State-Level Nanotechnology Policy Initiatives and Implications for Georgia

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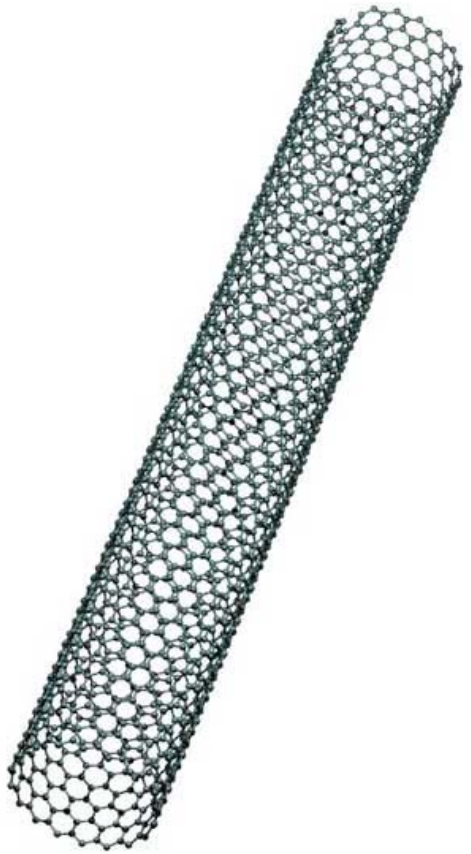
Research Question

- How do states choose to develop their nanotechnology research and development capacities, and how can these strategies be employed effectively in Georgia?

Overview

- Introduction
- Methods
- States Investigated
- Results
- Discussion
- Implications
- Recommendations



Source:
http://www.anthonares.net/

Introduction

- Basic Concepts
  - Technology-Based Economic Development
  - Nanotechnology
  - Nanotechnology Policy
- Policy Factors
  - Financial Incentives
  - National Initiative
  - State Growth

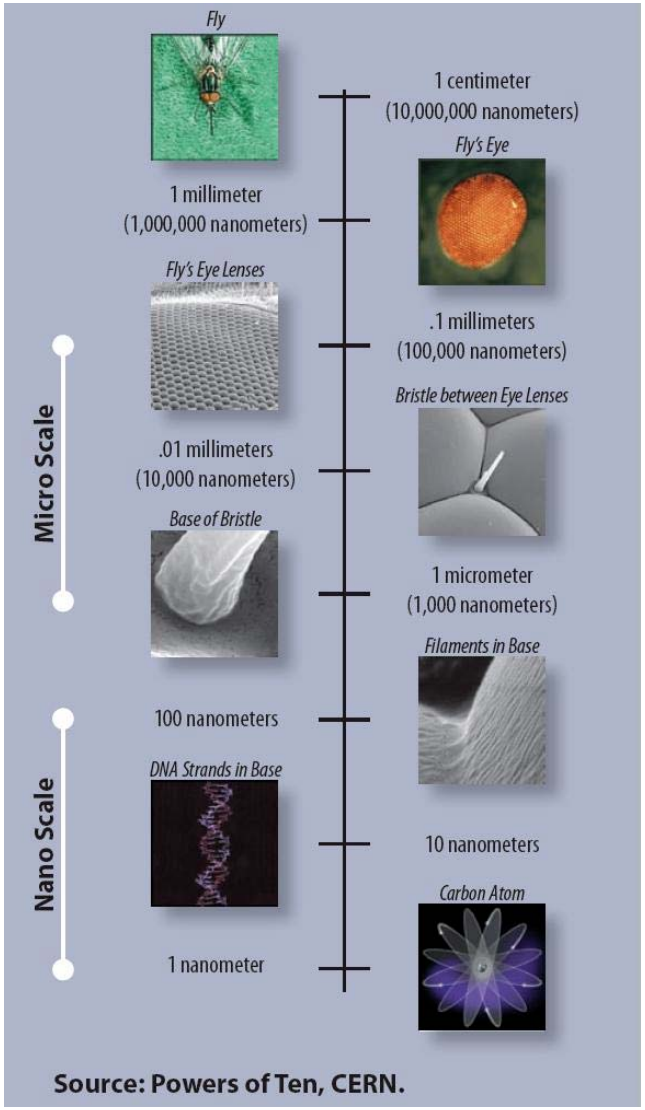
Technology-Based Economic Development

- Using innovative technologies to produce new:
  - Products
  - Jobs
  - Industries
  - Resources for economic growth
- Accomplished through furthering:
  - Infrastructure
  - Research Funding
  - Research Talent
  - Research Results
  - Education Production
  - Prototype Development
  - Seed Funding
  - Industrial Growth
  - Economic Growth

