Ergonomics in the Biosciences

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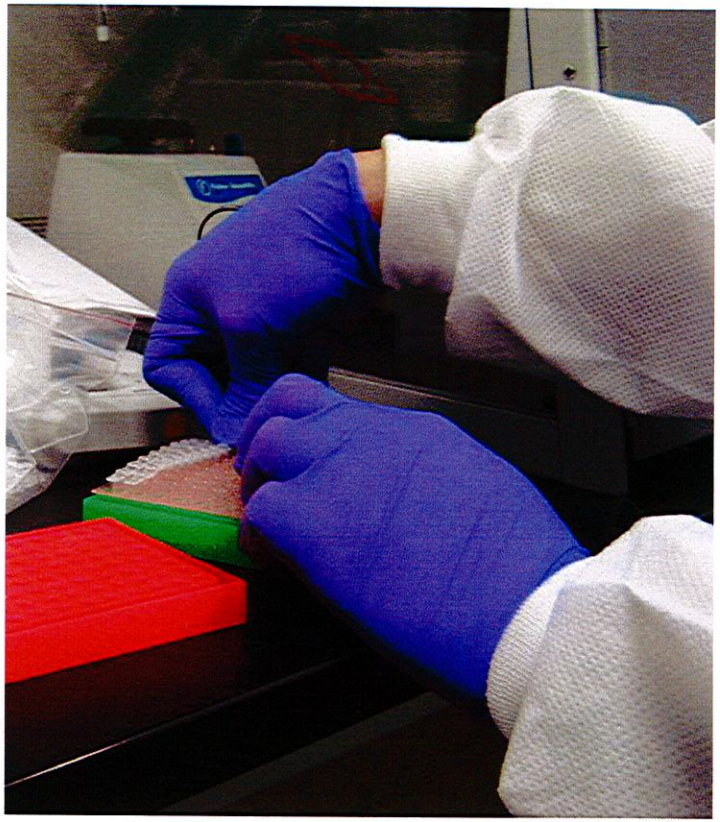
This work was performed under the auspices of the US Department of Energy's Office of Science, Biological and Environmental Research Program, and by the University of California, Lawrence Berkeley National Laboratory under contract No. DE-AC02-05CH11231, Lawrence Livermore National Laboratory under Contract No. DE-AC52-07NA27344, and Los Alamos National Laboratory under contract No. DE-AC02-06NA25396.

LOUIS STOKES LABORATORIES, NIH

"What the cathedral was to the 14th century and the office building was to the 20th century, the laboratory is to the 21st century."

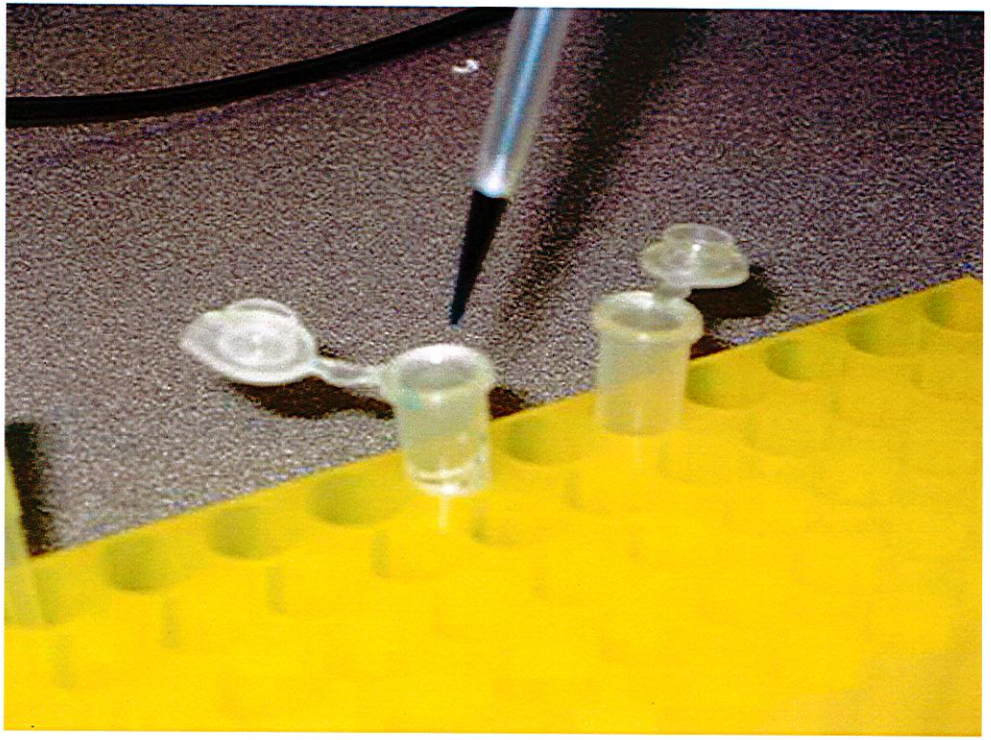
Don Prowler, LS&EM Conference, 2001

Ergonomics Risk Factors

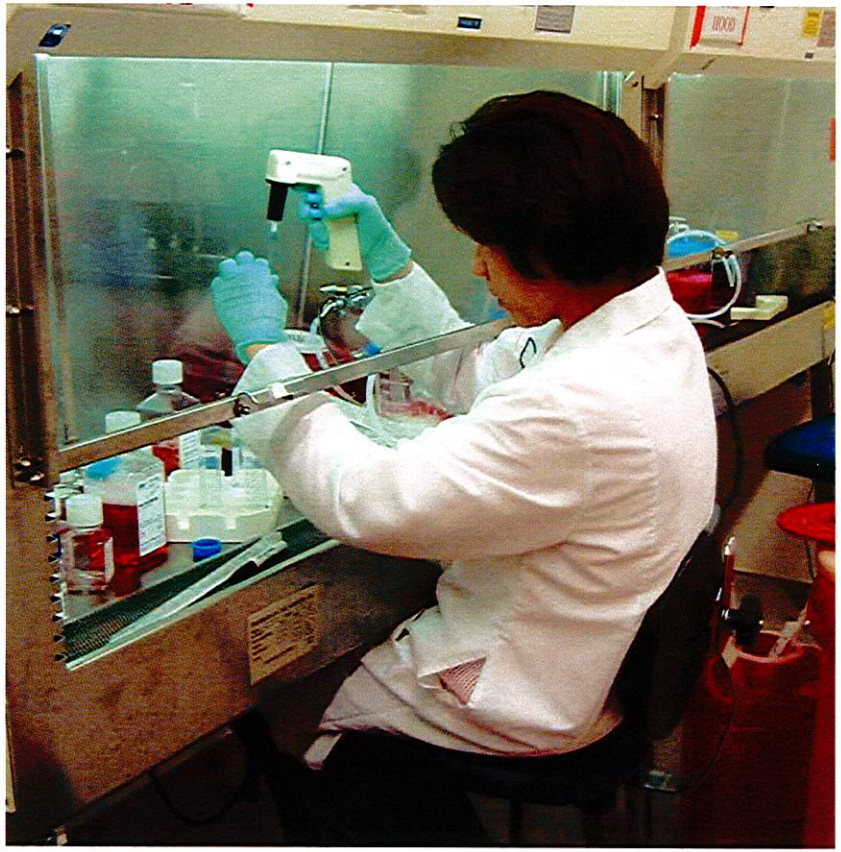


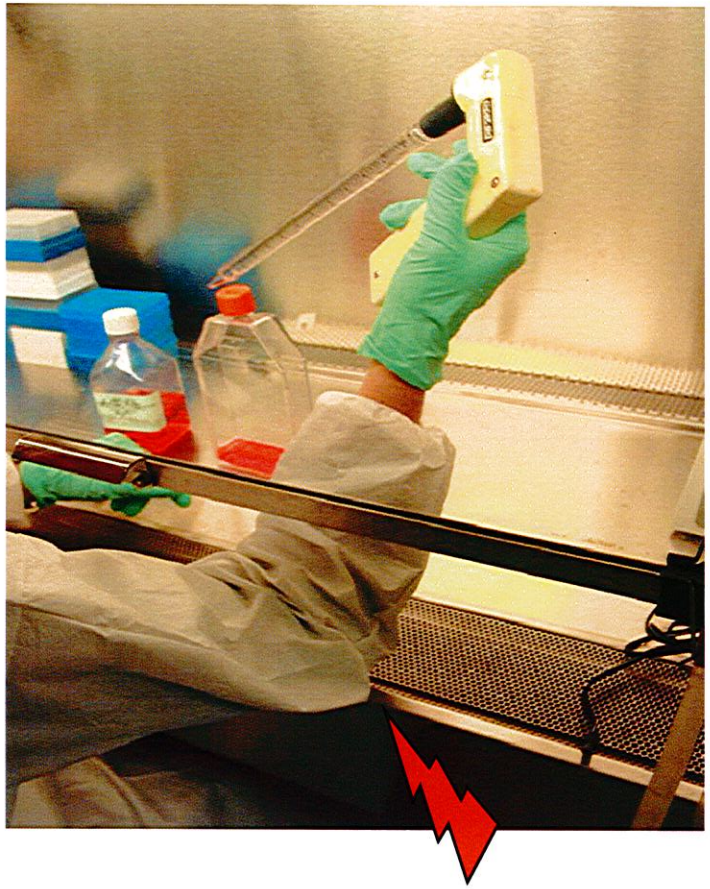
Many lab activities involve repetitive, forceful pinching in awkward postures

