A Career At A National Laboratory

August L. Keksis

July 15, 2015
TAMU REU Career Day

UNCLASSIFIED
Overview

- Undergrad
- Grad
- Post-Doc
- Staff
- University vs National Laboratory Environments

Overarching Themes
- Networking (Co-workers, Meetings, Seminars …)
- Documentation (CV, Reports, Presentations …)
Undergraduate Education

- 1995 – Entered as a Biology Major (Dr. English) & Chemistry Minor
- 1996 – Became a Dual Major
  - Biology
  - Chemistry (Certified by the ACS) – (Dr. Hartzell)
- 1998 – Added a Minor in Physics (Dr. Delinger)
- Undergraduate Research (Dr. Ketterer)
  - *Variations in the Isotopic Composition of Hafnium in Contaminated River Sediment*
  - ICP-MS
  - Funded through the Hopper Undergraduate Award Program
Graduate School

- University of California, Berkeley
- Texas A&M University
- Washington University, St. Louis
- Oregon State University
- University of Kentucky
- Clark University, Mass.

- Accepted to 4 / Tours / Decision
Texas A&M Cyclotron Institute
(2000 – 2007)
Sara, Sarah, Sherry, AJ, Gus, George, Mike, Cass, Brian, Beth, Dinesh
FAUST: The Forward Array Using Silicon Technology

What is a forward array?
A forward array is a group of detectors that cover the forward (i.e., front of target) angles. In the silicon array, the silicon array would cover the near field of target angles. A forward array would cover the far field of target angles.

Why use a forward array?
Why would you use a forward array? Instead of a forward array? There are three main reasons:

1. Physics
   The nature of the reaction being studied dictates what apparatus would be best for the job. Forward arrays are used for looking at the hydrogenic projectiles (projectiles that have been stripped of electrons, producing protons or deuterons). The higher energy allows for increased resolution of the reaction. A forward array would resolve these interactions, whereas a forward array would not resolve them.

2. Practical
   Forward arrays are better for higher-energy collisions, whereas forward arrays are better for lower-energy collisions. In collisions with lower-energy collisions, the type of array depends on what you want to study.

3. Cost
   Forward arrays are cheaper than a forward array, and it is very difficult to design a forward array that has a very high angular acceptance.

How is FAUST constructed?
FAUST is a forward array that is composed of 16 detector telescopes based in 5 arms (Figure 6). FAUST has a full-length coverage of 90% from 1° to 10° and 70% from 1° to 10°. It is comprised of 14 telescopes, each of which is a 5° x 5° silicon telescope. The average angular acceptance of FAUST is 5°. The detector telescopes are located at 5° intervals.

A Dissertation
by
AUGUST LAWRENCE KEKIS

Submitted to the Office of Graduate Studies of Texas A&M University in partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY

Approved by:
Chair of Committee, Sherry J. Yonnello
Committee Members, Che-Ming Ko, Rand L. Watson, Joseph B. Natowitz
Head of Department, David H. Russell

May 2007

Major Subject: Chemistry
Travel / Schools

- RIA Summer School
- Gordon Conferences
- ACS Conferences
- APS Conferences

- Career Fair
  - Los Alamos Table – Met with Staff Scientist
  - Interview / CV / Resume
  - Paul Passed around X-Division
  - Chuck (X-Division) and Dave (C-Division)
  - Paperwork / Training
Los Alamos National Laboratory

- National Security Mission
  - Developing capabilities to meet the needs of U.S. national security
- Covers 40 square miles
  - 268 Miles of Roads, over 2000 facilities, 8 million ft² of buildings
- 10,199 Employees (FY14)
  - 953 Students, 365 Postdocs
- $2.1 Billion annual budget (FY14)
- Replacement Value: $9.8 Billion
- Owned by DOE NNSA
- Managed by Los Alamos National Security, LLC
  - University of California, Bechtel, Babcock & Wilcox Technical Services and URS Energy and Construction
LANL Media

Webpage: http://www.lanl.gov/

https://www.facebook.com/LosAlamosNationalLab

https://twitter.com/LosAlamosNatLab

http://www.linkedin.com/company/5327?trk=NUS_CMPY_FOL-co

http://www.flickr.com/photos/losalamosnatlab/


http://www.youtube.com/user/LosAlamosNationalLab
Fission Product Data Measured at Los Alamos for Fission Spectrum and Thermal Neutrons on $^{239}$Pu, $^{235}$U, $^{238}$U