Nanotechnology

- Nanotechnology has three necessary components:
  1. Intentional manipulation
  2. Length scale of 1 – 100 nanometers
  3. Properties at length scale differ than that of the bulk material

Source: The National Nanotechnology Initiative Strategic Plan



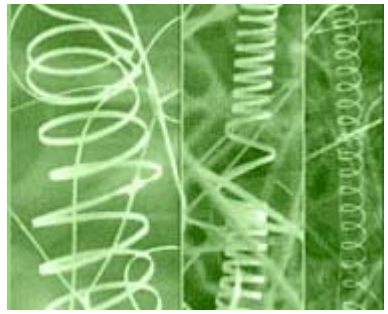
Nanotechnology Then

- History
  - 1980s:

  Invention of atomic-level microscopes (STM and AFM)
  - 1990s:

  Investments and advancements made in nascent nanotechnologies
  - 2000s:

  Federal initiatives in nanotechnology



Nanotechnology Now

- Over 600 consumer products with nanotechnology-enabled properties

  Source: Woodrow Wilson Project on Emerging Nanotechnologies

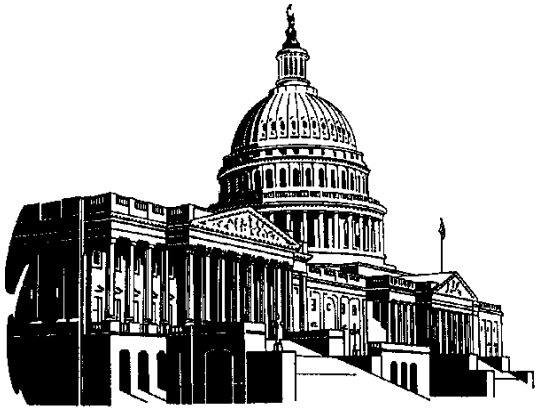
- Many candidates competing to be the leading region for new general purpose technology

Daewoo Washington Machines
Eagle One Nano-Polish
Dockers Go Khaki
IBM PowerPC 970FX Processor
NanoSlim Supplements
Air Santizers
Antibacterial Water Tap

NanoBreeze Room Air Purifier
General Motors Exterior Coating
90 nm Flash Drives
Plastic Beer Bottles
Acticoat Wound Dressings
Antibacterial Make-up
Nano-Pel Mattresses

Nanotechnology Policy

- Legitimate government action
  - Nanotechnology Research
  - Nanotechnology Development
  - Innovation Creation
  - Industrial Development
  - Economic Development



Policy Factors

- Financial Incentives
  - Intellectual Property
  - Commercial Potential
- National Initiative
  - Federal Money
  - Numerous Resources
- State Growth
  - High-Wage, High-Tech Jobs
  - Competitive Industry

Methods

- Literature Review
- Reviewed the National Nanotechnology Initiative goals.
- Selected states noted in reputable reports and rankings:
  - National Nanotechnology Initiative Workshop Report
  - Lux Research Inc. Nanotechnology Report
  - National Governor's Association Innovation America Report
  - Small Times Publication Rankings
- Investigated each state.
- Characterized state-wide initiative.