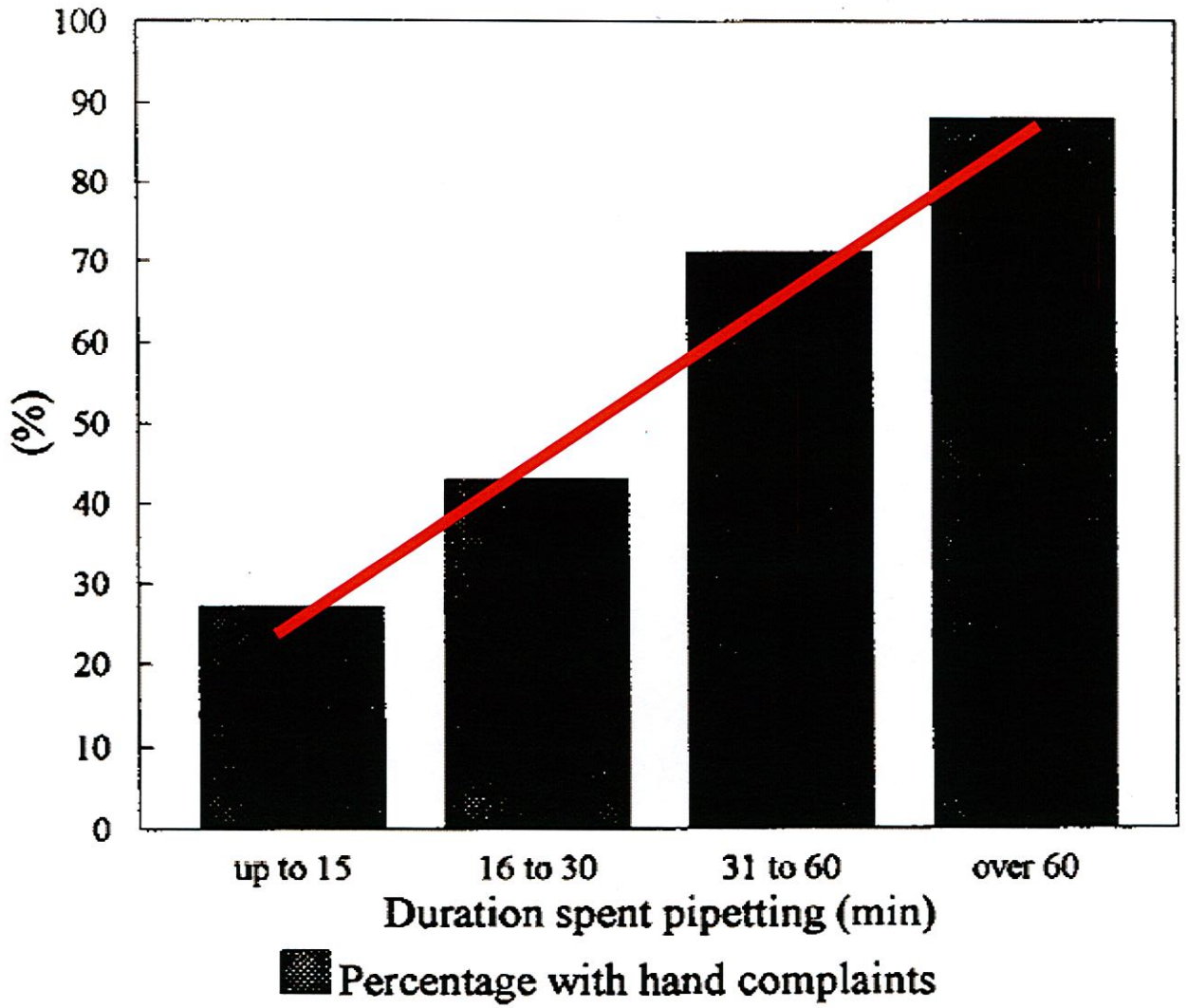
High precision demand



Static postures → Fatigue → Contact stress







David & Buckle, Applied Ergonomics, 28:4, 1997

Manual Pipetting – Epidemiology

- Frequent use (>300 hrs/yr) associated with high risk of hand & shoulder problems: pipetting > 1-1.5 hours per day
  - Hand problems (5.0 x control group)
  - Shoulder problems (2.4 x control group)

(David & Buckle, 1997)

(Bjorksten, 1994)

Microscopy

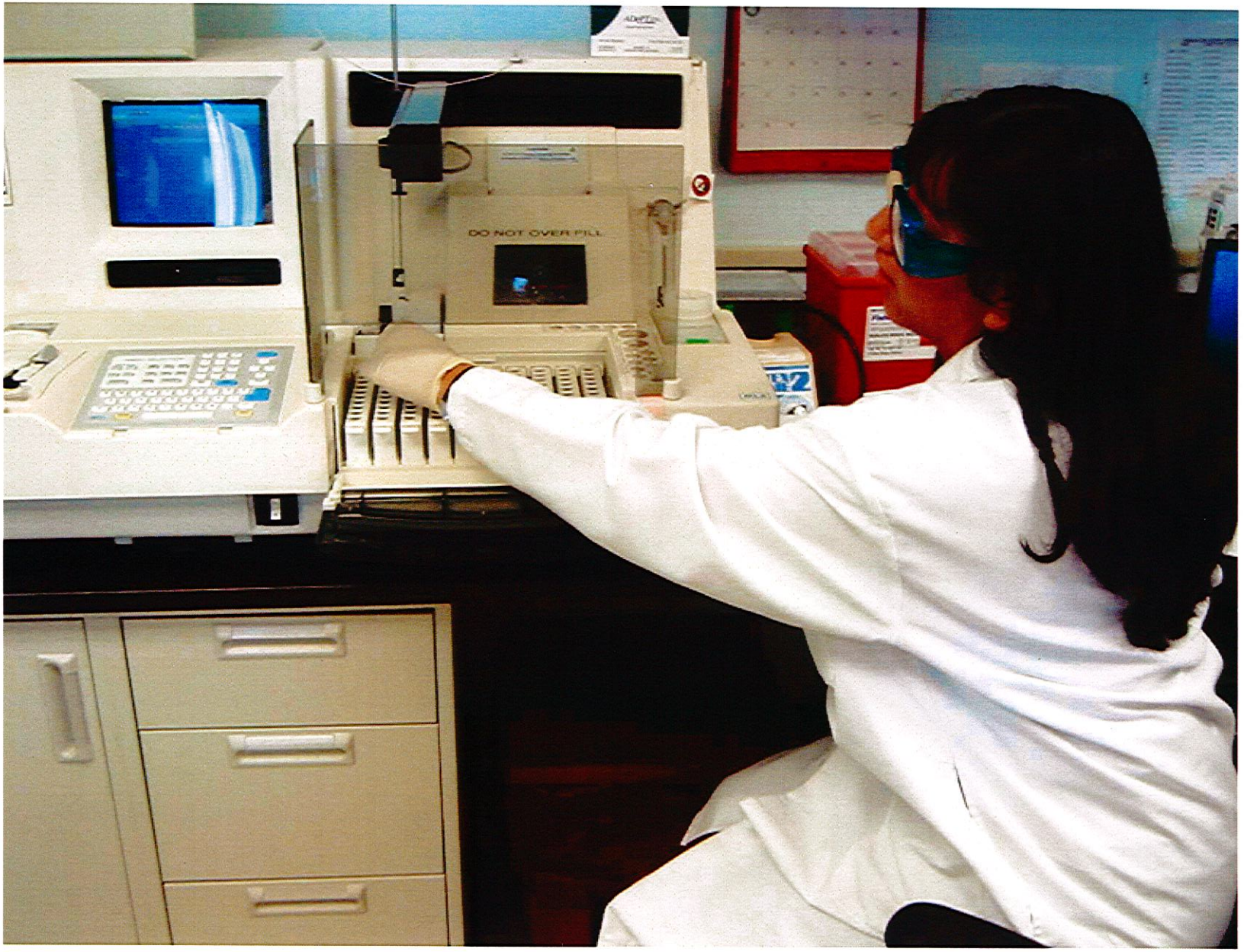
85% of cytotechnologists had some musculoskeletal symptom(s): headache, neck pain/stiffness, back pain, upper-extremity discomfort.