Los Alamos National Laboratory, Los Alamos, NM 87545, USA

(Received 30 June 30 2010; revised received 20 September 2010; accepted 1 October 2010)

We describe measurements of fission product data at Los Alamos that are important for determining the number of fissions that have occurred when neutrons are incident on plutonium and uranium isotopes. The fission-spectrum measurements were made using a fission chamber designed by the National Institute for Standards and Technology (NIST) in the BIG TEN critical assembly, as part of the Inter-laboratory Liquid Metal Fast Breeder Reactor (LMFBR) Reaction Rate (ILRR) collaboration. The thermal measurements were made at Los Alamos’ Omega West Reactor. A related set of measurements were made of fission-product ratios (so-called R-values) in neutron environments provided by a number of Los Alamos critical assemblies that range from having average energies causing fission of 400–600 keV (BIG TEN and the outer regions of the Flattop-25 assembly) to higher energies (1.4–1.9 MeV) in the Jezebel, and in the central regions of the Flattop-25 and Flattop-Pu, critical assemblies. From these data we determine ratios of fission product yields in different fuel and neutron environments ($Q$-values) and fission product yields in fission spectrum neutron environments for $^{99}$Mo, $^{95}$Zr, $^{137}$Cs, $^{140}$Ba, $^{141,143}$Ce, and $^{147}$Nd. Modest incident-energy dependence exists for the $^{147}$Nd fission product yield; this is discussed in the context of models for fission that include thermal and dynamical effects. The fission product data agree with measurements by Maek and other authors using mass-spectrometry methods, and with the ILRR collaboration results that used gamma spectroscopy for quantifying fission products. We note that the measurements also contradict earlier 1950s historical Los Alamos estimates by $\sim$5–7%, most likely owing to self-shielding corrections not made in the early thermal measurements. Our experimental results provide a confirmation of the England-Rider ENDF/B-VI evaluated fission-spectrum fission product yields that were carried over to the ENDF/B-VII.0 library, except for $^{96}$Mo where the present results are about 4%–relative higher for neutrons incident on $^{239}$Pu and $^{235}$U. Additionally, our results illustrate the importance of representing the incident energy dependence of fission product yields over the fast neutron energy range for high-accuracy work, for example the $^{147}$Nd from neutron reactions on plutonium. An upgrade to the ENDF library, for ENDF/B-VII.1, based on these and other data, is described in a companion paper to this work.
Postdoc Information

- ~365 Postdocs at LANL
- Salary start at $73k, based on years since PhD.
  - Comprehensive Benefits Package (Health, Vision, Dental, 401k plus matching, …)
- Temporary Position Usually 2-3 years
  - Find another job – Job Fairs
  - Go through Conversion Process to become a Staff Member
    - 25% of all Staff were formerly postdocs or students
    - 52% of new hires were formerly students/postdocs
~ Postdoc Composition

- Physics: 126 (35.3%)
- Earth Sciences: 1 (0.3%)
- Mathematics and Computer Science: 17 (4.8%)
- Materials Science: 32 (9.0%)
- Astronomy: 9 (2.5%)
- Biology, Bioscience, Chemistry: 21 (5.9%)
- Earth, Atmospheric, and Ocean Sciences: 16 (4.5%)
- Engineering: 60 (16.8%)
- Chemistry: 65 (18.2%)
- Bioscience, Bioscience, Chemistry: 6 (1.7%)
LAPA – Los Alamos Post Doc Association
Los Alamos National Laboratory
Staff Scientist (2009-Date)

- Historical Archiving
- Stockpile Stewardship
- Nuclear Forensics
- Nuclear Data Measurements
PROJECT SEDAN

DETONATED -------------- JULY 6, 1962
EXPLOSIVES ------------ THERMONUCLEAR, 70% FUSION, 30% FISSION
YIELD -------------- 104 KILOTONS
MEDIUM -------------- ALLUVIUM
DEPTH OF BURIAL -------------- 635 FT.
EMPLACEMENT HOLE DIAMETER --- 36"