Goals for Nanotechnology

- Progress in Up-Stream Research Activities

  Infrastructure, questions of societal import, and useful knowledge

- Progress in Down-Stream Research Activities

  Enhance existing products and new products

- Progress in Translating Skills

  Educational programs, train workforce, and public understanding

- Progress in Economic Activity

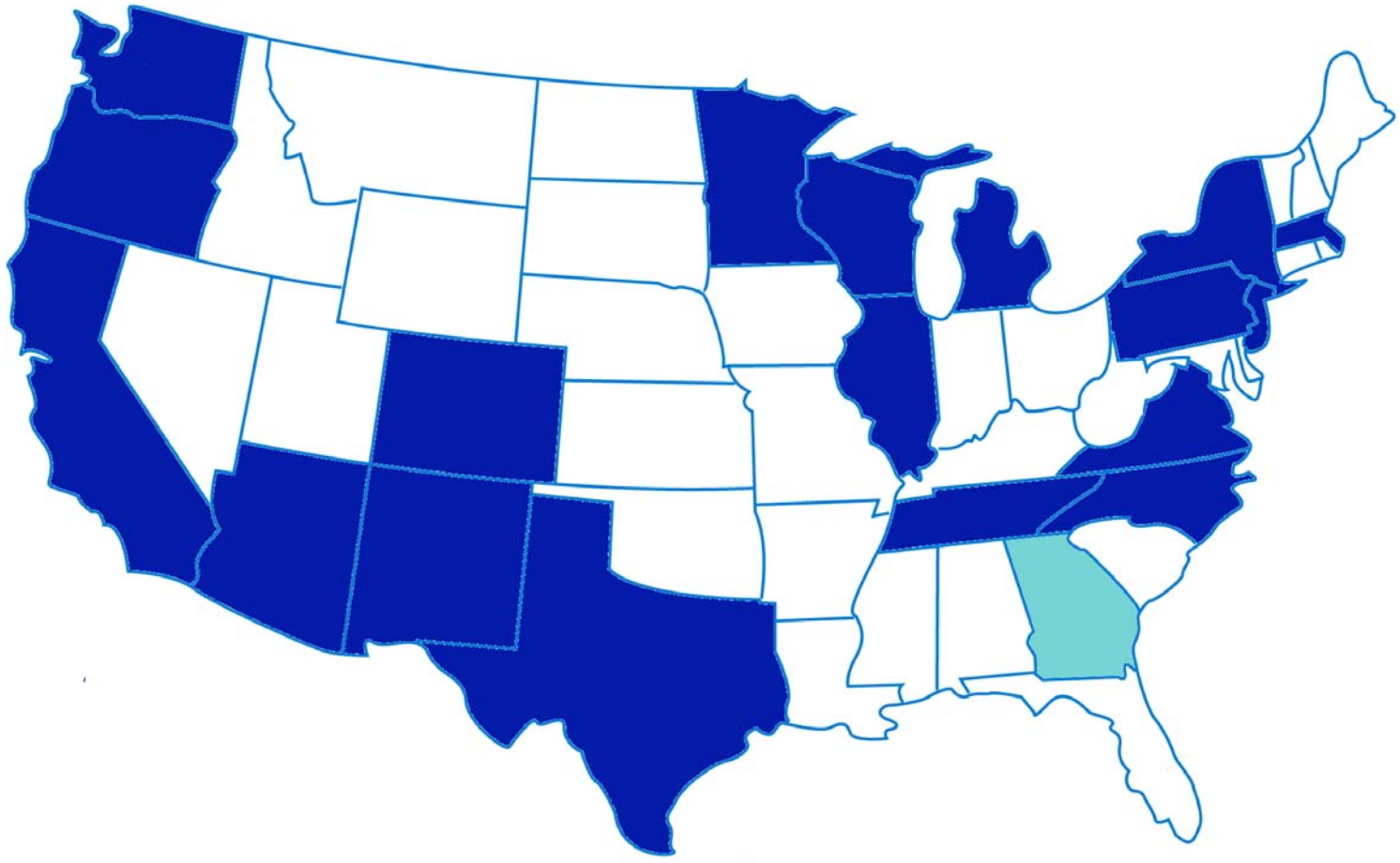
  Have the new knowledge, products, and labor bring returns to the area and society,

  and become leading center for nanotechnology

Adapted from the National Nanotechnology Initiative Strategic Plan

Source:
http://www.ostp.gov/cs/nstc

States Investigated



Models

- Consortium

  Focus on awareness and advocacy.

- Industry

  Focus on research collaboration and commercialization.

- University

  Focus on research collaboration, education, and commercialization.

- Agency

  Focus on achieving goals through autonom

Consortium Model

- Initial-Stage Model
- Decentralized Authority
- Group of Stakeholders:
  - Encourage collaborations
  - Inform about nano-related activities
  - Lobby for development

Arizona

- Arizona Nanotechnology Cluster
  - Private and university partners
  - Organize conferences
- State Efforts
  - Biodesign Institute at Arizona State ($78.5 Million)
  - Special 0.6% Sales Tax ($112 Million)
  - Lobbying for Federal Laboratory Expansion

Michigan

- Michigan Small Tech Association
  - Michigan Economic Development Corporation and Small Times Media partners
  - Advanced manufacturing
- State Efforts
  - 21st Century Jobs Fund ($100 Million)
  - Michigan Strategic Fund ($165 Million)
  - Michigan Universities Commercialization Initiative
  - Capital Market Development Initiative

