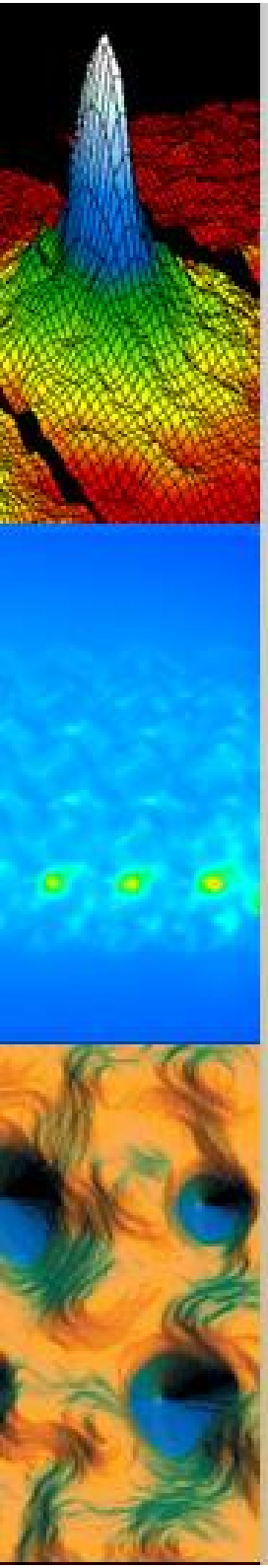
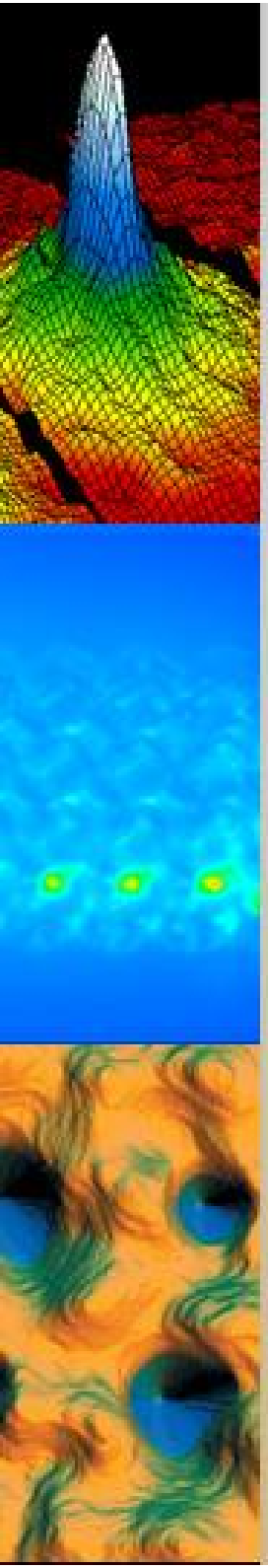


Nanotechnology Starts Here

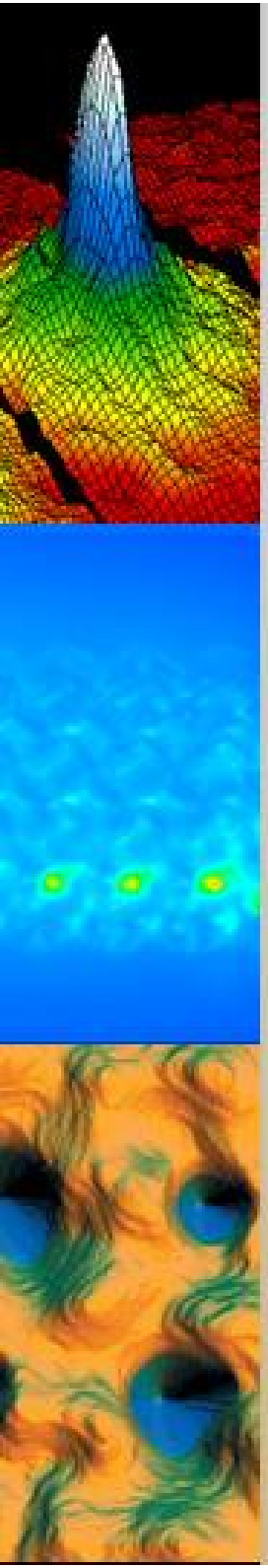
Christopher C. Foster
Chief Scientist and Deputy Secretary
Maryland Department of Business and
Economic Development