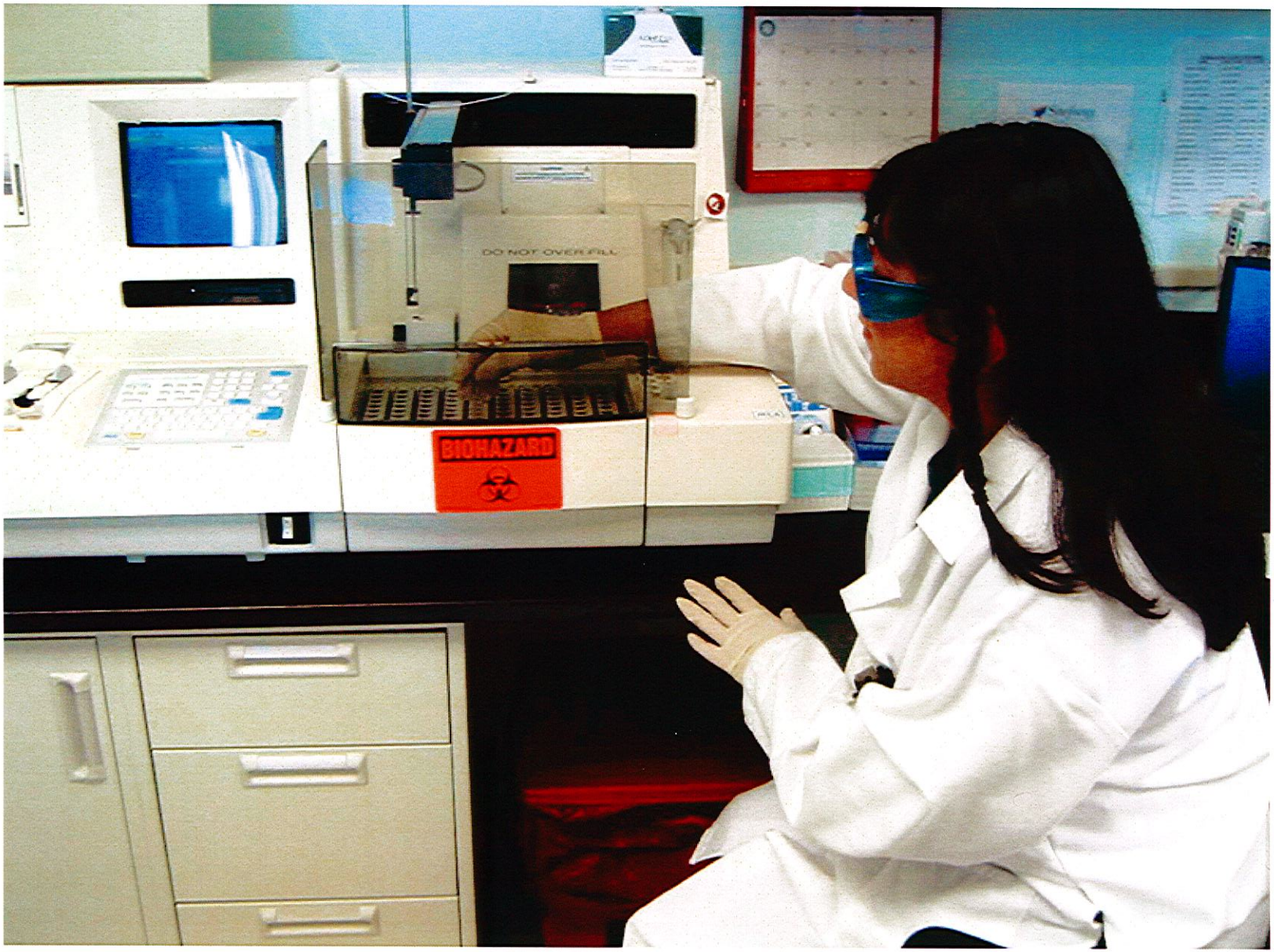
Numbness, tingling, & pain in fingers:

>1/2 Right hand

>1/3 Left hand

Thompson, 2003

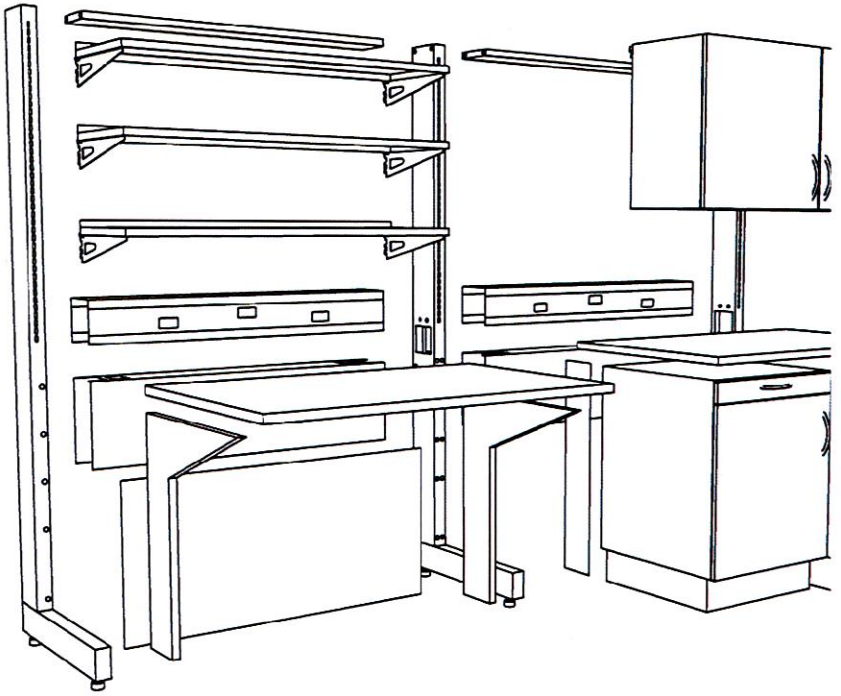

DO NOT OVER FILL


DO NOT OVERFILL
BIOHAZARD

Where should things go?

Height adjustability adapts to changes in equipment and technology over time

Modular lab furniture



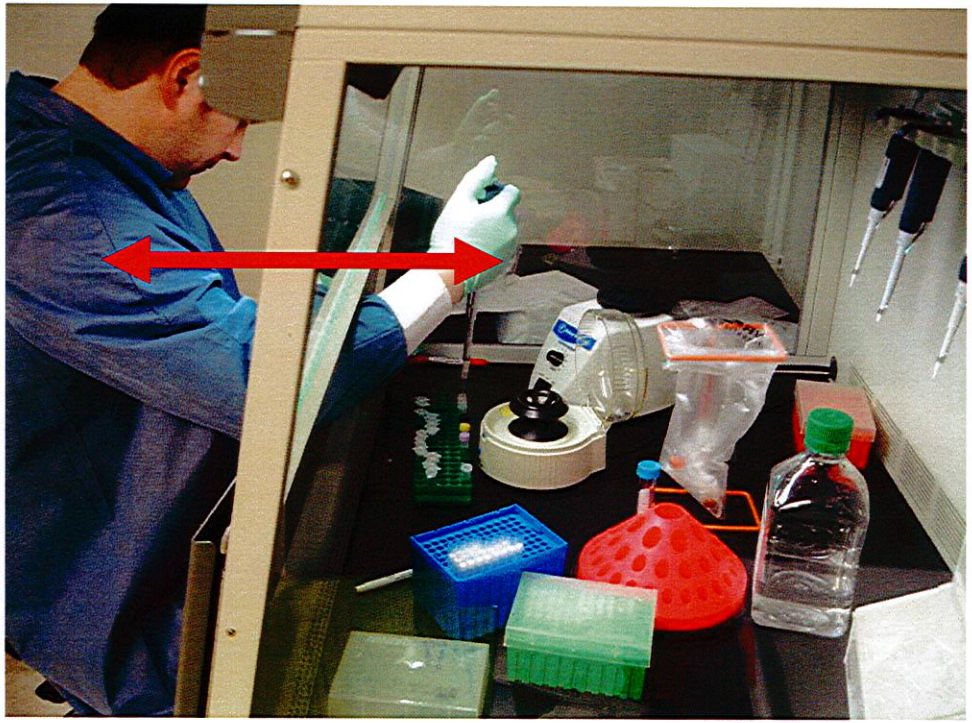
Workstation adjustability is a key factor in our ability to adapt work areas to the constantly changing people, task, and equipment in the lab environment.

"Biosafety cabinets and laboratory workbenches …present ergonomic hazards which are mostly due to ***lack of adjustability & leg room***."

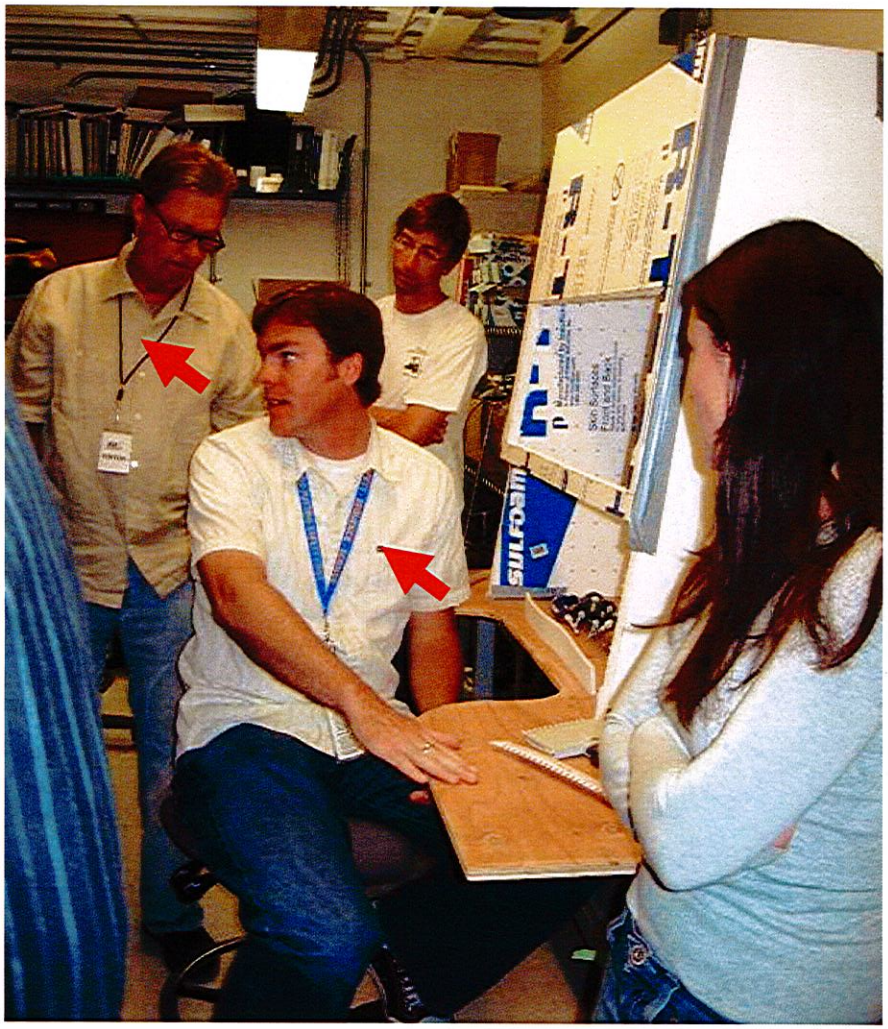
CDC, Laboratory Ergonomics website, 9-24-07
http://www.cdc.gov/od/ohs/Ergonomics/labergo.htm

