Los Alamos National Laboratory participation in California Nanosystems Institute

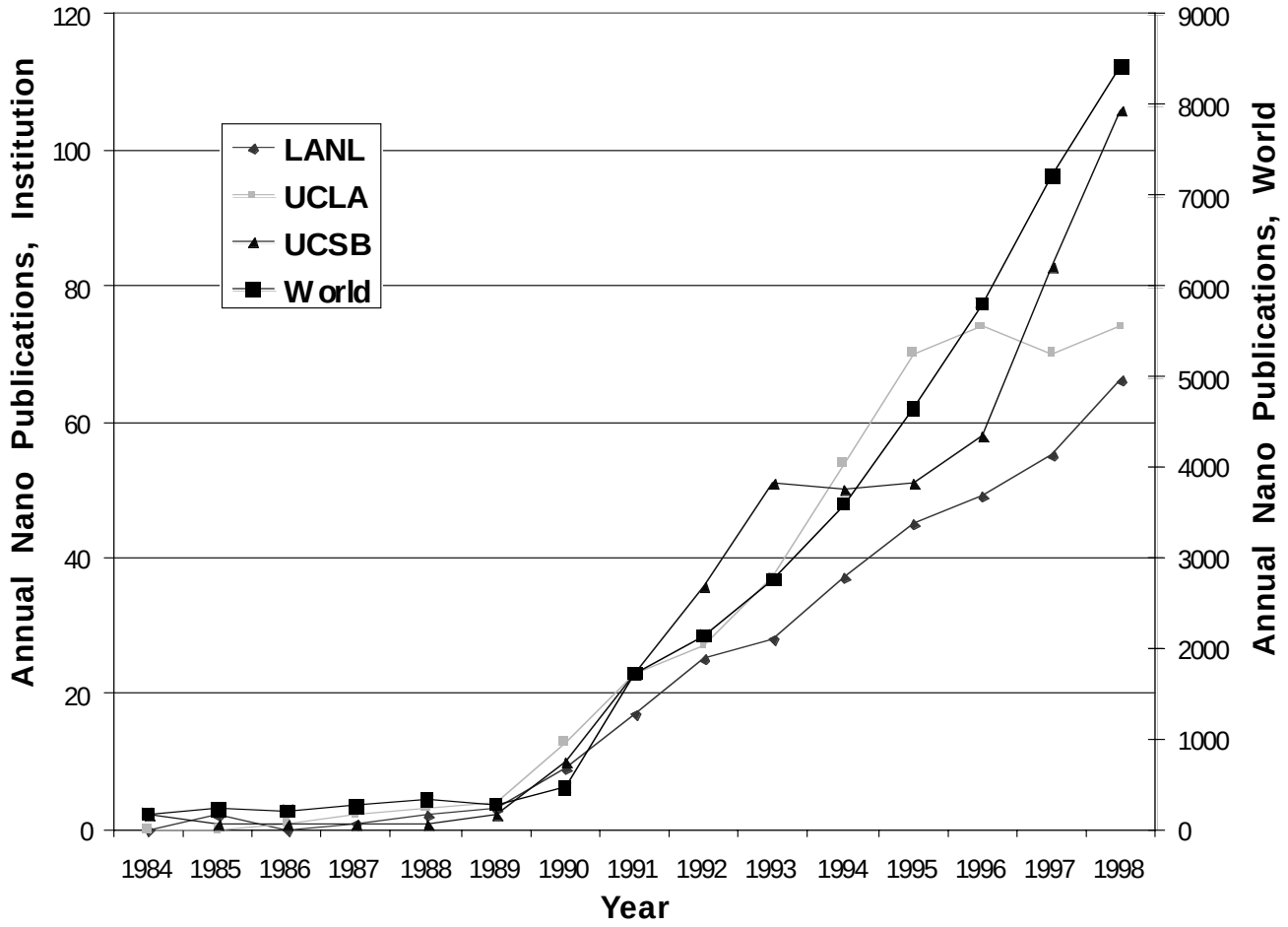
Terry C. Lowe

CNSI Workshop
UCLA
July 15-16, 2000

Key points

- **We want to strengthen the UC-LANL relationship**
- **Nanoscale science is a strategic research area at LANL**
- **LANL strategy for Nanoscience emphasizes partnership (UC partnership is special)**
- **We want to combine LANL strengths in critical CNSI research areas with those at UCSB & UCLA**
- **LANL expectations and contributions to CNSI and proposal preparation process**

There is parallel growth in nanoscale science at LANL, UCLA, and UCSB



LANL has a rich environment for nanoscale science & technology

Connection to:

Mission agencies (DOE, DoD, NASA, etc.)