MARYLAND



Nanotechnology has landed

MARYLAND



Nano Evolution Process

Products

- *evolutionary* — Nano-enhanced systems
- *revolutionary* — Nano-based systems

Knowledge

- Nano-scale science

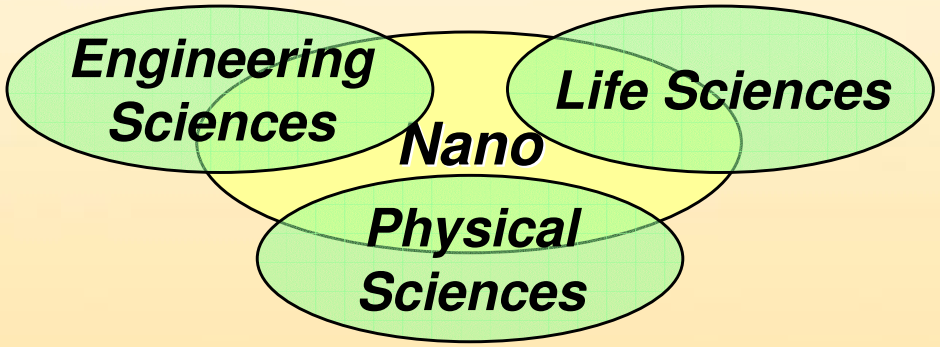
Enabling Technology

- Nano-manufacturing strategies
- Nano-synthesis, fabrication, & assembly
- Nano-probe technologies

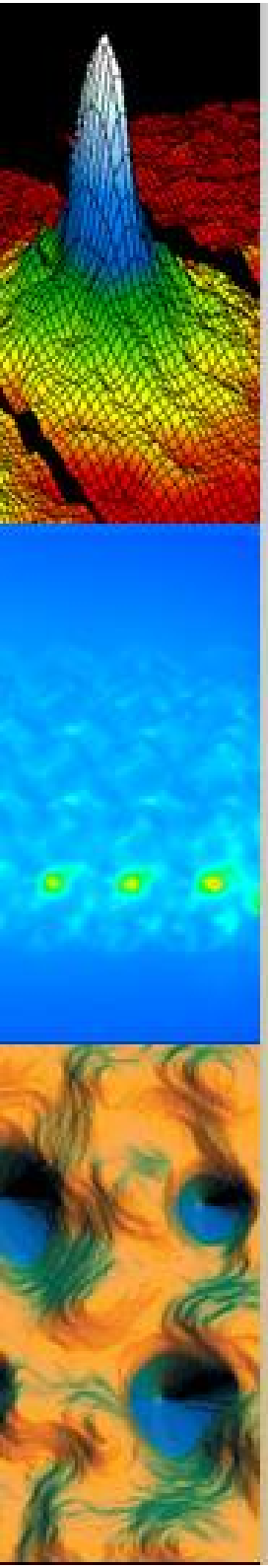
Nanoscale Elements

particles, sensors, devices, materials, surfaces, cells, Bio-molecules, interfaces

Nano is central to research



MARYLAND



Development Process

FUNDAMENTAL SCIENCE

Enabling technologies

- Nanoprocessing
- Surface & thin film nanostructure
- Modeling & design
- Combinatorial materials discovery

Nanoscale instrumentation & metrology

Manufacturing at the nanoscale

Nanostructured materials by design

Devices & manufacturing

- Nanoelectronic devices & systems
- Bioprocessing microsystems
- Energy & environmental nano systems

