The Power of Teamwork:  
JGI Ergonomics Program

Christine Naca, Ira Janowitz, Stephen Franaszek, Ray Turner, Susan Lucas  
…and the JGI Ergo Working Group
Overview

• Description of the JGI

• Review of Production Tasks

• JGI Ergonomics Program

• Ergo Methodology
• 250 Staff: 30% LLNL and 70% LBNL

• Mix of research and manufacturing work

• Integrated Safety Management (ISM)

• Stephen Franaszek (LBNL)
Office & Manufacturing Work Environments

60% staff in computer-intensive office settings

40% staff in hand-intensive production tasks (2 shifts)
- 40% of the staff make up the manufacturing work environment
- High throughput laboratory manufacturing
- Hand-intensive repetitive tasks
- 32 people, 2 shifts/day
Root Causes of Ergonomic Injuries

- Equipment/instruments designed for small batches/small lab use now being used for high throughput operation

- Culture:
  - Understanding Efficiency vs. Speed

- High force finger-intensive tasks
History of Ergonomics at JGI
(May 2005-Current)

May’05
- Ergo Eval of PGF by LLNL

Oct’05
- 1st Safety Committee Meeting

Jan’06
- Production Ergonomics Lead
- Ergonomics Program for JGI

Apr’06
- Ergo Risk Assessment Training by EORM
- Ergo Risk Assessment Team
- EWG production reps
- Onsite Ergonomist
- Ergo Mail

Jul’06
- Ergo for Computer Users
- Ergonomics in Pre-Production Training

Oct’06
- Stretch Program
- 1st Phase Qualification Cards
- Work Smart Lift Training
- Ergo for Computer Users
- Mat’l Handling for Instrumentation Group

Ergo Posters by Production, R&D Groups

Lab Ergo Training
- Stretch Training
- Potty Training Posters
Managing Ergonomics Team Effort

- JGI Ergo Program
  - Management
  - LBNL EH&S
  - EWG
  - JGI Safety
  - Ops/Facilities
  - Instrumentation
  - Informatics
Engaging the Staff

Ergonomics Working Group
## Current Ergo Project Status

### # Ergo Projects by Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Category</th>
<th>Closed</th>
<th>In Progress</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td></td>
<td>48</td>
<td>8</td>
<td>56</td>
</tr>
<tr>
<td>Engineering</td>
<td>Custom</td>
<td>40</td>
<td>17</td>
<td>55</td>
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<tr>
<td></td>
<td>Off the Shelf</td>
<td>51</td>
<td>16</td>
<td>65</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>139</td>
<td>41</td>
<td>180</td>
</tr>
</tbody>
</table>
Shake ‘N Plate

Administrative:
• Leg Room for seated option

Off the Shelf:
• Lighter plates
• Anti-fatigue Mat

Engineering (custom):
• Fixture to hold the plates

Increased Productivity:
• 25% ↑ throughput
Ergo Cup 2007 Winners
“Team Driven Workplace Solutions”
Top 3 High Risk Factor Tasks

**Thermal Cycler Loading**

**Peeling Seals**

**Freezer Rack Lifting**
Thermal Cycler Loading

- 84 Autolid Thermal Cyclers
- Pneumatic Pull-out Shelves & adjusted height.
- Networked the instruments

Before

After
Peeling Seals

- Plate Fixture to hold plates down freeing up both hands to peel
- Ergo Pliers to eliminate the pinch grip while peeling
- Continual Flow eliminates 90% of foil seal peeling
- LBNL custom automated peeler

Before

After
Freezer Rack Lifting

Administrative Changes:
- Eliminate use of top shelves (onsite)
- Continual Flow reduced frequency of racking

Before

After

Height adjustable push/pull cart
Production Wide Ergo Improvements

Height-Adjustable & Custom Designed Tables

Before

After
Advancing Science with DNA Sequence

Production Wide Ergo Improvements

Best Practices and Training

Before

After
Anti-Fatigue Mats

Before

After
The JGI Ergo Program
Why Are We Having Success?

- **Teamwork**
  - Employee-led Ergonomics Working Group
  - Management Commitment

- **Identify Solutions**
  - Quick Fix-Administrative Solutions
  - Long Term-Engineering Solutions

- **On-Site Ergo Support**
  - Rapid Response
  - Encourage Early Reporting

- **Communication/Education**
  - Group Meetings
  - Posters
  - Weekly Ergo Email
  - Custom Ergo Training Courses
Communication and Education

Warm Up Program

At JGI we are committed to taking positive actions in helping our employees prevent repetitive stress injuries. One of these actions is to ask each employee in the production line to take a five-minute break every hour. This break is intended to give the production team some time outside of their work areas to walk, relax, or do this approved program of ergonomic exercises.

Some of these exercises can be performed by our employees at any time during the day in their work areas, but this workplace ergonomic program, designed by Ronnie Ballarini, a physical therapist at LBNL, has been revised, ergonomically, and approved by Stephen Pranzak, JGI Safety Office. It is designed to meet our production employees’ specific ergonomic needs efficiently and safely.

Exercise can be done as a group or alone. Most are done slowly unless noted. All should be held only to a comfortable tension. Start with 3-5 seconds. They should not hurt. If you are under medical care check with your health care practitioner.

As time permits or if discomfort occurs, try some of the movements during the day.

JGI ERGO ROOM

Do you ever experience discomfort from using your mouse because it’s too small?

