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)

Walnut Creek, CA
60% staff in computer-intensive office settings

40% staff in hand-intensive production tasks (2 shifts)
Advancing Science with DNA Sequence

Manufacturing Work Environment

- 40% of the staff make up the manufacturing work environment
- High throughput laboratory manufacturing
- Hand-intensive repetitive tasks
- 32 people, 2 shifts/day
Production Short Film
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: Ergo Risk Assessment Training by EORM
- Apr'06: Ergo Risk Assessment Team
- Jul'06: EWG production reps
- Oct'06: Onsite Ergonomist
- Ergo Mail
- Ergo for Computer Users
- Ergonomics in Pre-Production Training
- Stretch Program
- 1st Phase Qualification Cards

- Production Ergonomics Lead
- Ergonomics Program for JGI
- Ergo Posters by Production, R&D Groups
- Lab Ergo Training
- Stretch Training
- Potty Training Posters
- Work Smart Lift Training
- Ergo for Computer Users
- Mat'l Handling for Instrumentation Group
Managing Ergonomics
Team Effort

JGI Ergo Program

- LBNL EH&S
- EWG
- JGI Safety
- Instrumentation
- Informatics
- Ops/Facilities
- Management
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>
</tr>
<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
Freezer Rack Lifting

Before

After

Height adjustable push/pull cart

Administrative Changes:
• Eliminate use of top shelves (onsite)
• Continual Flow reduced frequency of racking
Production Wide Ergo Improvements

Height-Adjustable & Custom Designed Tables

Before

After
Production Wide Ergo Improvements

Best Practices and Training

Before

After
Production Wide Ergo Improvements

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
Advancing Science with DNA Sequence

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 those 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 nationwide ergonomic program, designed by Nicole Galan, a physical therapist at UJMI, and approved by JGI safety officials, is intended to meet our production employees’ specific ergonomic needs efficiently and safely.

Exercises 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 3-6 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 ERGONOMIC 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

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

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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.
Intel Technology Engagement Model

Low to High Volume Increases Ergonomics Problems

Need to consider duration, repetitiveness + mix of tasks

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

Injuries & Costly retrofits
Plate Loading
### Ergo Evaluation Techniques

<table>
<thead>
<tr>
<th>Semiquantitative Assessment Methods</th>
<th>Quantitative Assessment Methods</th>
</tr>
</thead>
</table>