Nano-electronics, photonics & magnetics

Healthcare, therapeutics & diagnostics

Chem-bio detection & protection

Nanoscale processes for environmental improvement

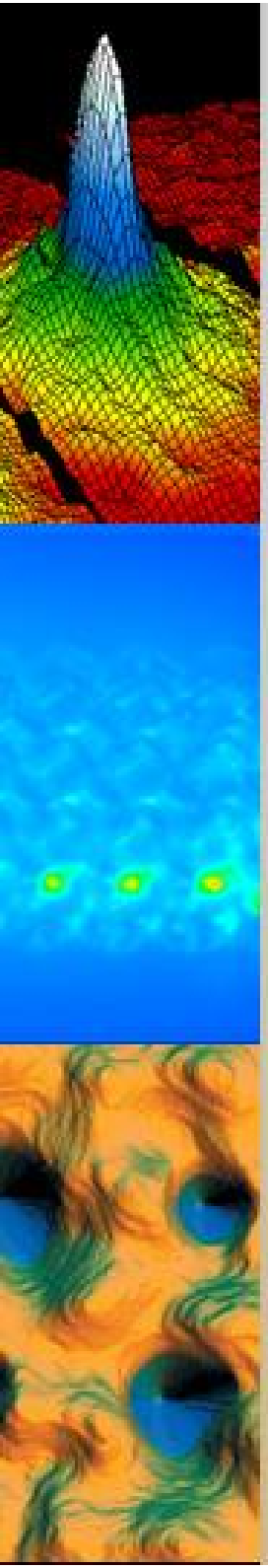
Efficient energy conversion & storage

Materials systems

- Nanophase materials
- Nanoparticle synthesis & applications

NNI Grand Challenges

MARYLAND



Focus Areas

Nano-Bio

- Nanochemistry & Nanobiology
- Drug Delivery
- Nanotherapeutics
- Nano, Bio-Fabrication

Nano-Devices

- Self-Assembled Systems
- Integrated Biocomponent Devices & Systems
- Nanotubes and Electronics
- Nano Robotics
- Nano Measurement, Quality

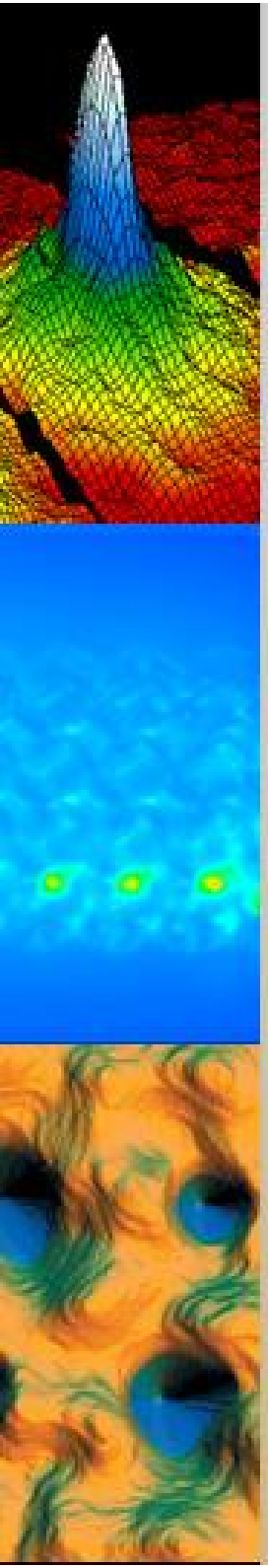
Nano-Materials

- Superconductivity
- Nanowires
- Coatings, Devices
- Sensors-Bio & Electronic

Nano-Informatics

- Bose-Einstein Condensates (BECs)
- Atomic Optics
- Nanofluidics
- Quantum Computing & Communications