Bench top DNA Hood before ergo modification:

Inadequate legroom & long reach distances →
flexed back and awkward neck/shoulder posture

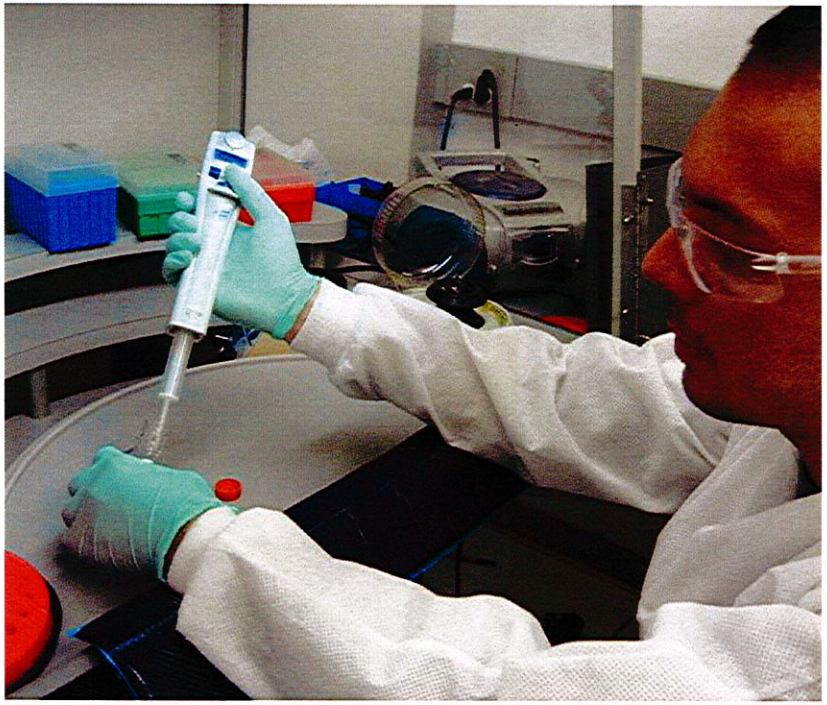


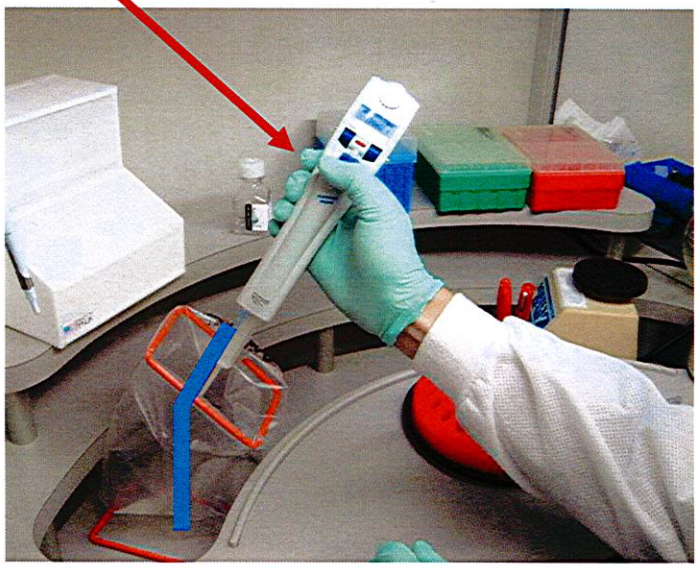
Early mock-ups for 454 group input & collaboration w/ Ergo Team (June 07)

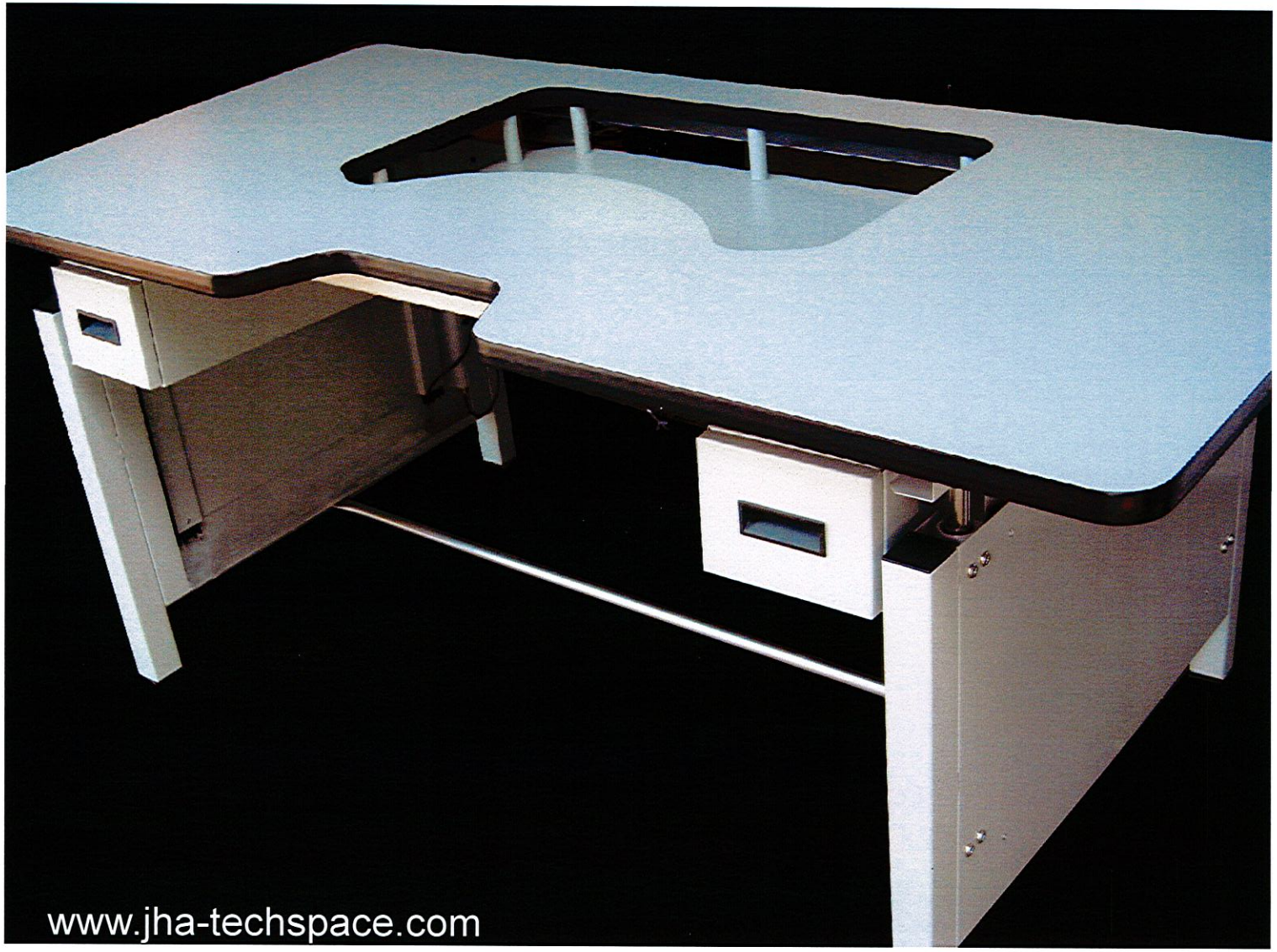


Bench top DNA Hood re-design

1. Recessed area & tilted receptacles reduce awkward wrist postures
2. Padding protects elbows & forearms
3. Programmable pipette (Eppendorf Xstream) improves hand position, reduces force & repetitive movement






www.jha-techspace.com

SOMA Hybrid chair

EXIT

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JGI
DOE JOINT GENOME INSTITUTE
US DEPARTMENT OF ENERGY
OFFICE OF SCIENCE

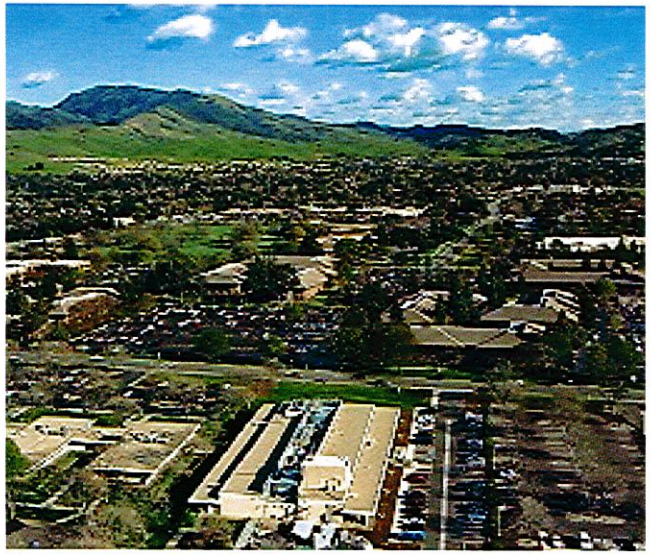
JGI Ergonomics Program

"A recipe for success to improve worker safety and health"

