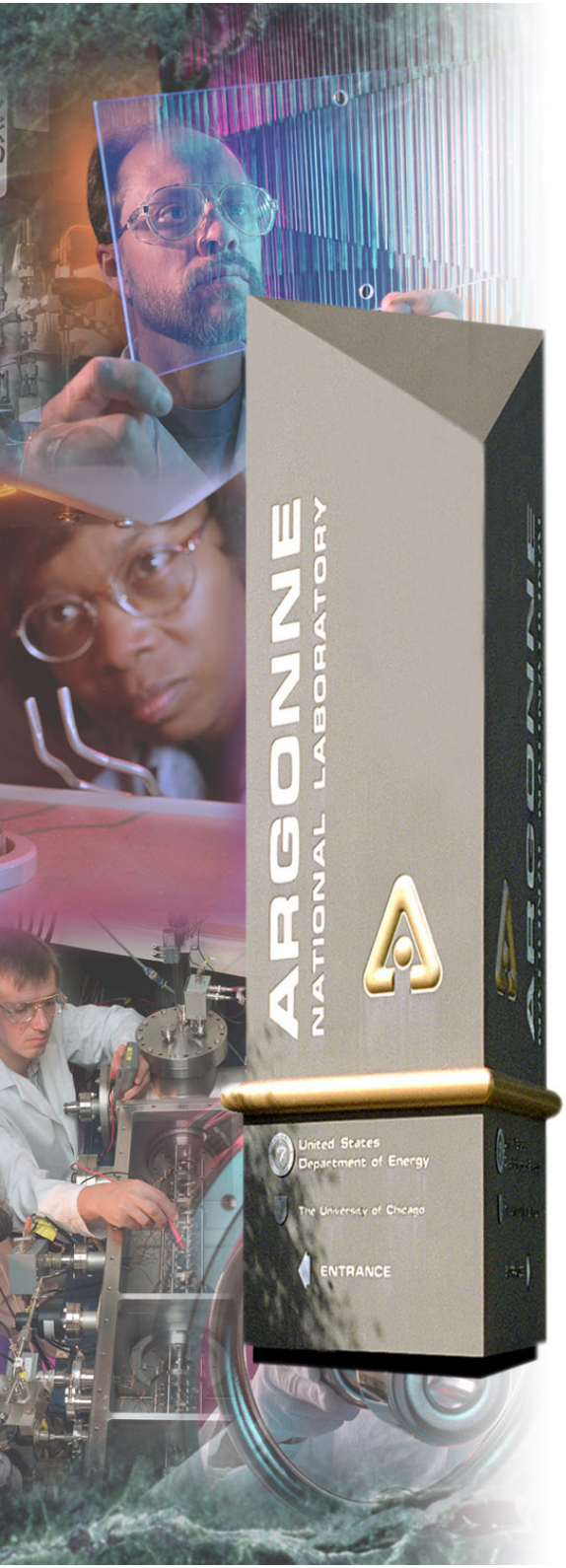


A Tale of Two LDRDs

J.F. Mitchell

Materials Science Division

Argonne National Laboratory

A U.S. Department of Energy
Office of Science Laboratory
Operated by The University of Chicago

Office of Science
U.S. Department of Energy

A Tale of Two LDRDs . . .

"It was the best of times . . ."

"Nanoscale Confinement of Highly Spin-Polarized Oxides"

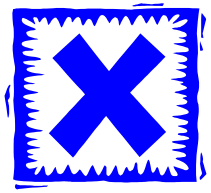
Strategic Initiative: Nanoscience

Funded and renewed!

"It was the worst of times . . ."

"Synthesis of Novel Quantum Magnets at High Pressure"

Director's Competitive Grant



Sorry, not this time!

Essential Ingredients

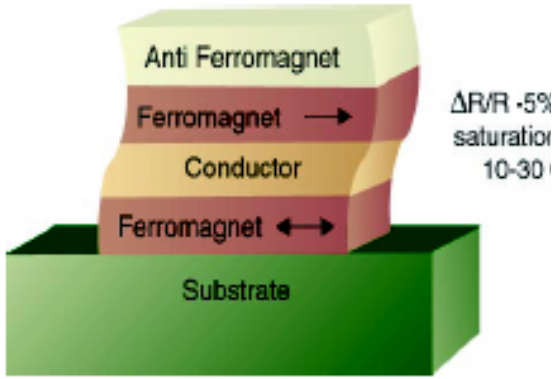
For both competitive and strategic LDRD

- **Compelling science -- new, not incremental**
- **Resonance with existing (or future!) laboratory interests**
- **Broad appeal - easy to appreciate by audience**
  - **Stragetic: Initiative leader**
  - **DCG: Laboratory Committee**
- **Added Value**
  - **Strategic: How does it fit/advance this initiative?**
  - **DCG: Is there promise for future external funding?**

Success vs. Failure

Compelling science -- new, not incremental

Nanoconfined Oxides



Spintronics -- transmission and storage of information by spin as well as charge of electron