MARYLAND



Maryland's Physical Assets

Facilities and Capabilities

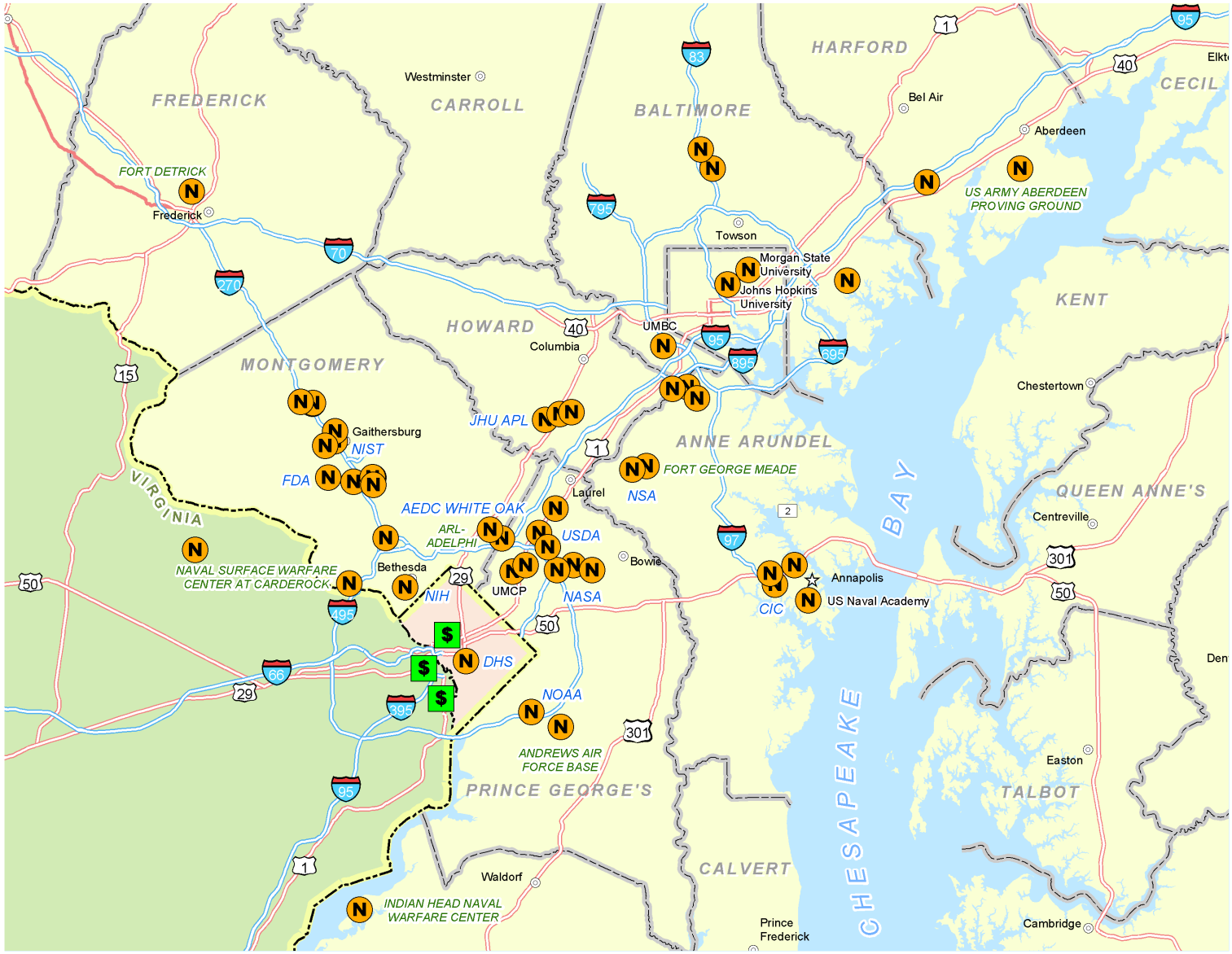
- Multiple (30+) cleans rooms (Class 10 and above)
- Electron Beam Deposition (15+)
- Chemical Vapor Deposition (CVD) (20+)
  - Multi segment reactors
  - CVD Cluster tools
- UHV Atomic Layer Deposition

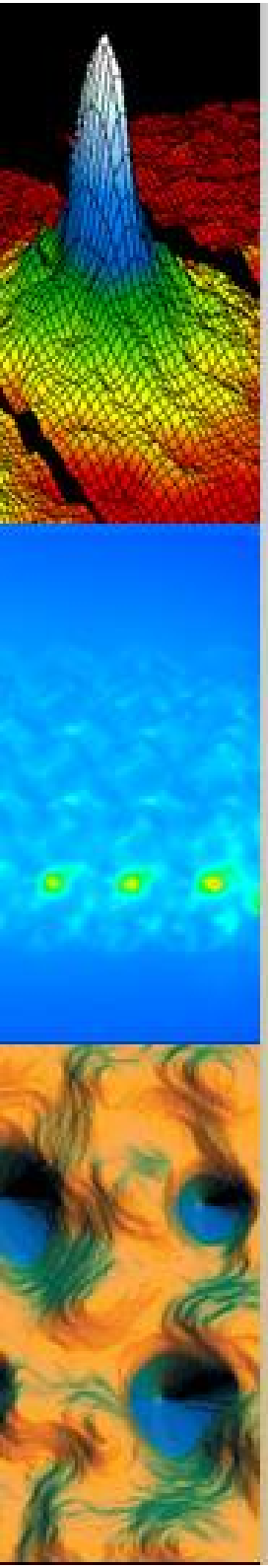
Equipment

- Metrology
- Atomic Force Microscopes
- Scanning Tunneling Microscopes
- Plasma Etching clusters
- Characterization Equipment
- Spin coaters
- Lithography equipment
- Single Particle Mass Spectrometry
- Computer simulation
- Laser Cooled Plasmas
- Laser trapping and cooling of atoms
- Electron Counters