**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:** 7/27/2006  
**Analyst:** Christine Naka, Ira Janowitz

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rating Criteria</th>
<th>Observation</th>
<th>SI Score</th>
<th>Interpretation</th>
<th>Enter Multiplier</th>
<th>% Max, MVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity of Exertion</td>
<td>Light</td>
<td>Barely noticeable or relaxed effort (BS: 0-2)</td>
<td>1</td>
<td>Safe</td>
<td>1</td>
<td>&lt;25%</td>
</tr>
<tr>
<td></td>
<td>Somewhat Hard</td>
<td>Noticeable or definite effort (BS: 3)</td>
<td>3</td>
<td>Safe</td>
<td>3</td>
<td>25-35%</td>
</tr>
<tr>
<td></td>
<td>Hard</td>
<td>Obvious effort, Unchanged facial expression (BS: 4-5)</td>
<td>6</td>
<td>Safe</td>
<td>6</td>
<td>35-65%</td>
</tr>
<tr>
<td></td>
<td>Very Hard</td>
<td>Substantial effort, Changes expression (BS: 6-7)</td>
<td>9</td>
<td>Safe</td>
<td>9</td>
<td>65-75%</td>
</tr>
<tr>
<td></td>
<td>Near Maximal</td>
<td>Uses shoulder or trunk force (BS: 8-10)</td>
<td>13</td>
<td>Safe</td>
<td>13</td>
<td>&gt;75%</td>
</tr>
<tr>
<td>Duration of Exertion (%)</td>
<td>&lt; 10%</td>
<td></td>
<td>0.5</td>
<td>Safe</td>
<td>0.5</td>
<td>&lt;25%</td>
</tr>
<tr>
<td></td>
<td>10-25%</td>
<td></td>
<td>1.0</td>
<td>Safe</td>
<td>1.0</td>
<td>25-35%</td>
</tr>
<tr>
<td></td>
<td>30-45%</td>
<td></td>
<td>1.5</td>
<td>Safe</td>
<td>1.5</td>
<td>35-65%</td>
</tr>
<tr>
<td></td>
<td>&gt; 60%</td>
<td></td>
<td>2.0</td>
<td>Safe</td>
<td>2.0</td>
<td>&gt;65%</td>
</tr>
<tr>
<td>Efforts Per Minute</td>
<td>&lt; 4</td>
<td></td>
<td>0.5</td>
<td>Safe</td>
<td>0.5</td>
<td>&lt;25%</td>
</tr>
<tr>
<td></td>
<td>4 - 8</td>
<td></td>
<td>1.0</td>
<td>Safe</td>
<td>1.0</td>
<td>25-35%</td>
</tr>
<tr>
<td></td>
<td>9 - 14</td>
<td></td>
<td>1.5</td>
<td>Safe</td>
<td>1.5</td>
<td>35-65%</td>
</tr>
<tr>
<td></td>
<td>15 - 19</td>
<td></td>
<td>2.0</td>
<td>Safe</td>
<td>2.0</td>
<td>&gt;65%</td>
</tr>
<tr>
<td></td>
<td>&gt; 20</td>
<td></td>
<td>3.0</td>
<td>Safe</td>
<td>3.0</td>
<td>&gt;75%</td>
</tr>
<tr>
<td>Hand/Wrist Posture</td>
<td>Very Good</td>
<td>Perfectly Neutral</td>
<td>1.0</td>
<td>Safe</td>
<td>1.0</td>
<td>&lt;25%</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>Near Neutral</td>
<td>1.0</td>
<td>Safe</td>
<td>1.0</td>
<td>25-35%</td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>Non-Neutral</td>
<td>1.5</td>
<td>Safe</td>
<td>1.5</td>
<td>35-65%</td>
</tr>
<tr>
<td></td>
<td>Bad</td>
<td>Marked Deviation</td>
<td>2.0</td>
<td>Safe</td>
<td>2.0</td>
<td>&gt;65%</td>
</tr>
<tr>
<td></td>
<td>Very Bad</td>
<td>Near Extreme</td>
<td>3.0</td>
<td>Safe</td>
<td>3.0</td>
<td>&gt;75%</td>
</tr>
<tr>
<td>Speed of Work</td>
<td>Very Slow</td>
<td>Extremely relaxed pace</td>
<td>1.0</td>
<td>Safe</td>
<td>1.0</td>
<td>&lt;25%</td>
</tr>
<tr>
<td></td>
<td>Slow</td>
<td>Taking one’s own time</td>
<td>1.0</td>
<td>Safe</td>
<td>1.0</td>
<td>25-35%</td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>Normal speed of motion</td>
<td>1.5</td>
<td>Safe</td>
<td>1.5</td>
<td>35-65%</td>
</tr>
<tr>
<td></td>
<td>Fast</td>
<td>Rushed, but able to keep up</td>
<td>2.0</td>
<td>Safe</td>
<td>2.0</td>
<td>&gt;65%</td>
</tr>
<tr>
<td></td>
<td>Very Fast</td>
<td>Rushed and barely able to keep up</td>
<td></td>
<td>Safe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of Task Per Day</td>
<td>&lt; 1</td>
<td></td>
<td>0.25</td>
<td>Safe</td>
<td>0.25</td>
<td>&lt;25%</td>
</tr>
<tr>
<td></td>
<td>1 - 2</td>
<td></td>
<td>0.50</td>
<td>Safe</td>
<td>0.50</td>
<td>25-35%</td>
</tr>
<tr>
<td></td>
<td>2 - 4</td>
<td></td>
<td>0.75</td>
<td>Safe</td>
<td>0.75</td>
<td>35-65%</td>
</tr>
<tr>
<td></td>
<td>4 - 8</td>
<td></td>
<td>1.00</td>
<td>Safe</td>
<td>1.00</td>
<td>&gt;65%</td>
</tr>
<tr>
<td></td>
<td>&gt; 8</td>
<td></td>
<td>1.50</td>
<td>Safe</td>
<td>1.50</td>
<td>&gt;75%</td>
</tr>
</tbody>
</table>

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

Reference: J. Steven Moore & Ann Garg, Thomas E. Bernard and Robert D. Walton  
Partial support from UAW-Ford NJCHS  
Ford Motor Company  
US Air Force

For updates, see Stone Wheels at www.hsc.usf.edu/~bernard

Website: www.hsc.usf.edu/~bernard

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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