Presented by
Melanie Alexandre
and
Christine Naca

DOE Joint Genome Institute

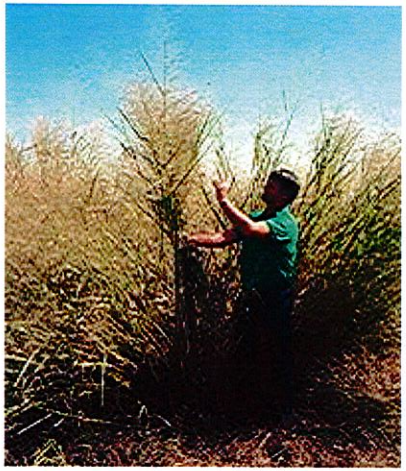
Production Genomics Facility



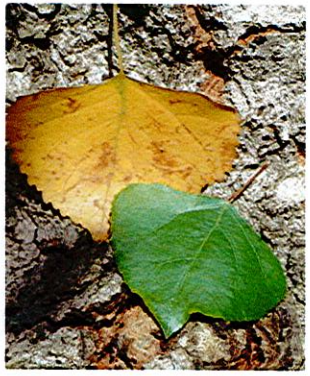
Opened in 1999
~250 employees

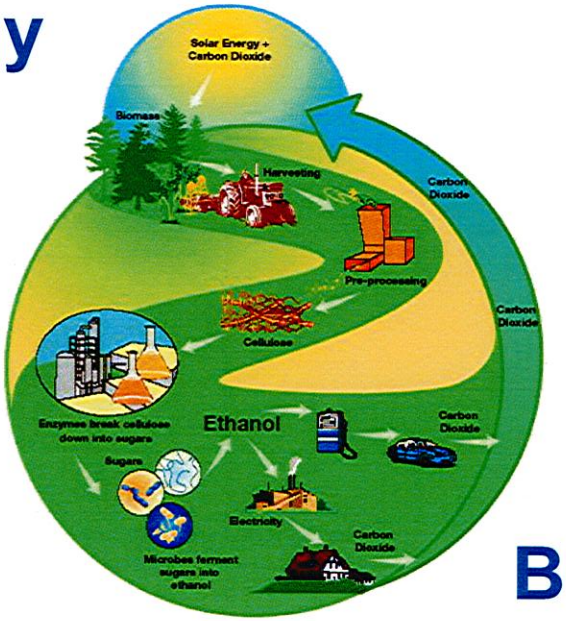
Office of Science
U.S. DEPARTMENT OF ENERGY