MARYLAND

Cluster Development



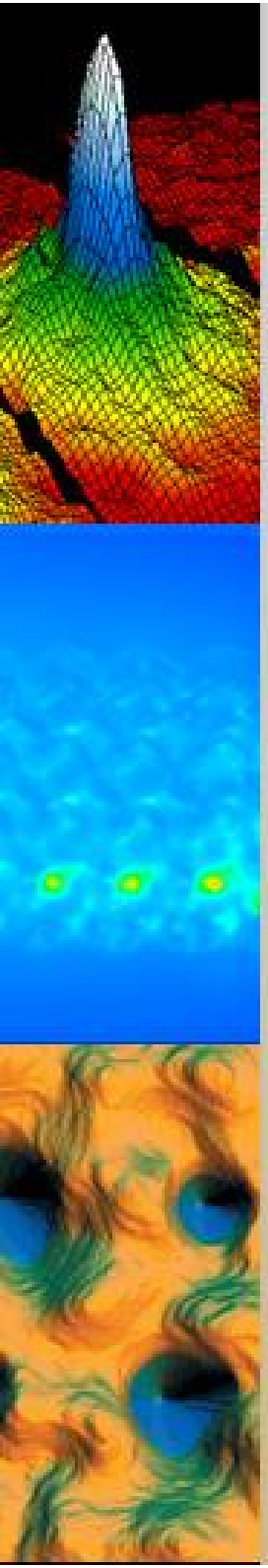


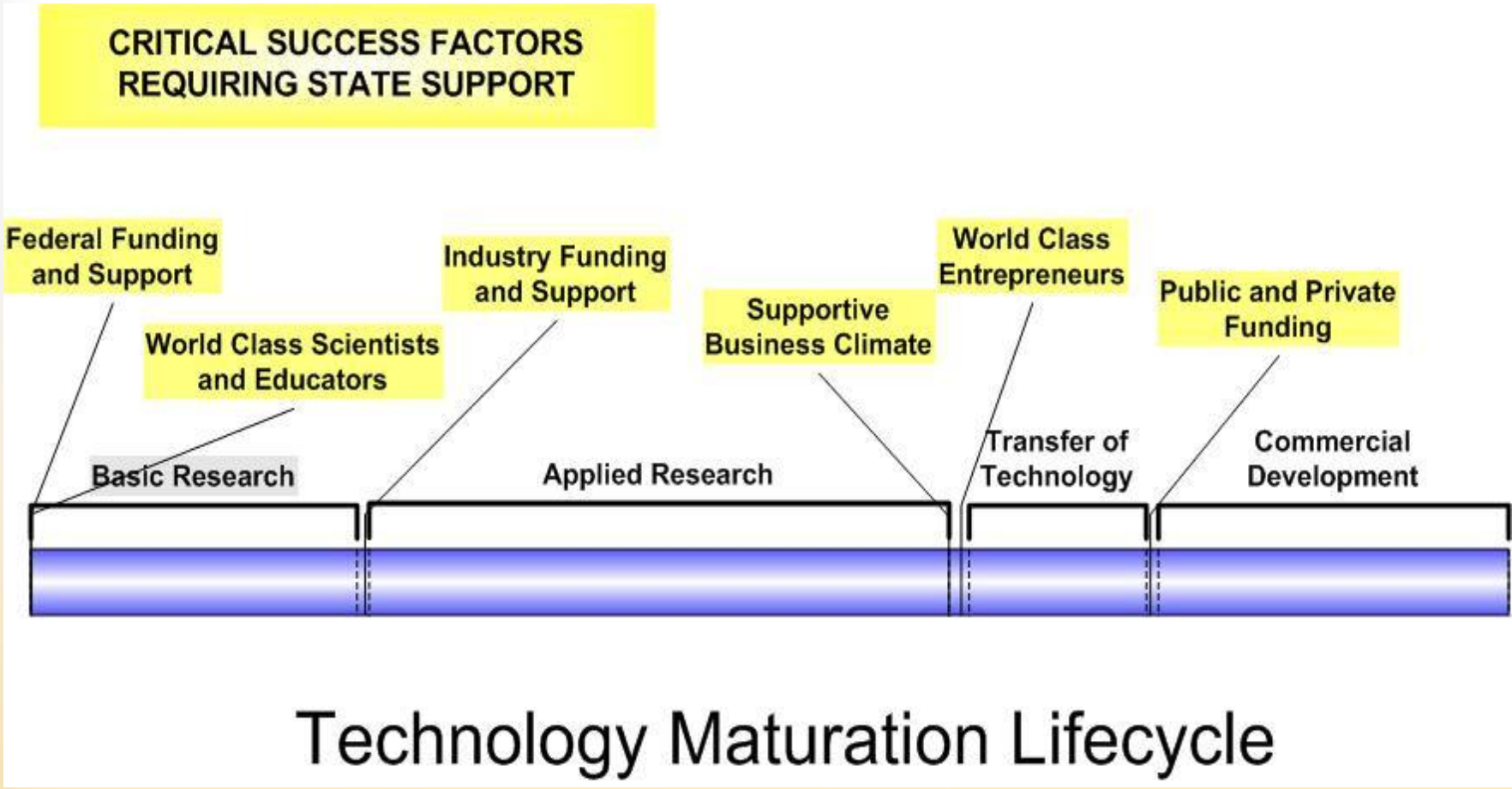
Maryland Initiatives

- Establish a Chief Scientist for Maryland
- Create Governor's Scientific Advisory Board
- Attract world class researchers
- Invest in physical Infrastructure
- Build integrated Nanotechnology Center