CRATER STATISTICS

MAXIMUMDEPTH -------------- 320 FT.
MAXIMUM DIAMETER -------------- 1,280 FT.
VOLUME -- 6.6 MILLION CUBIC YARDS
WEIGHT OF MATERIAL LIFTED --- 12 MILLION TONS
MAXIMUM LIP HEIGHT -------------- 100 FT.
MINIMUM LIP HEIGHT -------------- 20 FT.
Hot Cells – Medical Isotopes

Rb-82 from the parent Sr-82
Countroom

- 7000 sq. ft.
- 24/7/365
- ~ 70,000 Measurements Annually
  - Medical Isotopes, Separation Chemistry, Pu
  - Bioassay, Environmental Monitoring,
    National Security Programs
- 50+ HPGe Detectors
  - 1 has been in continuous operation since 1978
- 15 Beta Counters
- 100 Alpha Counters
- 5 NaI(Tl) Detectors
- Low Backgrounds, Highly Calibrated
Travel

- London, UK
- Paris, France
- Washington DC
- Florida, Nevada, California, Tennessee, New Hampshire, Virginia, …
1,700+ Cultural Sites

Aerial View of Tsirege

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Manhattan Project Sites (MED National Park – In The Works)

V-Site (TA-16) – Trinity Assembly
Gun Site (TA-8) – Little Boy Assembly
Quonset Hut (TA-22) – Fat Man Assembly
Concrete Bowl (TA-6) – Plutonium Recovery
Slotin Building (TA-18) – Slotin Criticality Accident
Pond Cabin (TA-18) – Plutonium Research
Activities

- Bandelier National Monument
- Bradbury Museum
- Pajarito Ski Area
- World’s Highest Altitude Olympic Size Swimming Pool
- Running, Bicycling, Camping, Rafting, Outdoor Activities
- Santa Fe (State Capitol) ~ 50 Minutes
- Albuquerque ~ 90 Minutes
Differences between University & National Lab Environment

- Training – ½ Day every month, 2 Weeks initially
- Rules & Regulations
- Processes / Procedures
  - Publications / Presentations LAUR-15-24834
    • Reviewed / Process – 3 to 7 working days
  - Testing Detectors in a Vacuum Chamber
    • TAMU ~ 2 Weeks
    • LANL ~ 6 Months
      - IWD – Integrated Work Document
      - Purchasing / Counterfeit Check
      - Assembling the right people

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Handling Cf-252 Fixed Sources in RC-17 at TA-48

**IWD - PART 1 (Activity Specific Information)**

<table>
<thead>
<tr>
<th>IWD#: IWD-RC17-0007</th>
<th>Revision#: 0.0</th>
<th>Activity/Task Title: Handling Cf-252 Fixed Sources in RC-17 at TA-48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Document #: (work order #)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA: 48</td>
<td>Building: RC-17</td>
<td>Room: 100-A</td>
</tr>
</tbody>
</table>

### Work Tasks/Steps
Identify work steps/tasks in sequence when such sequencing contributes to safety, security, and/or environmental protection. These may be limited to basic steps if an independent Work Instruction Document is to be developed.

<table>
<thead>
<tr>
<th>Work Tasks/Steps</th>
<th>Hazards, Concerns, and Potential Accidents/Incidents</th>
<th>Controls, Preventive Measures, and Bounding Conditions</th>
<th>Reference Documents</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Tasks</td>
<td>Identify both activity and work-area hazards for each task/step.</td>
<td>Specify preventive measures, controls for each hazard (e.g., lockout/tagout points, specific PPE, TIDs, alams, safes, recycle, waste minimization)</td>
<td>List permits, operating manuals, security plans, and other reference procedures.</td>
<td>List training and qualification requirements.</td>
</tr>
<tr>
<td></td>
<td>TA-48 RC-17 emergencies</td>
<td>Personnel must be aware of the evacuation plan, lights and signals used in RC-17 and TA-48.</td>
<td>C-INC-POL-1001: Unattended Operations Posting Policy</td>
<td>TP 115 - Radiological Worker II</td>
</tr>
<tr>
<td></td>
<td>After hours and weekend work</td>
<td>Personnel must be aware of C-NR policies, especially after-hours and weekends.</td>
<td>C-NR-POL-1000 R2.0: Working Alone Policy</td>
<td>TP 4138 – Rad Sealed Source Custodian/User</td>
</tr>
<tr>
<td></td>
<td>Radiological contamination of personnel or equipment due to breach of source windows or leakage.</td>
<td>Installation and removal of Cf-252 sources are not allowed after hours or weekends, unless special permission has been given by the C-NR Group Leader.</td>
<td>PRO-C-DO-007.R3: Radioactive Material Inventory Control at RC-1</td>
<td>TP 5875: MCFO TA-48 RC-1 Complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The thin windows of the source are the protective barrier that keep the Cf-252 material contained. Care must be exercised to protect the windows during handling and mounting.</td>
<td>PRO-C-DO-008 R.5: TA-48 Radioactive Material Handling</td>
<td>TP 6113: RC-1 Radioactive Inventory Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C-INC-POL-1001: Unattended Operations Posting Policy</td>
<td>TP 6351: C-NR General Worker Lab Policies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C-NR-POL-1000 R2.0: Working Alone Policy</td>
<td>TP 6957: IWM Worker Training Requirements</td>
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</table>
Detector and Equipment Testing and Development in RC-17 at TA-48