Texas

- Texas Nanotechnology Initiative
  - Private partners with university involvement
  - Leverage state strategic funds
- State Efforts
  - Texas Enterprise Fund ($200 Million)
  - Texas Emerging Technologies Fund ($300 Million)
  - Advanced Materials Research Center with SEMATECH ($40 Million)

Virginia

- Virginia Nanotechnology Initiative
  - Center for Innovation Technology and private partners
  - Workforce development
- State Efforts
  - Joint Commission on Technology and Science
  - Virginia Economic Development Partnerships
  - Innovative Technology Authority

Industry Model

- Developed Model
- Decentralized Authority
- Group of industry partners with universities and government to:
  - Bolster research
  - Enhance Commercialization

California

- California NanoSystems Institute
  - UCLA and UCSB ($100 Million)
  - Abraxis, Amgen, BASF, Hewlett-Packard, Intel, Oracle, and Sun Microsystems ($250 Million)
  - Biomedical, chemical, and advanced manufacturing; limited education
- State Efforts
  - Local Initiatives
  - Blue Ribbon Task Force ($300 Million)

New Jersey

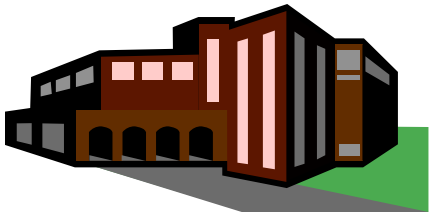
- New Jersey Nanotechnology Consortium
  - New Jersey Institute of Technology, University of Medicine and Dentistry of New Jersey, and Rutgers University ($2 Million each)
  - Alcatel-Lucent Technologies and Pfizer
  - In existing Bell Labs facility; Nobel prizes and patents simultaneously
- State Efforts
  - Support of projects

New York

- New York Loves Nanotech
  - SUNY Albany, Rensselaer Polytechnic Institute, Clarkson University, Columbia University, Cornell University, SUNY Binghamton (plus out-of-state)
  - IBM, SEMATECH, Tokyo Electron, Advanced Micro Devices, Applied Materials, Vistec Lithography, ASML, Einhorn Yaffee Prescott
  - Has corporate headquarters and labrotories in same building; includes nano degree programs
- State Efforts
  - Nearly $1.05 Billion out of $5.8 Billion
  - Empire State Development
  - Center for Advanced Technology

University Model

- Developed Model
- Decentralized Authority
- Group of Universities and Other Laboratories:
  - Increase research and collaborations
  - Educate new researchers and public
  - Commercialize university technologies



Illinois

- Illinois Coalition
  - University of Illinois at Urbana-Champaign, Illinois Institute of Technology ($63 Million)
  - University of Chicago, Northwestern University
  - Argonne National Laboratory, Fermi National Accelerator Laboratory, and National Center for Supercomputing Applications ($143 Million)
  - Use of university technology transfer offices; nano-course specializations
- State Efforts
  - Illinois Research and Technology Parks
  - NanoBusiness Alliance (AtomWorks)

Oregon

- Oregon Nanoscience and Microtechnologies Institute
  - Eastern Oregon University, Oregon Health and Science University, Oregon Institute of Technology, Oregon State University, Portland State University, Southern Oregon University, University of Oregon, Western Oregon University ($21 Million)
  - Pacific Northwest National Laboratory, Oregon Museum of Science and Industry ($30 Million)
  - Natural and traditional industries; expanding infrastructure; school outreach
- State Efforts
  - Oregon Innovation Council
  - Emerging Technologies Support

Agency Model

- Highly Developed Model
- Centralized Authority
- Non-Profit Public Entity
  - Adapt policy mix to reach objectives

Massachusetts

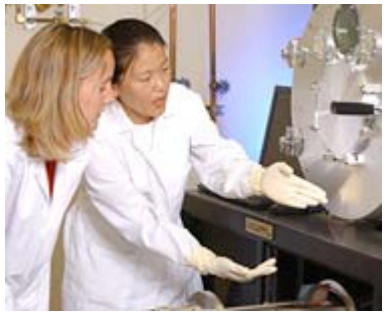
- Massachusetts Nanotechnology Initiative
  - John Adams Innovation Institute (Massachusetts Technology Collaborative) ($30 Million)
  - University of Massachusetts at Lowell ($5 Million)
  - Assigning incubator facilities, allocating from strategic state funds
- State Efforts
  - Regional Initiatives ($15 Million)
  - Research Grants ($20 Million)
  - Emerging Technologies Support ($26 Million)

