

**"Past as Prologue:
Are there Lessons to be Learned from
the
Nuclear Physics and Cryptography
Communities?"**

Thomas J. Bowles
*Chief Science Officer
Los Alamos National
Laboratory*

National Science Advisory Board for
Biosecurity
June 30, 2005

- **Los Alamos is a national defense laboratory with three primary missions:**
 - **Stewardship of the nation's nuclear stockpile**
 - **Responding to threats of weapons of mass destruction**
 - **Responding to the nation's energy and environmental need**
- **Basic and applied research and engineering underpin the Laboratory's ability to respond to our missions**
 - **~ 60% of the research at Los Alamos is very applied**
 - **Modeling the performance of nuclear weapons**

Representative Cases

EST. 1943

erica

- **Nuclear Physics Research**

- **The majority of nuclear physics research is unclassified and often involves large collaborations with several participating countries.**
- **A relatively small fraction of the experiments and theory generate dual-use information.**
 - **In the absence of nuclear testing, we need to develop accurate *ab initio* calculations of nuclear weapons performance.**
 - **This requires improved measurements and calculations of cross sections that are of relevance in nuclear weapons.**

Representative Cases

- **Quantum Cryptography (QKD) and Quantum Computation (QC) Research**
 - The underlying concepts and technology that enable QKD and QC are generally unclassified.
 - **The QKD effort at LANL is closely tied to the QC effort.**
 - Both rely on the ability to use isolated quantum-mechanical states.
 - Virtually all of the techniques developed are dual-use.
 - QKD is of great interest to industrial and financial companies.
 - QKD is also of great interest to the Intelligence Community as a means

Issues in Representative Cases

- There are two classes of information that must be handled
 - Data that has dual-use applications
 - eg., nuclear physics cross sections
 - Techniques and equipment that have dual-use applications
 - eg., quantum cryptographic equipment
- In both cases, much of the data, techniques, and equipment are dual-use but become restricted to single-use in particular applications.
 - In nuclear physics, it is the incorporation of the data into models of

Issues in Publication and Presentation

- **Two paths for publication and presentation of research**
 - **Research is in an area that falls within the specified subjects in a Designated Unclassified Research Area (DUSA)**
 - *DUSAs are standing NNSA approved exceptions of specified research are*
 - *eg., cosmology, high energy neutrino physics, ...*
 - **Papers and talks are reviewed and approved for publication by an Authorized Derivative Classifier (ADC)**

Every LANL publication and public presentation goes

Issues in Mail and Email Communication

- **Individuals are trained to recognize classified material and then charged with the responsibility to ensure content in emails is not classified.**
 - **If uncertain, email message is checked by ADC prior to being sent.**
 - **Email from people working on classified programs contains a statement about the classification level.**
- **Most problems that arise fall into three categories:**
 - **Content that may be classified was sent without ADC review.**
 - **Classification level was incorrectly determined.**

Communication Issues within Groups

- **Almost all LANL groups have both cleared and uncleared personnel.**
- **Many groups have foreign nationals as staff, postdocs, or students.**
- **This results in the inability to discuss some aspects of the research within the group with all group members.**
 - **This requires continuous awareness of what is being discussed.**
 - *This has occasionally been an issue, but has not proven to be a*

Communication Issues with External Groups

- **Most of the interactions of LANL staff with external institutions deal with open R&D.**
 - This does not raise any additional concerns, although collaborative work needs to be approved by management.
 - There is a separate issue with open communications with people from sensitive countries.
 - **All such interactions must be reported to LANL security.**
- **Classified R&D requires special means of communication:**

Communication and Physical Separation

- **Work on dual-use technologies can normally be done in open, unclassified environments.**
 - **Nuclear physics research is normally done at open user facilities**
 - **Specific experiments (eg., with Pu) require setting up an exclusion area that has physical security (fences, locked doors, surveillance, ...)**
 - **Staff typically has offices in open, unsecured areas but have access to offices and systems (xerox, computing, printing, ...) in classified areas.**
 - **In a number of cases, part of the group has offices inside a security area and part of the group has nearby offices in an open area.**

Communication with Foreign Nationals

- **All communication that involves foreign nationals requires security oversight and verification.**
 - **At Los Alamos, all foreign nationals must be approved.**
 - **Approval includes designated mentor , work description, buildings that can be visited, computer systems that can be accessed.**
 - **Meetings that involve foreign nationals must be approved in advance.**
 - **Foreign national assignments are reviewed each year to ensure no inappropriate information or technologies have been shared.**
- **Restrictions are continuously becoming more stringent.**

Lessons Learned

- **The bioscience community will have to deal with the increasing rigor that is being focused on national security issues.**
- **Dual-use R&D necessarily engenders additional efforts:**
 - **Review process for all publications and presentations.**
 - **Mail and email exchanges must be monitored.**
 - **Awareness in discussions with internal and external personnel.**
 - **Provision for infrastructure for sensitive communications.**
- **Physical access restrictions create barriers to communication**