Quantum Magnets

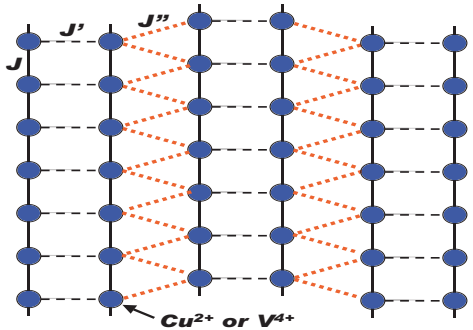


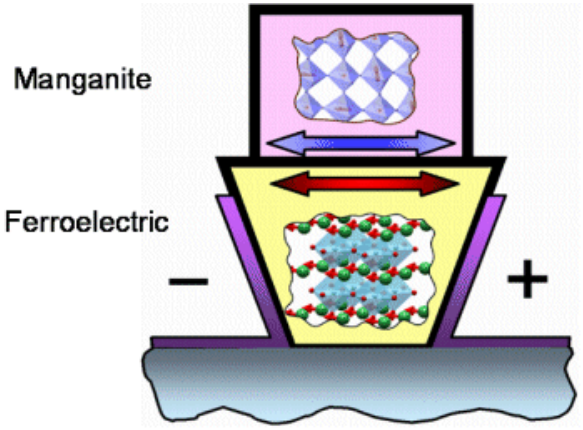
Fig. 1 Sketch showing the basic trellis layer structure of the Cu and V sublattices in the two-leg ladder compound $SrCu_2O_3$ and in CaV_2O_5 and MgV_2O_5, respectively. The figure shows the intraladder leg J and rung J' exchange constants and the inter-ladder J'' exchange coupling within the the trellis layer.

Ladder compounds: if doped a predicted source of new high-T_c superconductors

Success vs. Failure

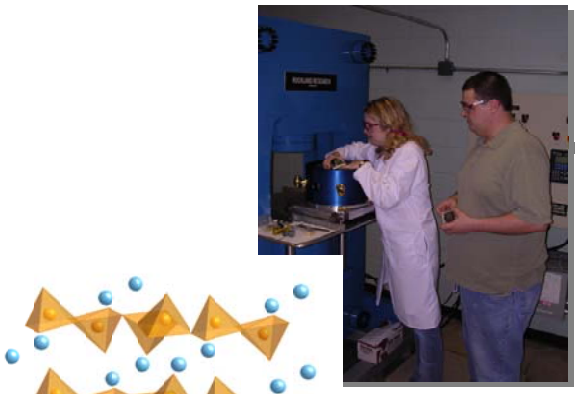
Resonance with existing (or future!) laboratory interests

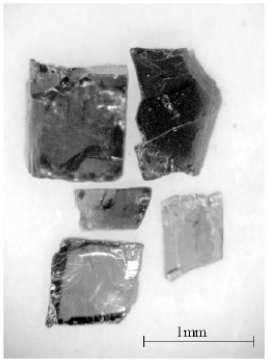
Nanoconfined Oxides



Center for Nanoscale Materials -- Complex Oxide Theme

Quantum Magnets





Renewed emphasis on bulk materials synthesis

Success vs. Failure

Broad appeal - easy to appreciate by audience

Nanoconfined Oxides

- Oxides a big part of ANL culture
  - Ferroelectrics
  - CMR
  - Solid oxide fuel cells
- Magnetic oxides promising
  - 100% spin polarized
  - Compatible w/other oxides
- Potential application

Clear case to nano initiative leader

Quantum Magnets

- High T_c superconductivity remains a central problem in condensed matter physics
- New materials = new science
- Fundamental science

Does this appeal to wide community?

Success vs. Failure

Added Value to ANL

Nanoconfined Oxides

- ‘Jump-start’ for CNM theme
- DARPA ‘Spins’ program
- Discussion of NWU/ANL MRSEC on multifunctional oxides

Quantum Magnets

Compelling argument that this is a way to new BES money

Opportunity to Enhance ANL Programs

BES Context - Workshop Findings

- Re-energize materials synthesis
- Establish inter-lab connections
- Provide for facilities science

BES Workshop
on Future Directions of Design, Discovery and Growth of Single Crystals for Basic Research

Design, Discovery and Growth of Novel Materials

For Basic Research:

An Urgent U.S. Need

Report on the DOE/BES Workshop:

ÒFuture Directions of Design, Discovery and Growth of Single Crystals for Basic ResearchÓ

Ames Laboratory, Iowa State University
(October, 10-12, 2003)

Organizing Committee:

Lynn Boatner, Oak Ridge National Laboratory
Mac Beasley, Stanford University
Paul Canfield, Chair, Iowa State University and Ames Laboratory
Robert Cava, Princeton University
Doon Gibbs, Brookhaven National Laboratory
Thomas Lograsso, Iowa State University and Ames Laboratory
David Mandrus, Oak Ridge National Laboratory
John Mitchell, Argonne National Laboratory

We need to be ready

- High-Pressure synthesis
- Handful of US facilities
- Unique capability to access new compounds

So, What Went Wrong?

- **Proposal do-able and good science would result**
- **Recognized the value of high pressure as a new materials synthesis technique for MSD portfolio**
- **Failed to convince committee of broad appeal, specific reason these specific compounds (spin ladders) should be targeted**

Just because you *can* do something, it doesn't mean that you *should.*

Further thoughts . . .

- ***Very*** **competitive field (only 11 out of 32 finalists funded)**
- **We wanted to jumpstart a new synthesis program but didn't market the specifics well**
- **Quantum magnets are neat materials, but perhaps not novel enough by themselves**
- **Can it be fixed and resubmitted?**

A Tale of Two LDRDs: Conclusions

It is a far, far better thing to . . .

- **Give them your best idea and tell them why it's good - do it right away!**
- **Show them that it is do-able with LDRD level funding as a path to future $**
- **Write it for an knowledgeable, but general audience so that it can be appreciated**
- **Convince them that it SHOULD be done**

If at first you don't succeed . . .