Pennsylvania

- Pennsylvania Initiative for Nanotechnology
  - Ben Franklin Technology Partners ($15 Million*)
  - Carnegie Mellon University, Drexel University, Lehigh University, Pennsylvania State University, University of Pittsburgh, Nanotechnology Institute (UPenn)
  - Recruiting and partnering with private firms, workforce development programs
- State Efforts
  - Private and Federal Support ($4.5 Million*)
  - Idea Foundry, Life Sciences Greenhouses, Technology Collaborative, Small Business Development Centers, Keystone Innovation Zones

Others

- Roadmap States
  - Colorado
  - Minnesota
  - North Carolina
  - Washington
- Without coordinated state-wide policy initiative
  - Georgia
  - New Mexico
  - Tennessee
  - Wisconsin



Lessons Uncovered

- Progress in Up-Stream Research Activities
  - Other universities and federal laboratories to attract infrastructure support (IL, MN, OR, VA).
  - Align part of university center toward local industry needs to attract involvement (NJ, NY, OR).
  - Recruit prominent researchers to university centers (WA).
- Progress in Down-Stream Research Activities
  - Include local industry (CA, NJ)
  - University technology transfer offices (CO, IL, OR, VA)
  - Regional clusters for specialized innovations (PA, TX)
- Progress in Translating Skills
  - Workforce development at two-year colleges (PA, VA)
  - Nano-specific education programs (CA, IL, NY, WA)
  - Public information campaign (OR, PA)
- Progress in Economic Activity
  - Existing technology-based industries (CA, NC, PA, WA).

Georgia's Background

- Invested in progressing microelectronics since the early 1980s.
- Advanced research programs in agricultural, biological, material, and engineering technologies.
- Georgia Research Alliance attracts talent through the Eminent Scholars Program.
- Georgia is positioned highly in research on emerging technologies

Source: Southern Growth Policies Board

Georgia's Development

- 2003: Georgia Tech is named to the National Nanotechnology Infrastructure Network.
- 2004: Emory University and Georgia Tech awarded three Centers for Excellence in Nanotechnology through the National Nanotechnology Initiative.
- 2006: The National Nanotechnology Manufacturing Center opens in Swainsboro.
- 2006: State provides one-half of the $90 million Nanotechnology Research Center at Georgia Tech.
- 2007: Totals over 700 nano-patents from 70

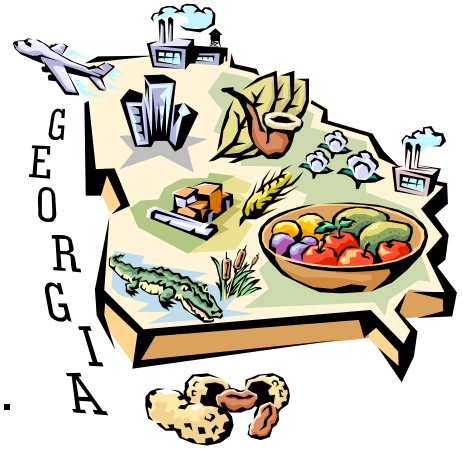
Georgia's Stake

- Selected Georgia Nano-Patent Holders
  - Alcatel-Lucent Technologies
  - Coca-Cola Company
  - Dow Chemical
  - Georgia Tech Research Corporation
  - Intel Corporation
  - Kimberly-Clark Worldwide
- Selected Georgia Nano-Publication Producers
  - Centers for Disease Control and Prevention
  - Emory University
  - Georgia Institute of Technology
  - Medical College of Georgia
  - Morehouse School of Medicine
  - University of Georgia

Georgia Moving Forward

- Expanding Infrastructure
- Expanding Research
- Expanding Industry
- Enhancing Existing Industry

Recommendations



- Near Term
  - Establish a nano-related association (Consortium).
  - Infrastructure developments in regional centers.
  - Further coordination with area university centers and federal sites.
  - Continue Georgia Research Alliance recruiting eminent scholars to university research centers.
  - Workforce development programs through the two-year colleges.
- Long Term
  - Transition to more developed model (e.g. University).
  - Align new center with demonstrated local need.
  - Solicit industry to establish companion research facilities near centers.
  - Start nano-specific degree programs.
  - Increase Science, Technology, Engineering, and Math educational achievement in K-12 programs.