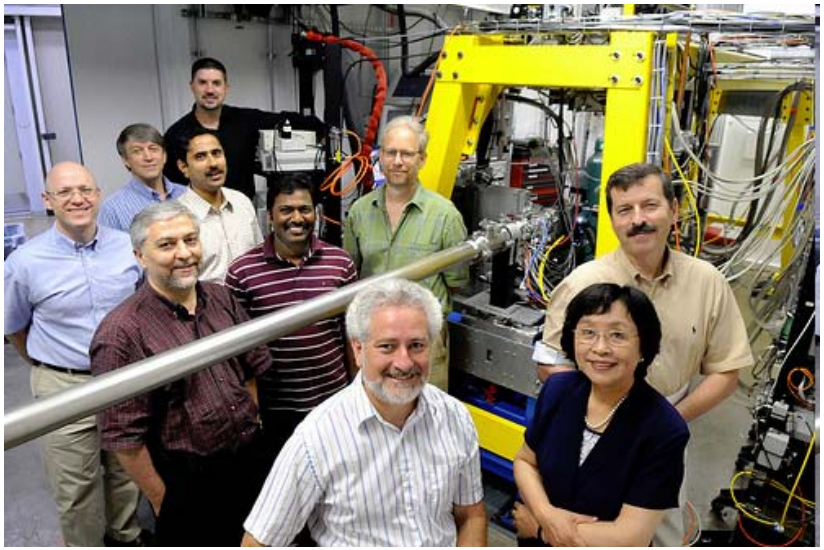
BAM1

- Update old robots with servo-motor driven linear stages and a force sensor
- Add a procedure for auto-alignment

The team

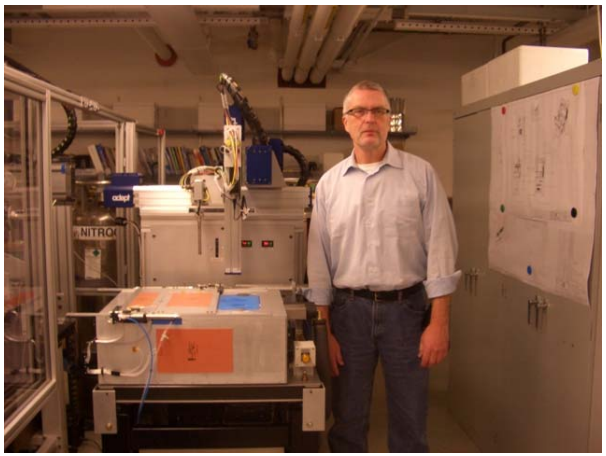
GMCA-CAT

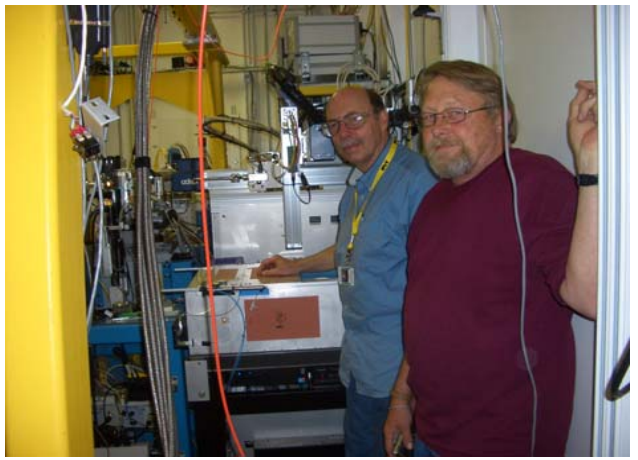
- Robert Fischetti
- Craig Ogata
- Sergey Stepanov
- Mark Hilgart
- Sudhirbabu Pothineni
- Shenglan Xu
- Steve Corcoran
- Dale Ferguson



LBNL

- Thomas Earnest
- Carl Cork
- James O'Neill





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