**IWD – PART 1 (Activity Specific Information)**

<table>
<thead>
<tr>
<th>IWD#</th>
<th>JHA Validation #</th>
<th>N/A</th>
<th>Part I Development Participants:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IWD-RC17-0008</td>
<td>0.0</td>
<td>N/A</td>
<td>August Keksis, Dave Vieira, Todd Bredeweg, Bob Rundberg, Xinxin Zhou, Marian Jandel</td>
</tr>
</tbody>
</table>

**Activity/Task Title:** Detector and Equipment Testing and Development in RC-17 at TA-48

**TA:** 48  **Building:** RC-17  **Room:** 100-A  **Additional Location Description:** NA

**Activity Description/Overview**

This document describes work associated with detector and equipment testing and development in RC-17 at TA-48. Detectors and equipment will be built and tested in room 100-A. There is a vacuum chamber for detector testing, which requires rigging and engine hoist to lift the lid – this is handled in a separate IWD (IWD-RC17-0009). Low activity (<10µCi) beta and gamma sources (such as Ru-106, Co-60, Y-88, and Na-22) will be used along with low activity fixed alpha and fission sources (such as Th-228, Th-230, and Cf-252). The Cf-252 fission source is covered in a separate IWD (IWD-RC17-0007), due to its fragile window.

No classified work is involved.

This IWD took assorted tasks (based on the scope of this IWD) from the following IWDs:
- LANSCE-NS-26 – Flight Path 1FP14 (DANCE) Neutron Beam Experiments at LANSCE/Lujan Center
- LANSCE-NS-34 – Use of alpha, beta, gamma emitting samples at DANCE
- LANSCE-NS-39 – Testing and operation of the PPAC fission-tagging detector with actinide targets at DANCE

as well as certain tasks from the RC-1 Countroom IWDs, Xinxin Zhou’s IWDs and Marianne Wilterson’s IWDs.

**List Names of Hazard Analysis (HA) Team:** August Keksis, Todd Bredeweg, Dave Vieira, Xinxin Zhou and Bob Rundberg  **Date HA Performed:** April 20, 2008

**Work Tasks/Steps**

| Identify work steps/tasks in sequence when such sequencing contributes to safety, security, and/or environmental protection. |
| Hazards, Concerns, and Potential Accidents/Incidents Identify both activity and work-area hazards for each task/step. |
| Controls, Preventive Measures, and Bounding Conditions Specify preventive measures, controls for each hazard (e.g., lockout/tagout points, specific PPE, TIDs, alarms, safes, recycle, waste minimization). |
| All Tasks |
| Personnel must be aware of the evacuation plan, lights and signals used in RC-17 and TA-48. |
| Personnel must be aware of C-NR policies, especially after-hours and weekends. |
| Follow postings before entering the lab. |
| PPE: Must wear TLD and Safety Glasses with side-shields while in lab. |
| Reference Documents |
| List permits, operating manuals, security plans, and other reference procedures. |
| Training |
| List training and qualification requirements. |

**Reference Documents**

- C-INC-POL-1001: Unattended Operations Posting Policy
- C-NR-POL-1000 R2.0: Working Alone Policy
- HCP-C-INC-001: General Laboratory, Office and Field Operations