DOE nanoscience network

National Nano Initiative planning

Direction and focus:

Senior mgt nanoS&T planning/coordination team

Strategic plans and mission-driven imperative to integrate nanoS&T across disciplines

Scientific Infrastructure:

Forums for nanoS&T presentation/discussion

- Bio/physical Nanoscience Forum
- Nanoscale Theory/Modeling/Computing Forum
- nanoS&T Highlight/Program Forum

Vigorous nanoscience collaborations

Experimental & computational facilities to support nanoscale science

Science & Technology Base research proposed by LANL researchers for 2001

Mark Hoffbauer	Achieving the Ultimate Limits in Thin Film Device Nano-Fabrication
Geoff Waldo	Adaptive Biomimetic Nanomachines for Protein Production and Folding
Atul Parikh	Bio-inspired Hierarchical Self-Assembly of Nanostructured Materials
Kevin Ott	Chemistry Below the Diffraction Limit: Design, Synthesis, and Structural Characterization of Nanoscale Compounds and Materials
Darryl Holm	Coarse-Grained Formulations of Strongly Coupled Multiscale Problems: A Unique Opportunity in Computational Physics
Dave Reagor	Electron Spin Transport in Novel Materials and Devices
Victor Klimov	Fundamental Electronic Interactions on Nanometer Length Scales
Alan Perelson	Modeling Complex Biological Systems: From Gene Circuits to the Immune System

A sample of joint UC campus-LANL research partnership and CULAR projects

Campus PI	*Campus*	*Title*	*LANL PI*	*LANL Org*
D. E. Morse	UCSB	Extending the Scale of Self-Assembly to Macroscopic Dimensions: Oriented Fluroescent Microwires and Biosensors	Basil Swanson	CST-1
Geoffrey Strouse	UCSB	Electron Transport in Bio-Engineered Super-Lattices: DNA-Bridged Arrays of Semiconductor Nano-Clusters	Andrew Shreve	CST-4
Cyrus Safinya	UCSB	Miniaturized Hybrid Materials for the 21st Century: Biological Molecules Self-Assembled on Micro- and Nano- Scale Patterned Surfaces	Gregory Smith	LANSCE
Fred Wudl	UCLA	Functionalized Fullerenes: Optimized Materials for Optical Limiting and Self-Assembly	Duncan McBranch	CST-6
H-W Jiang	UCLA	Physics of Quantum Hall Devices in Ultra-High Magnetic Fields	Greg Boebinger	MST-NHMFL
Robert Mendelson, Jr.	UCSF	Investigations of the Structures of Microtubule-Based Cellular Motors Using Neutron Scattering	Rex Hjelm	LANSCE-MLNSC
Rajesh Mehra	UCR	Synthesis and Characterization of Novel Biologically Grown Nanocrystallites	Victor Klimov	CST-6
Jin Zhang	UCSC	Development and Characterization of Novel Conjugated Polymer/Semiconductor Nano-particle Composite Materials	Duncan McBranch	CST-6

LANL strengths in nanoS&T are synergistic with CNSI critical research areas

- **Macromolecular synthesis: self-assembled FETs, nanosponge, biosensors**
- **Next generation information technologies: quantum computing, spintronics, organic electronics**
- **New instrumentation for rapid 3D nanoscale diagnostics to study genomes and proteomes: cytometry, fast SEM, neutron scattering**
- **Development of new systems architectures, parallel computing, etc. to exploit nanostructure components: Quantum algorithms & error correction, Parallel Replica Dynamics, Hyperdynamics**
- **Development of multiscale simulation tools: ASCI thrust area, meso-scale methods, Temperature-Accelerated Dynamics**

LANL expectations for CNSI

- **Jointly attract the best students and faculty to the UC system**
- **Jointly enhance training, education, and lifetime learning in nanoscale science**
- **Facilitate innovation and scientific achievement:**
  - **joint research proposals and projects**
  - **faculty exchange**
  - **student exchange/internships**
  - **information exchange**
- **Facilitate sharing of complementary facilities**
  - **Synthesis, nano-fabrication (Neutral Beam Facility, etc,)**
  - **Characterization (LANSCE, Natl High Magnetic Field Lab)**
  - **Computing (Teraflop computers)**
  - **Remote "virtual laboratory" capabilities**
- **Mechanism for sharing of industrial partners**
  - **LANL has strategic industrial partners (e.g. Motorola, Xerox)**

LANL contributions

- Aid in proposal preparation
- Member of CNSI governing board
- Direct access to and integration with LANL nanoscale science facilities
- Scientific workshops, intellectual forums
- Partnership in proposing and executing nanoS&T programs to DOE, DoD, NASA, and other federal agencies
- Career path for students, post docs
- Support for faculty exchange/sabbatical