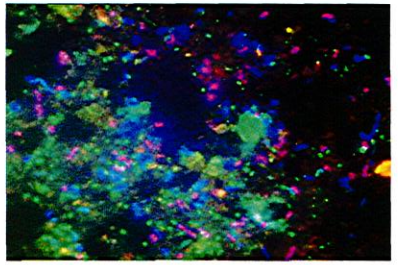
DOE Mission Relevance

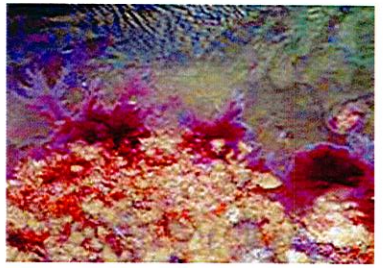


Bioenergy

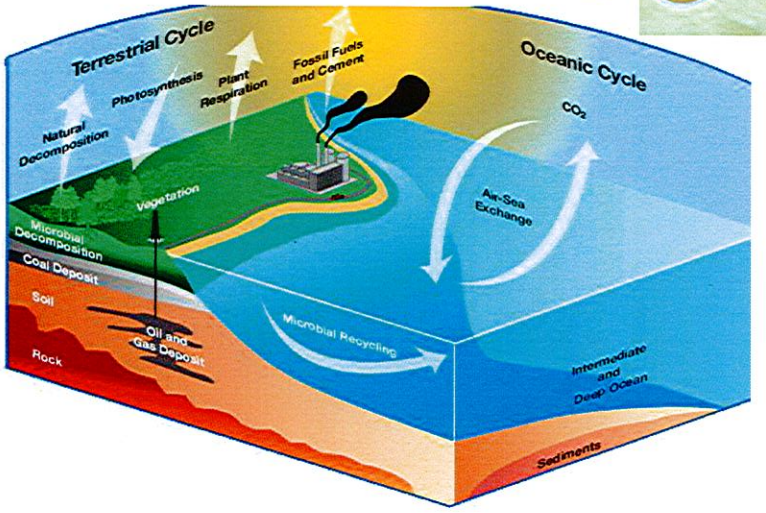




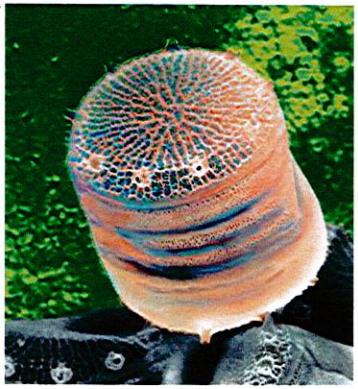


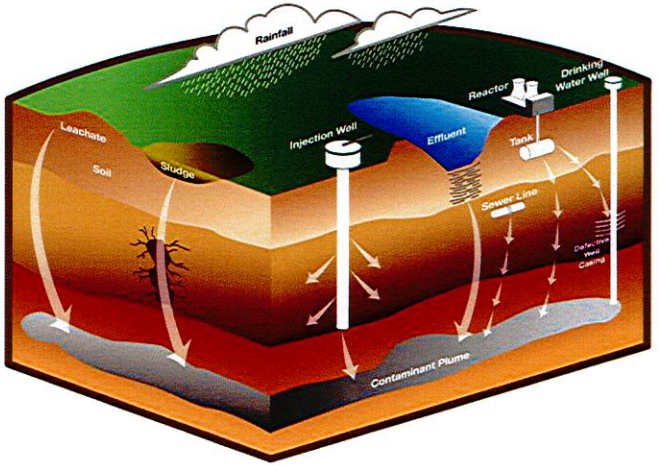


Carbon Cycling



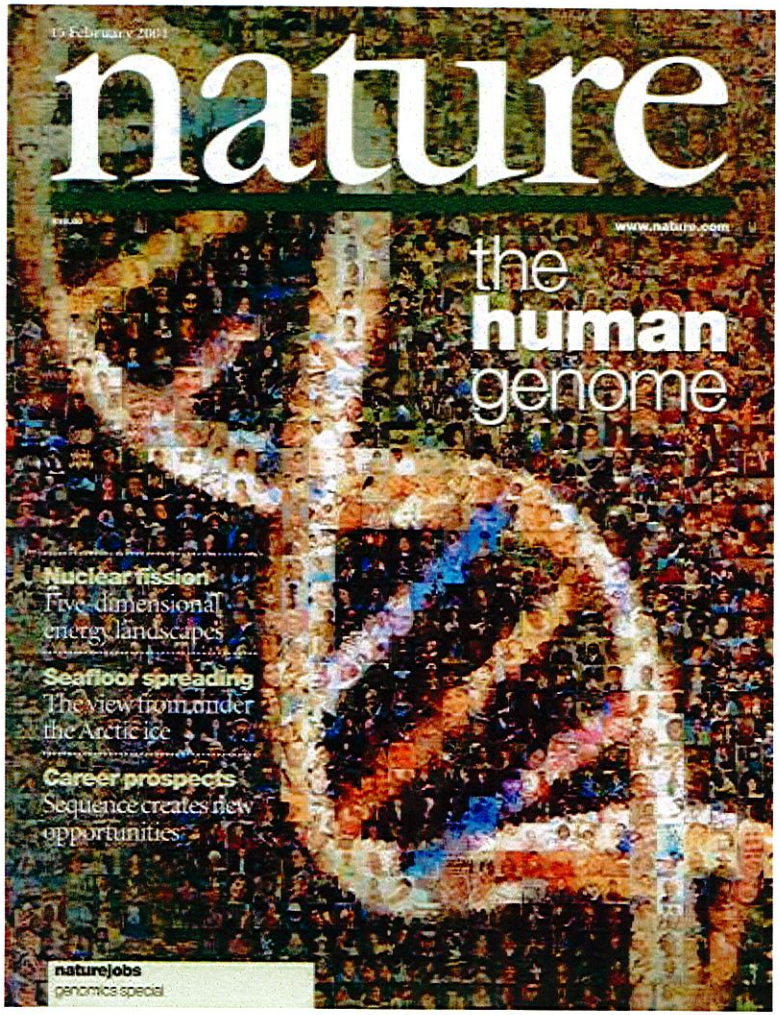
Biogeochemistry

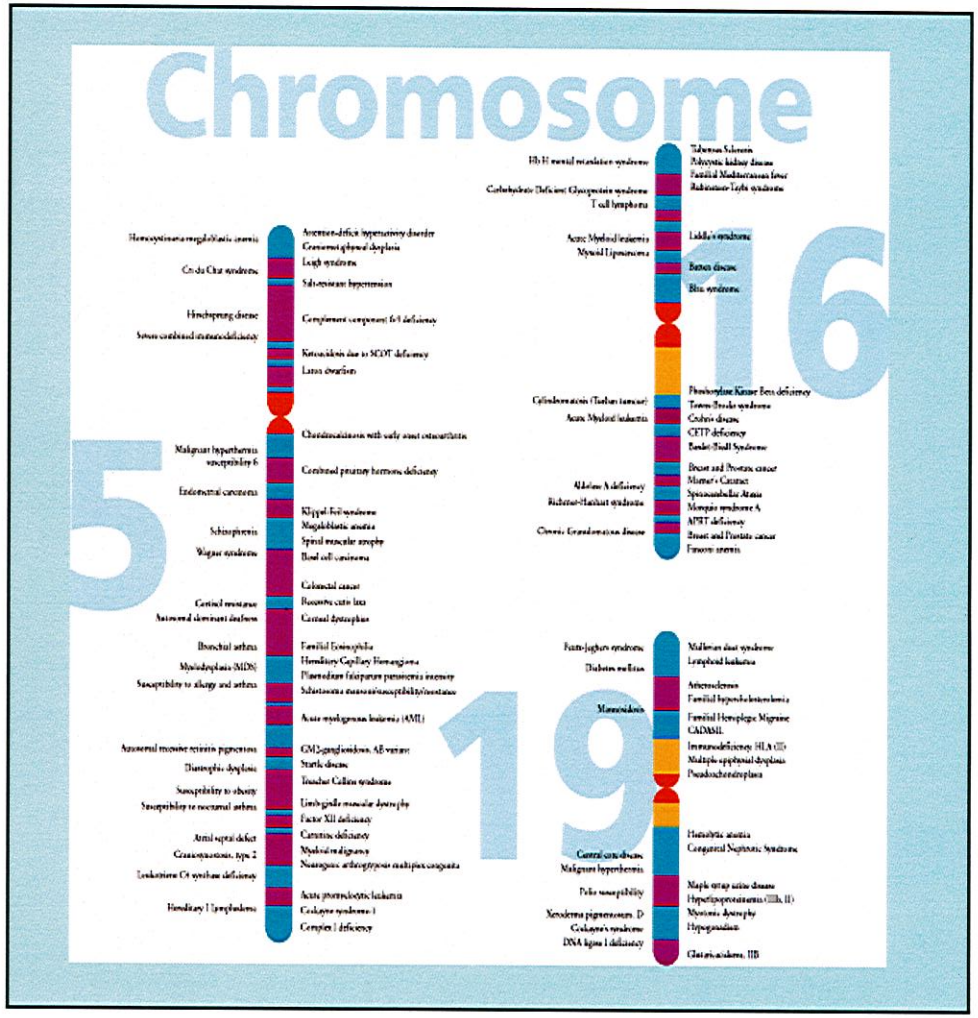




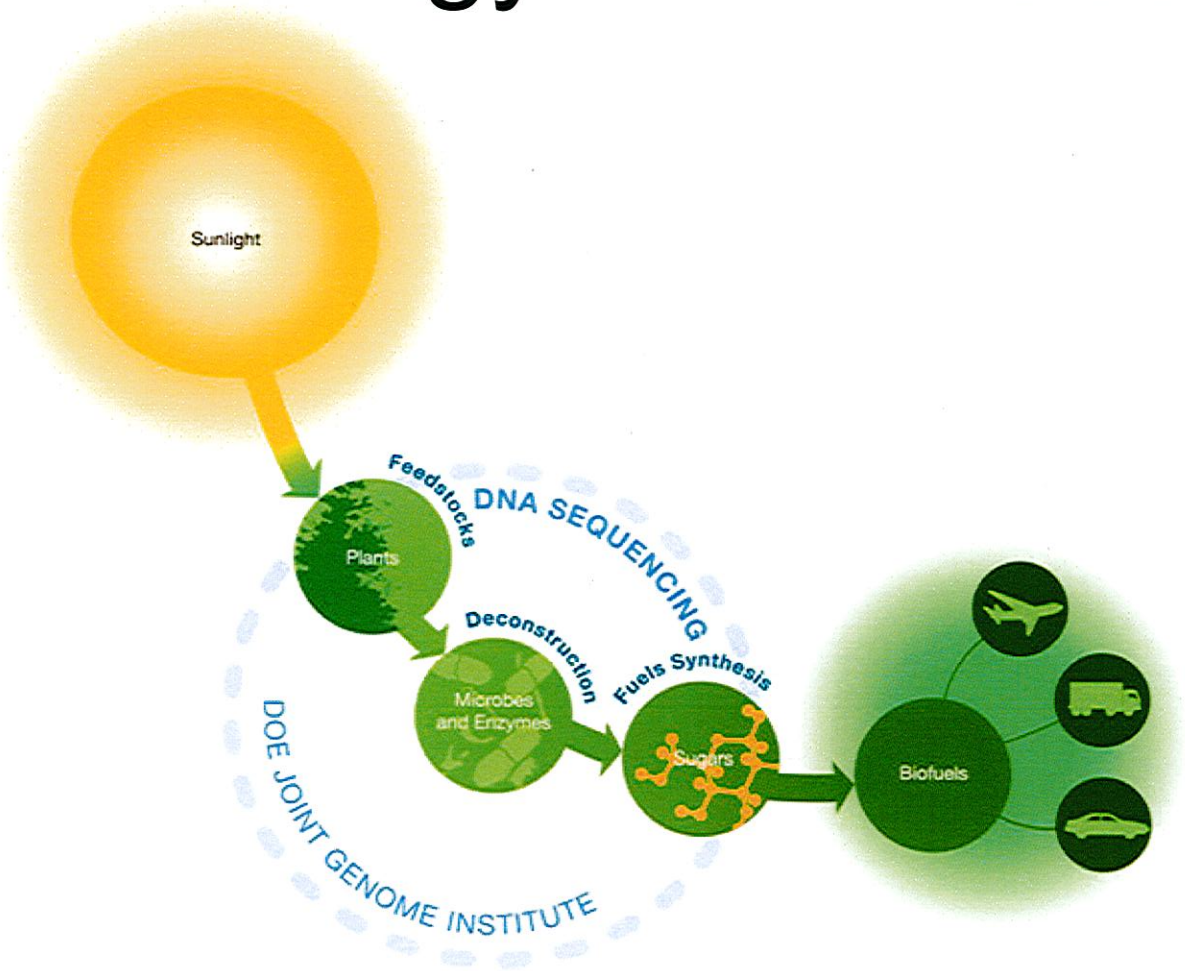
The Human Genome

2003

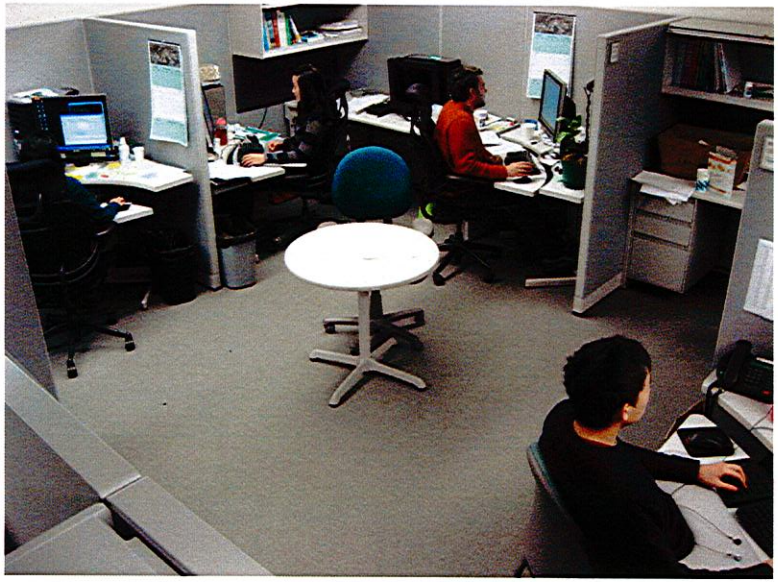




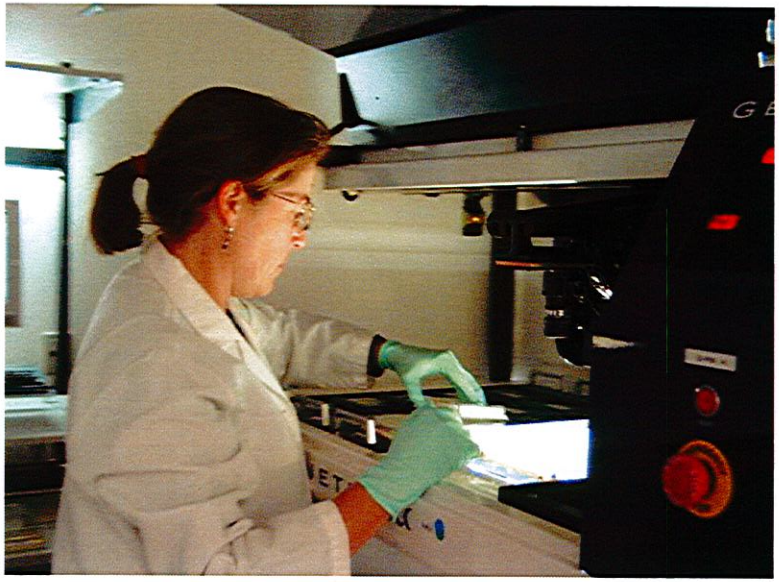
Bioenergy at DOE JGI



Office & Manufacturing Work Environments



60% staff in computer-intensive office settings



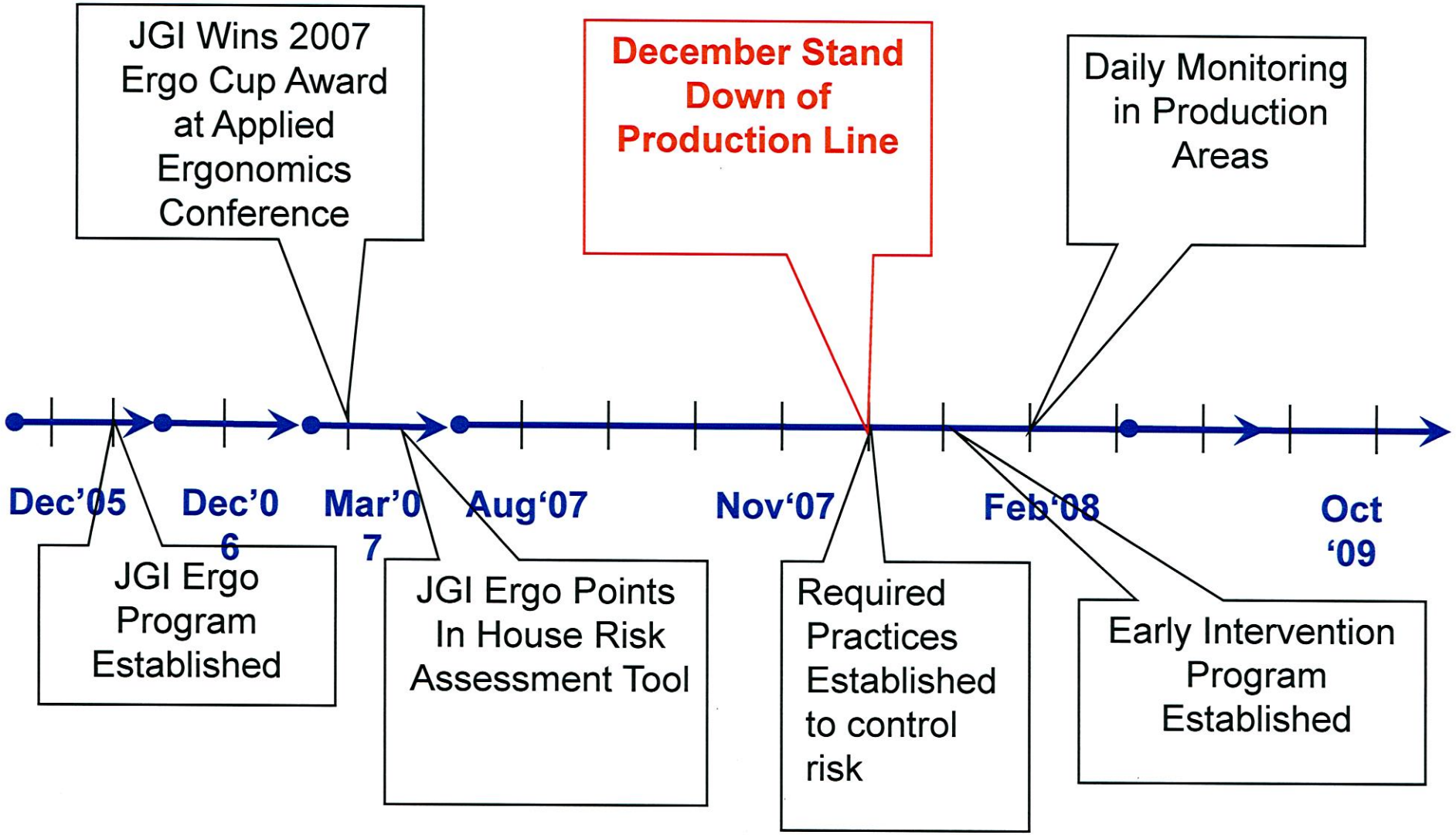
40% staff in hand-intensive production tasks (2 shifts)

Root Causes of Ergonomic Injuries

- Equipment/instruments designed for small batches used for high throughput operation
- Culture:
  - Understanding Efficiency vs. Speed
- High force hand-intensive tasks

