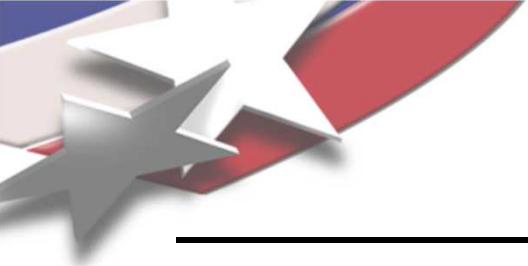


Agency Update

Sandia National Laboratories New Mexico

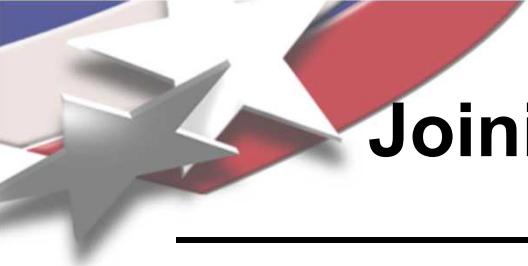
**IMOG/JOWOG Joining Subgroup Meeting
Los Alamos National Laboratory
March 6-7, 2007**

**Jerry Knorovsky
Joining & Coating Department
Sandia National Laboratories, Albuquerque, NM**



Joining at SNL/NM

- **Materials Science and Engineering (1800)**
 - 1813 Joining & Coating Dept (mgr: Mike Hosking)
 - 1824 Microsystem Materials (mgr: Jon Custer)
- **Manufacturing Science and Technology Center (2400)**
 - 2430 Manufacturing Enterprise (includes "the Weld Shop", Fred Hooper, Jo Bridge)
 - 2450 Manufacturing Process Science and Technology
- **Other Centers**
 - Microsystems Science, Technology & Components (1700)
 - Responsive Neutron Generator Product Deployment (2700)
 - Gary Pressly, Dan Garcia, Dan Appel, Pierrette Gorman
 - Energetic Components Realization (2500)
 - Includes battery (Lou Malizia), explosive components groups
 - Remote facilities tend to have "maintenance" welders



Joining/Coating Personnel Changes

- **Matt Perricone is leaving at end of month**
- **Doug Hinkley, recently back from Pentagon tour, is leaving this month**
- **Don Susan joined 1813 (from Matl's Reliability Dept) and was recently appointed to the board of directors of the International Metallographic Society (IMS) for a four-year term beginning August 2007**
- **John Cates left TSRL**



Joining & Coating 1813, Mike Hosking, Mgr. Microsystems Materials 1824, Jon Custer, Mgr.

Welding staff members:

Charlie Robino*

Jerry Knorovsky

**Matt Perricone (new chair of ASM
Emerging Professionals Comm.)**

Doug Hinkley (LTE)

Jerome Norris (LTE)

Brazing/Soldering staff members:

Paul Vianco (1824)

Don Susan (1813)

Brad Boyce (1824)

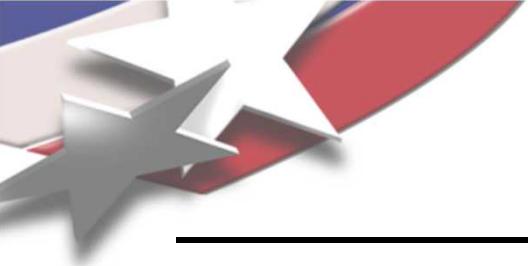
Technologists:

**Danny MacCallum (rec'd AWS
District Meritorious Award)**

Mark Reece

Peter Duran

**Jerry Rejent (1824)
Mark Grazier (1824)**



Joining & Coating Dept.

Coating staff members:

Aaron Hall

Dave Melgaard

Rod Williamson

Deidre Hirschfeld (faculty sabbatical)

Technologists:

James McCloskey

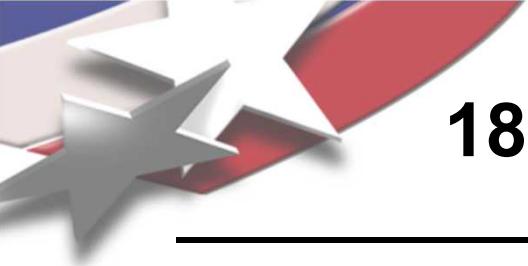
Greg Poulter

David Urrea

David Beatty (contractor)

Andrew Mayer (contractor)

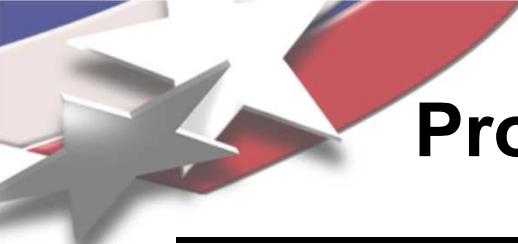
Tim Roemer (contractor)



1813 Equipment Acquisitions:

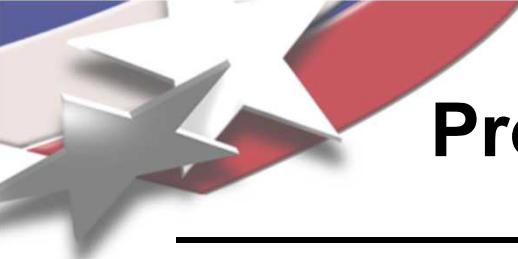
Put into service recently:

- SPI 40 watt fiber laser added to Potomac Photonics MicroPackaging System
- Scrounged a Wild binocular microscope
- That's all folks! (Not a good year for capital equipment requests)