**Training**

- TP 115 Radiological Worker II
- TP 5875: MCF0 TA-48 RC-1 Complex
- TP 6351: C-NR General Worker Lab Policies
- TP 6957: IWM Worker Training Requirements
Using the Ruger RC-1000S engine hoist at TA-48

### Activity/Task Title:
Using the Ruger RC-1000S engine hoist at TA-48

### Building: RC-17

### Room: 100-A

### Additional Location Description:
All of TA-48

#### Activity Description/Overview
This IWD covers the use of the Ruger RC-1000S engine hoist at TA-48. The hoist will be used in RC-17 for opening and closing a chamber lid as well as in multiple locations in RC-1 for moving shielding and detectors. Anyone who uses the hoist must have incidental crane operator training (TP 122) and be wearing steel toed shoes (which can be ordered through the group office) and leather gloves. As always read the entry requirements and wear the appropriate PPE for the location where the hoist will be used (i.e. in RC-17 safety glasses are required in the lab). Also the hoist must be within the annual preventative maintenance inspection, which is shown by a sticker on the hoist. All rigging must be inspected before use and then the object that will be lifted should be lifted 1" to check the stability of the rigging and alignment of the load. Check the path that the hoist will traverse for obstacles then proceed with the lift and move. If at any time a question arises contact the PNC for information. Only weights up to 750 pounds are allowed under this IWD. Most objects have their weights listed/stamped on them. If unsure of a weight a diagram scale to measure, but only lift up to 750 pounds.

Before using the hoist a Preoperational Inspection Record for Overhead Cranes and Hoists (Form 1489 – 7/08 Version) must be filled out. Also each month a Monthly Inspection Record For Manually Lever-Operated Hoists (Form 4902 – 4/03 Version) needs to be filled out.

Restrictions: NO CRITICAL LIFTS ALLOWED. A critical lift is lifting a weight greater than 75% of the manufacturers rated capacity, so for the Ruger RC-1000S, which has a rated capacity of 1000 pounds means that only weights less than 750 pounds are allowed to be lifted. Critical lifts are also defined by using two or more cranes, having a person being hoisted, any lift where there is a possibility of contacting an energized power line, any lift that is in close proximity to critical or expensive items which could be damaged and when the item being lifted requires special care because of weight, size, asymmetry, center of gravity, installation tolerances or other unusual factors. All of the activities listed in the previous sentence are forbidden under this IWD.

#### List Names of Hazard Analysis (HA) Team:
August Keksis, Todd Bredeweg, Marian Jandel, Dave Vieira

#### Date HA Performed:
July 30, 2008

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<td>List permits, operating manuals, security plans, and other reference procedures.</td>
<td>List training and qualification requirements.</td>
</tr>
<tr>
<td>Task 1. Review site specific hazards for TA-48 (pre-job briefing)</td>
<td>Site specific hazards are listed on the form 2102 (part 2 of the IWD).</td>
<td>Follow instructions for hazards on the form 2102 (part 2 of the IWD).</td>
<td>ES&amp;H Form 2102.</td>
<td>TP 5875: TA48 General Training</td>
</tr>
<tr>
<td></td>
<td>Area specific hazards.</td>
<td>Site specific training and C-Division specific training are required.</td>
<td></td>
<td>TP 6351: C-INC General Worker Lab Policies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow all posting that are in the area where hoisting operations are taking place.</td>
<td></td>
<td>TP 6957: IWM Worker Training Requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TP 6113: RC-1 Radiological Inventory Control</td>
</tr>
</tbody>
</table>
Summary – Overarching Themes

- Networking
  - Interact with folks
  - LinkedIn, Business Cards, Resumes
  - APS has a CV database, Many labs have CV databases
  - Go to meetings, summer schools, lectures
  - New Ideas, New People

- Documentation
  - CV – Update Yearly
    - What have you done? Training, Work, Coding, Volunteering, Memberships
    - This is where you can pull specific information for a resume to a specific job application
  - Reports, Presentations
    - This is how people typically first interact with you
    - Quality
Digital Files on History of LANL

- DOE/MA-0002. The Manhattan Project – Making the Atomic Bomb.
- Science in the National Interest – Photographs Celebrating Six Decades of Excellence.