We are striving to determine how much is too much

History of Ergonomics at JGI
(Dec 2005-Current)



Engineering designs and solutions

Early intervention

Targets employees with discomfort
Includes bi-weekly review meeting

Safety Culture Working Group

Promotion
Awareness
Communication

Proactive Efforts

Labs and offices
Monitoring
Walk-abouts
Comfort surveys

Training/education

Risk targeted classes
Stretch break programs
Potty training
Website resources

Relaxation/Rejuvenation Room

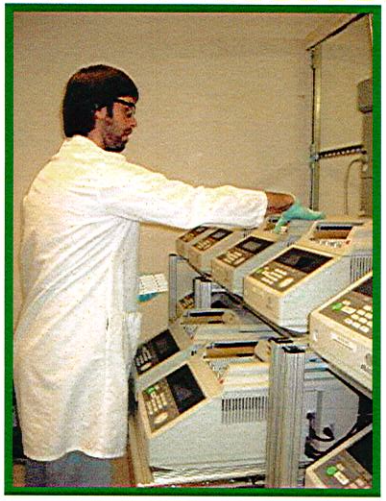
Ergonomics Demo Room

Work tool and practices

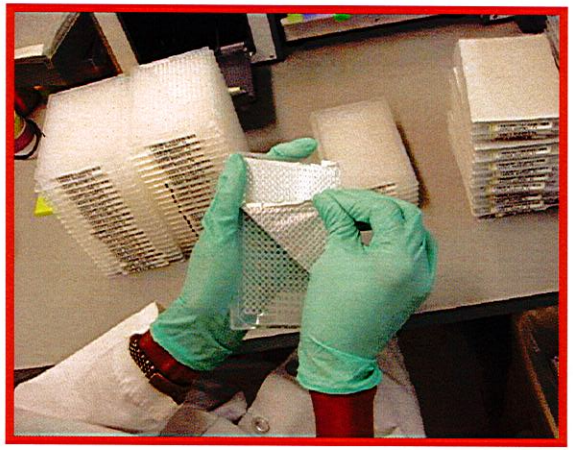
Ergo Points
Required Practices

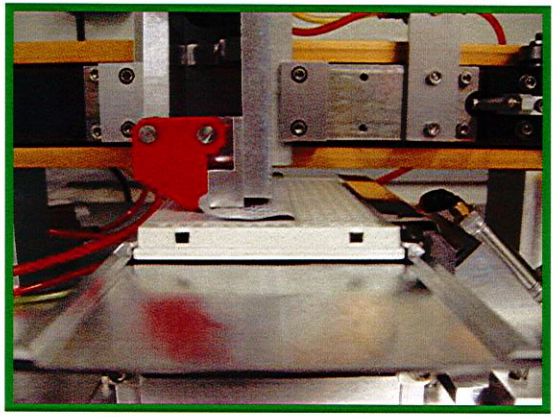
Top 3 High Risk Factor Tasks (Pre-2007)

Thermal Cycler Loading



Peeling Seals

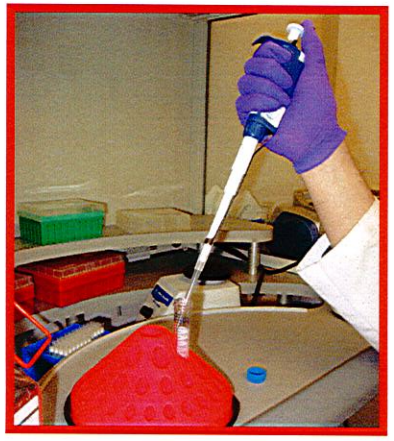




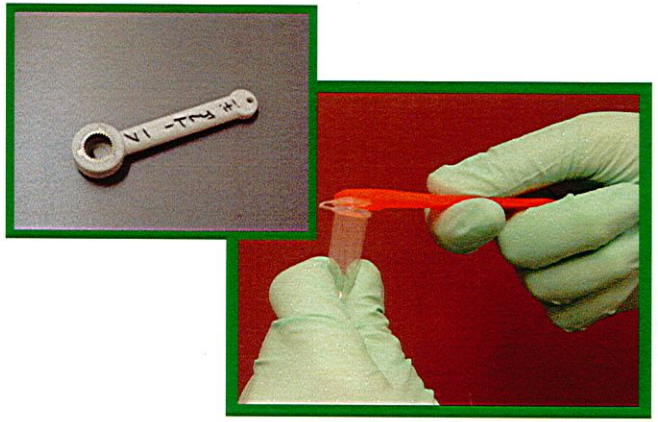
Freezer Rack Lifting

Top 3 High Risk Factor Tasks (Now-2009)