Does your keyboard cause you to bend your wrists into an uncomfortable position?

Did you know that there ARE options available?

The JGI now has an ergonomic demo room available to try out alternatives to your standard keyboard and mouse. We have set-up a computer that will enable you to experience a better workstation layout using a mouse and keyboard that fits your needs. The demo room is located in building 400, room 405. If you are interested in trying out any of the equipment, please contact Mike Lee in Safety (ext 5649) or via email at: mdlee@lbl.gov to schedule an appointment.

Stretch Posters

Potty Training
Work Pattern Issues

- Regular Breaks and Lunch
- Mix of hand-intensive activities
- Overtime practices
- Staffing issues

The production line has been reorganized by shift instead of by work areas. This will better handle staffing shortages and distribute ergonomic risk across different tasks.
Advancing Science with DNA Sequence

Intel Technology Engagement Model

Move ergo upstream by early engagement with suppliers, contractors, in-house planners

Low to High Volume Increases Ergonomics Problems

Need to consider duration, repetitiveness + mix of tasks
Ergo Evaluation Techniques

Semiquantitative Assessment Methods

Quantitative Assessment Methods

Moore-Garg Strain Index

• Estimates the risk of injury to the distal upper extremity (elbow and below)
• Integrates risk factors: force, repetition, posture, recovery time, and duration of the day
# Moore-Garg Strain Index

**Job / Task:** RCA; Peeling, Foil Seals  
**Date:** 7/27/2008  
**Analyst:** Christine Naca, Iris Janowicz  

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rating Criterion</th>
<th>Observation</th>
<th>Variable Multiplier</th>
<th>Enter Multiplier</th>
<th>%Max, MVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity of Exertion (Borg Scale)</td>
<td>Light</td>
<td>Light: Barely noticeable or relaxed effort (BS 0-2)</td>
<td>1</td>
<td>6</td>
<td>&lt;25%</td>
</tr>
<tr>
<td></td>
<td>Somewhat Hard</td>
<td>Somewhat Hard; Noticeable or definite effort (BS 3)</td>
<td>3</td>
<td>25-35%</td>
<td></td>
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<tr>
<td></td>
<td>Hard</td>
<td>Hard: Obvious effort, Unchanged facial expression (BS 4-6)</td>
<td>6</td>
<td>35-65%</td>
<td></td>
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<tr>
<td></td>
<td>Very Hard</td>
<td>Very Hard: Substantial effort, Changes expression (BS 6-7)</td>
<td>9</td>
<td>55-75%</td>
<td></td>
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<tr>
<td></td>
<td>Near Maximal</td>
<td>Near Maximal: Uses shoulder or trunk for force (BS 8-10)</td>
<td>13</td>
<td>75%</td>
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<tr>
<td>Duration of Exertion (% of Cycle)</td>
<td>&gt; 10%</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-25%</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>30-45%</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 60%</td>
<td>3.0</td>
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<tr>
<td>Efforts Per Minute</td>
<td>&lt; 4</td>
<td>0.5</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>4-8</td>
<td>1.0</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>9-14</td>
<td>1.5</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>15-19</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 20</td>
<td>3.0</td>
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<tr>
<td>Hand/Wrist Posture</td>
<td>Very Good</td>
<td>Perfectly Neutral</td>
<td>1.0</td>
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<tr>
<td></td>
<td>Good</td>
<td>Near Neutral</td>
<td>1.0</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Fair</td>
<td>Non-Neutral</td>
<td>1.5</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Bad</td>
<td>Marked Deviation</td>
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<tr>
<td></td>
<td>Very Bad</td>
<td>Near Extreme</td>
<td>3.0</td>
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<tr>
<td>Speed of Work</td>
<td>Very Slow</td>
<td>Extremely relaxed pace</td>
<td>1.0</td>
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<tr>
<td></td>
<td>Slow</td>
<td>Taking one’s own time</td>
<td>1.0</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Fair</td>
<td>Normal speed of motion</td>
<td>1.0</td>
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<tr>
<td></td>
<td>Fast</td>
<td>Rushed, but able to keep up</td>
<td>1.5</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Very Fast</td>
<td>Rushed and barely able to keep up</td>
<td>2.0</td>
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<tr>
<td>Duration of Task Per Day (hours)</td>
<td>&lt;1</td>
<td>0.25</td>
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<tr>
<td></td>
<td>1-2</td>
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<td>2-4</td>
<td>0.75</td>
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<td>4-8</td>
<td>1.00</td>
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</tr>
<tr>
<td></td>
<td>&gt; 6</td>
<td>1.50</td>
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</table>

**SI Score:** 10.1  
**Interpretation:**  
* 3: Safe  
* 3-5: Uncertain  
* 5-7: Some Risk  
* > 7: Hazardous  

**Product of all multipliers:**  

**Note:** This worksheet was adapted and interpreted by the USF investigators. No warranty is offered.

**Reference:** J. Steven Moore & Anne Garg  
Partial support from UAW-Ford NCRHS  
Ford Motor Company  
US Air Force  

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For updates, see Stone Wheels at www.hsc.usf.edu/~bernard
How much is too much?
• Complex, heterogeneous mix of tasks → difficult to track and control ergo risk exposure

• Supervisors need guidelines for assigning workload within safe parameters
In Summary

- Collaborative Effort
- Continuous Improvement
- Proactive and Participatory Ergonomics Program

Results:
- Improved Employee Morale
- Decreased Recordable Injuries