- Leverage regional and national partnerships
- Enable and support commercialization

MARYLAND

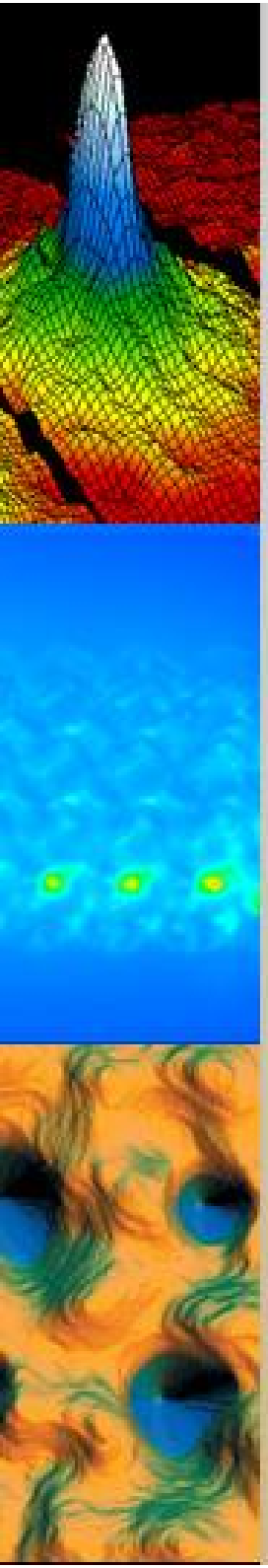
The Maryland Approach





Technology Maturation Lifecycle

MARYLAND



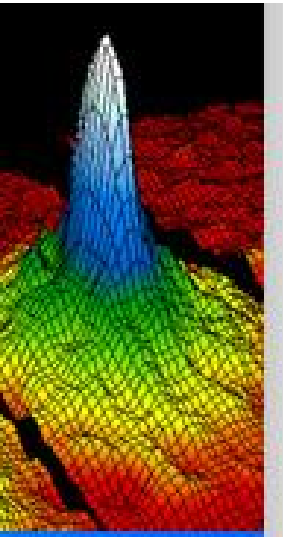
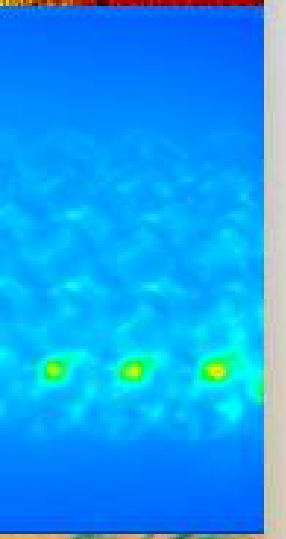
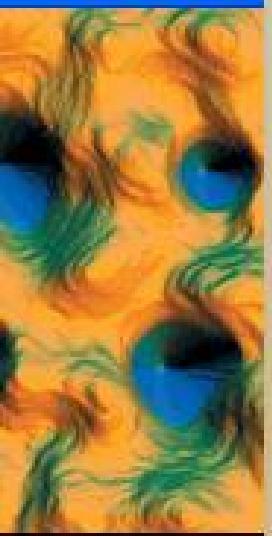
Nanotechnology Starts Here