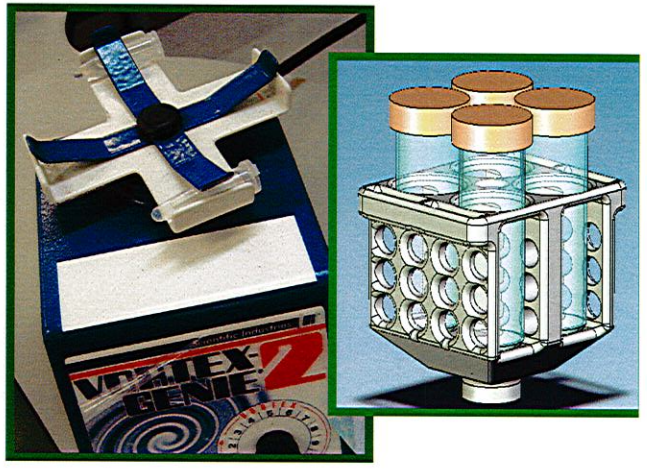
Pipetting



Capping/uncapping

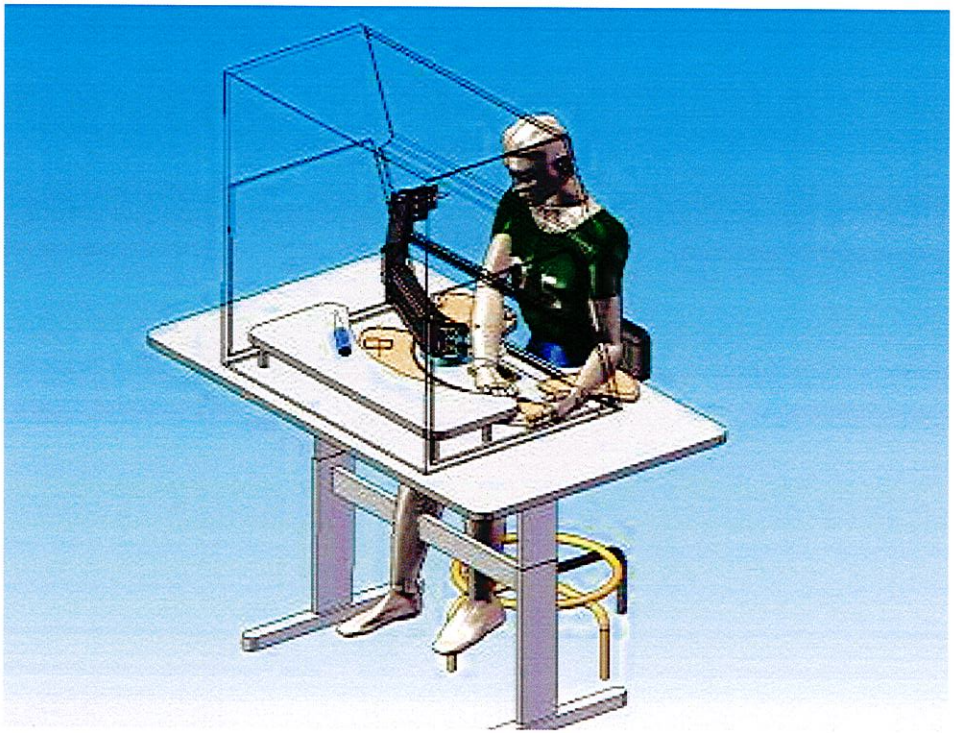


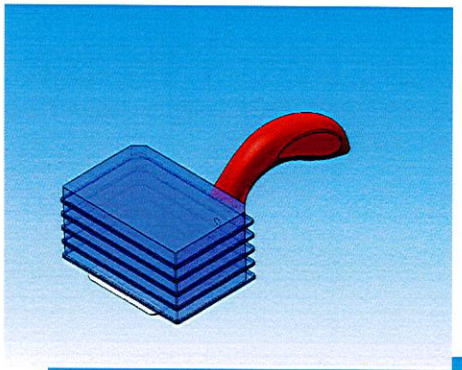
Vortexing

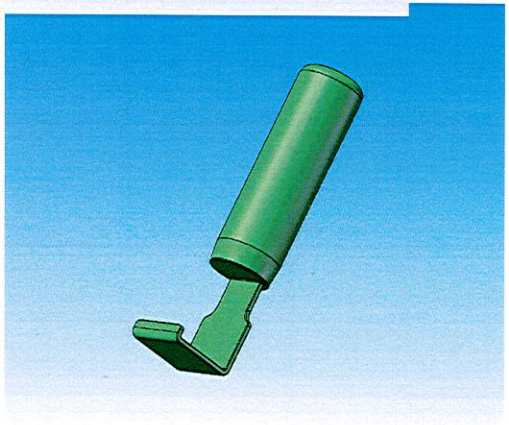


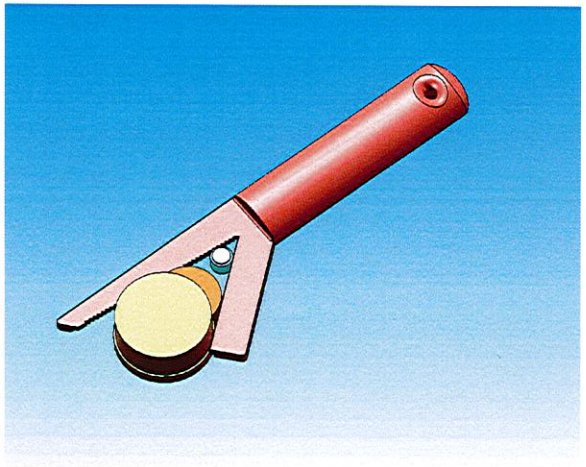
Tour of Ergo Projects

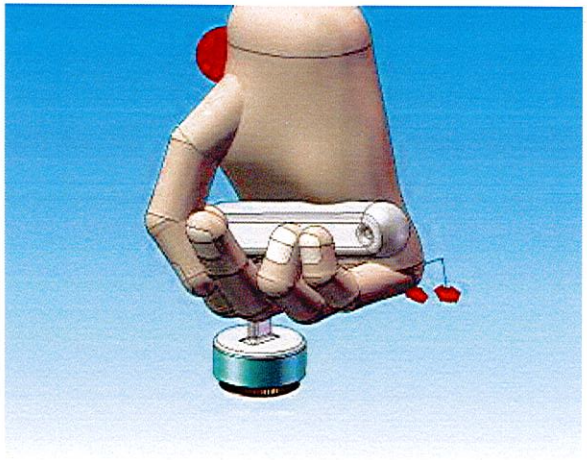
Employee Driven Designs

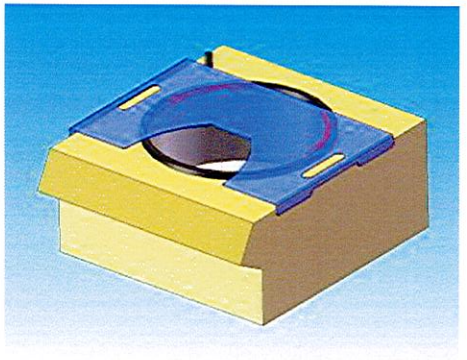




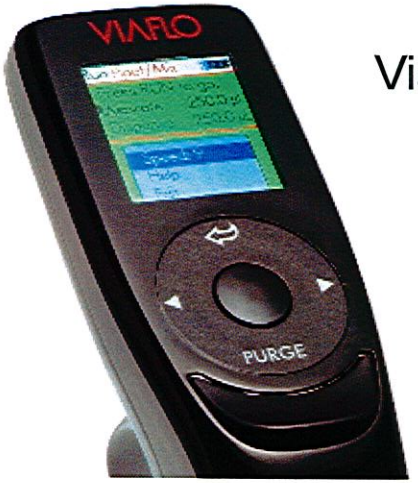








454 & Illumina Pipetting



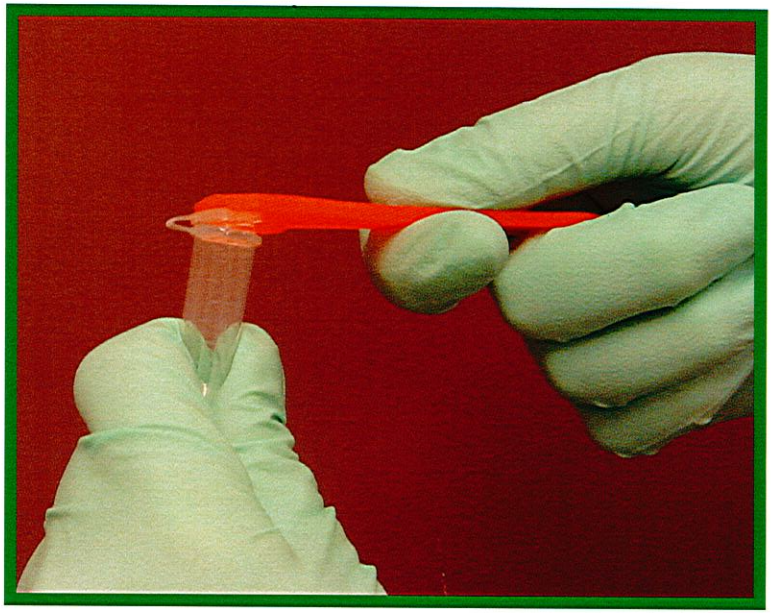
Viaflo

Vistalab Ovation

Eppendorf Xstream

Best Practices

Don't use thumbs to open tubes.



Use uncapping tool to open ALL tubes, .2mL, 1.5mL, 2.0mL

Ergo Points

- Supervisors want to know….

  "HOW MUCH IS TOO MUCH?"

- Guidelines for schedulers
  - What tasks can be scheduled together
  - How many tasks can be conducted in one day
- No ergonomics risk tool exists for low force high repetition ***mixed*** tasks

GOAL: Reduce ergonomic risk caused by the combination of tasks assigned