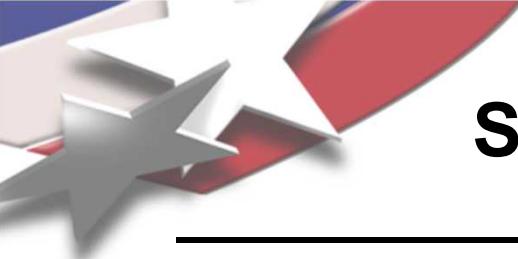
Programs: Welding/Matls Research

- **C6 (Validation & Verification of ASC codes) Studies**
 - Completed FY06 ST&E Level 2 milestone to develop predictive capabilities/process characterization tools for HED weld applications
 - Laser welding model validation (JN, CVR, MP)
 - Dynamic Response of solder (MP, BB)
- **C2 (Research Foundations) Study:**
 - Laser Welding characterisation (CVR, JN, MP, going, going,.....)
 - LW microstructural development & microplastic ratcheting (MP)
- **DOE Environmental Management**
 - Ni-Cr-Mo-Gd Alloy developed for DOE-owned spent fuel disposal. Primary activities this year are:
 - Commercialization: development of refractory materials for melting
 - Weldability studies (mostly with Lehigh), weld procedure development (mostly at INL), and weldment PWHT and properties (mostly at SNL)
 - Development of optimized annealing procedures.
- **LDRD**
 - Armor development (GAK, J. Glass 1825, others)
- **Geothermal**
 - High Temperature Down hole hammer drill materials and fabrication (CVR, BB)



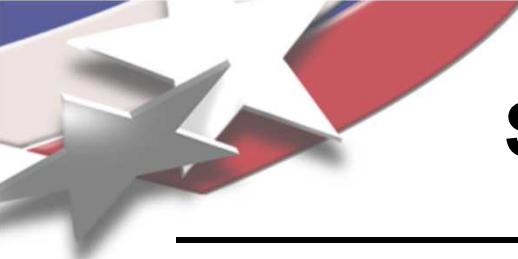
Programs: Welding Manufacturing

- PDP
 - Porosity formation in laser welds, (JN, AR) also C6
 - Gap bridging of laser welds (JN, AR, GAK, completed)
 - Laser-based Ultrasonic NDE technique for welds, brazes, g-to-m seals (GAK)
 - Welding AI components in the ELNG (JN, MP)
 - Modeling of NT girth and header welds (GP, JN, MN)
- W76-1 LEP welding support (all)
 - Support of PPI and QE lots for stronglinks/firing set/AF&F
 - Materials (Hiperco, PH stainless,)
 - Misc. Design and QA issues
 - Specification writing
 - Modeling ISL, TSL headers (SD, JN, MN)
 - Evaluating glass-to-metal header substitute for ceramic-to-metal ISL header (JN, JB, SM, DS)



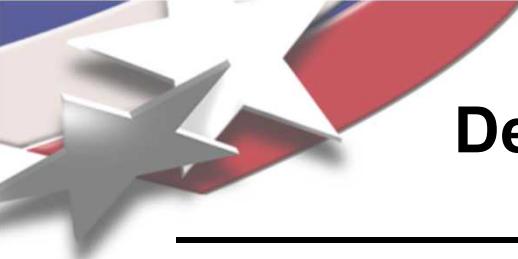
Soldering/Brazing Programs

- Effect of Au contamination on aging of solder microstructures and mechanical properties (DS C2 Research Foundation support)
- Ceramic/metal brazing US NDE evaluation (DS, PDP)
- Investigation of composition and pre-oxidation behavior on adhesion of glass-to-austenitic alloy seals (other than 304L). C2 RF, LAC and KCP-origin ADAPT funds. (DS, JvdA, SM)
- Enhanced Surveillance Campaign (PV):
 - Thermal-mechanical fatigue (TMF) modeling of Sn-Pb
 - Development of Sn whisker model
- DOD/DoE/MOU (PV)
 - TMF of Sn-Ag-Cu (Pb-free) solder joints
 - Determination of intermetallic compound growth of Sn-Ag-Cu/Pd
 - Contract with American Competitiveness Institute to build package-on-pack test vehicles for reliability analysis
- LDRD (PV)
 - Development of contact films for MEMS devices
- W-76-1 LEP (PV)
 - Characterization of immersion Ag as a circuit board finish



Soldering Programs II (PV)

- **Slapper detonators**
 - Evaluate candidate thin film structures for soldering and In bump bonding
- **BDYE (GPS IIF)**
 - Evaluate flip-chip solder bump interconnections to LTCC substrates
- **Lockheed Martin - Defense Technology Opportunities**
 - Validation experiments for computational models constructed to predict TMF damage in Sn-Pb and Sn-Ag-Cu solder joints.



Dept. 2431-2 ("Weld Shop") Update

- **Special Component (FH)**
 - Have developed and qualified Laser weld schedules for the Special Component. This is LANL-designed, SNL Dept 2523 Power Sources Production-produced unit.
 - Has completed PPI and are currently in the QE build.
- **AFT Satellite Program (FH)**
 - E-beam welded titanium feed-thru connectors have successfully met program requirements and have produced flight assemblies.
- **Polaris Target Missile (FH)**
 - Working with Tom Hund Dept. 2522 Power Sources Comp. Dev. assembling the main missile batteries. We have developed a process to mechanically crimp and laser weld the connections.
- **Other customers**
 - Jo Bridge has been supporting NG projects and a tooling project from Pantex, he also serves most of the walk-in costumers.
- **Equipment**
 - No new equipment but have been able to maintain capabilities; i.e.: E-Beam, Laser, Laser marking, Vacuum Leak checking