Christopher C. Foster

cfoster@choosemaryland.org

(410) 767-6302

MARYLAND

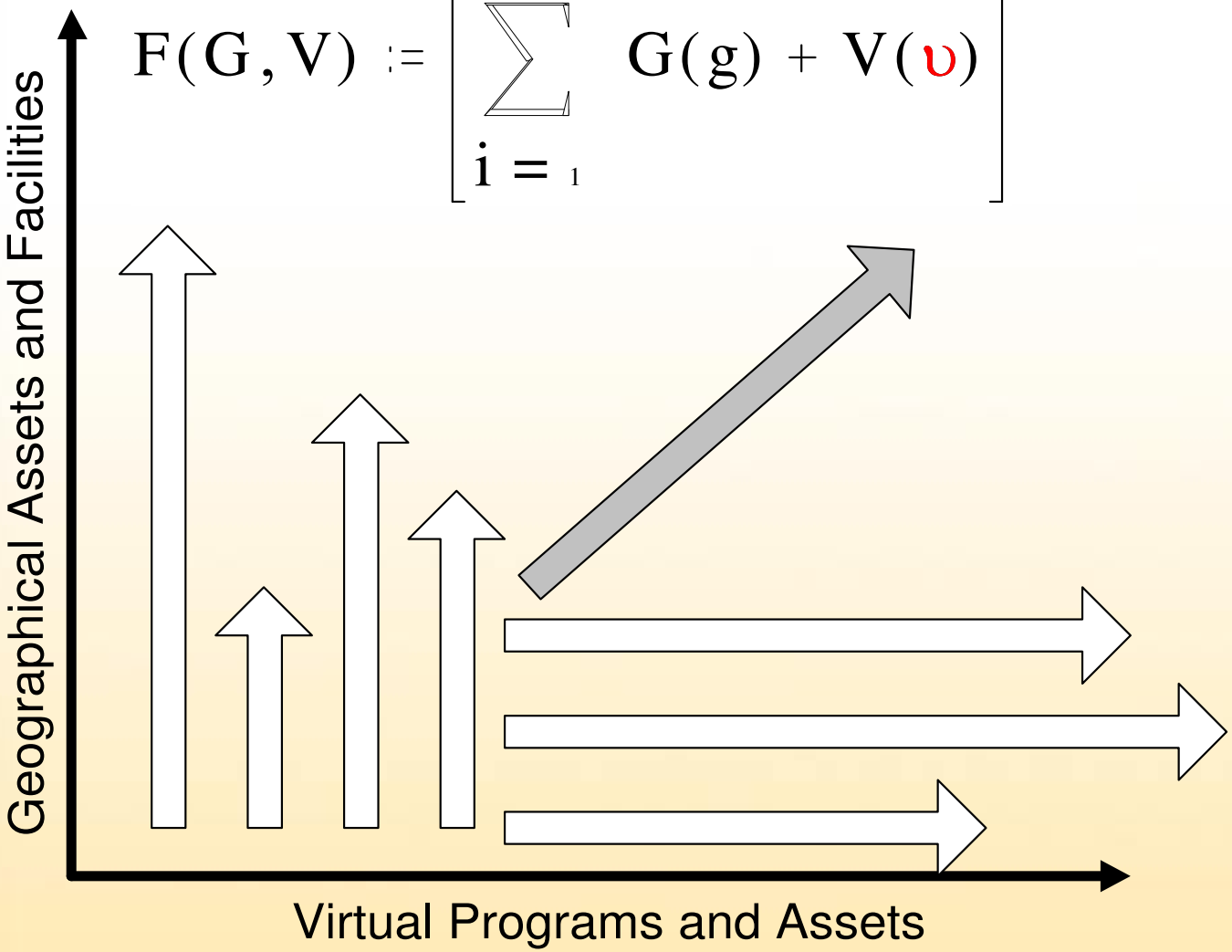




Backup

MARYLAND

Cluster Theory 101

$$F(G,V) := \left[\sum_{i=1}^{\infty} G(g) + V(\upsilon) \right]$$



MARYLAND