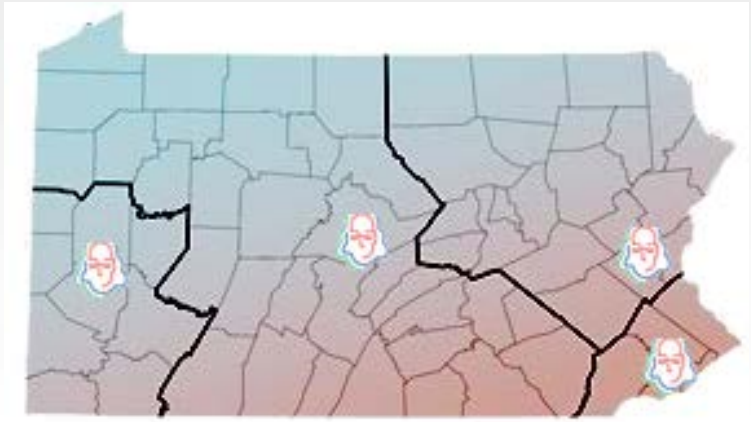
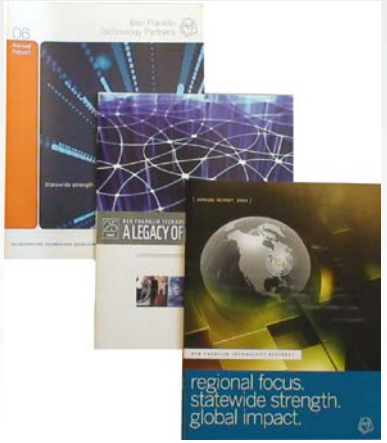
Ben Franklin Technology Partners:
Statewide Partnership…Regional Focus

Ben Franklin Technology PArtners
Southeastern Pennsylvania





Since 1982, Pennsylvania's Partners to drive technology based growth

Mission:

"…invest in the transformation of the Pennsylvania economy through *technology, innovation, & strategic partnerships* that foster a favorable business environment for high-growth companies."

Capital: *Building the Pipeline*

Ben Franklin Technology PArtners
Southeastern Pennsylvania

Q4 2011: Greater Philadelphia

BFTP/SEP 's investments represented 61% of all seed/early stage companies funded in the five county region. - **PwC MoneyTree**

Q4 2011: Nationally

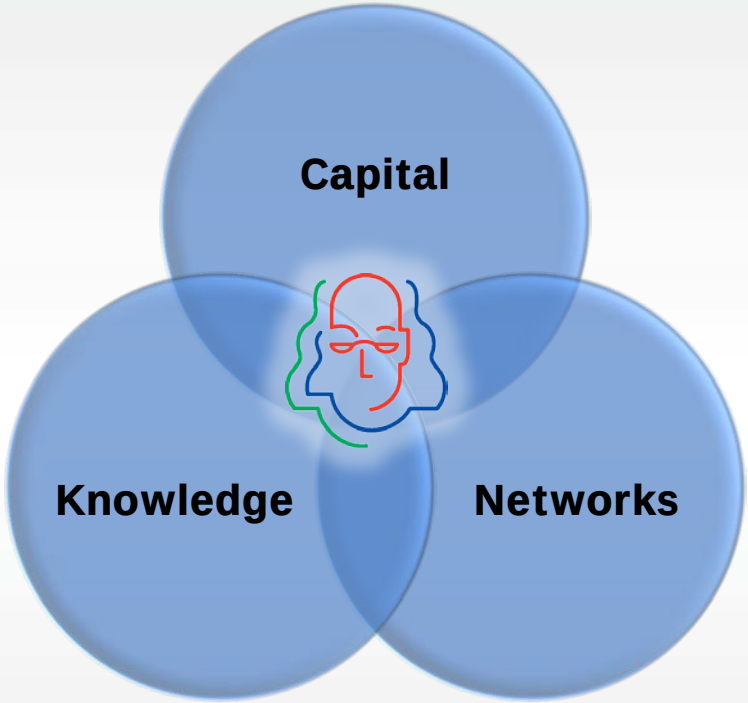
Ranked 11th by # of deals

Rank	Firm	City	Deal #
1	500 Startups	Mountain View, CA	37
2	New Enterprise Associates	Menlo Park, CA	27
3	First Round Capital	West Conshohocken, PA	20
4	Google Ventures	Mountain View, CA	17
5	Kleiner Perkins Caufield & Byers	Menlo Park, CA	17
6	Benchmark Capital	Menlo Park, CA	16
7	Bessemer Venture Partners	Larchmont, NY	16
8	True Ventures	Palo Alto, CA	16
9	Polaris Venture Partners	Waltham, MA	13
10	Battery Ventures, L.P.	Waltham, MA	12
11	**Ben Franklin Technology Partners Southeastern PA**	**Philadelphia, PA**	**12**

What We Do:

Seed, Link & Leverage Innovation Assets

Ben Franklin Technology PArtners
Southeastern Pennsylvania



=

New Companies

New Products

Jobs

Wealth

Capital:
Seeding the next crop of tech enterprises

Ben Franklin Technology PArtners
Southeastern Pennsylvania

1980's	1990's	2000's	Today

Cephalon
Acquired by Teva Pharmaceuticals

Infonautics
Nasdaq: INFO

adolor CORPORATION
Acquired by Cubist Pharmaceuticals

compoze software
Acquired by BEA Systems

morphotek
Acquired by Eisai

NuPathe
New Pathways in Neuroscience
IPO in 2010

REALWINWIN
BUILDING VALUE WITH ENERGY EFFICIENCY

NovaThermal Energy

centocor
Acquired by Johnson & Johnson

ORTHOVITA
Architects of the New Biomaterials Age

RAJANT

MODA
MOBILE DATA ACQUISITION PLATFORM

BOOMI
Acquired by Dell

ViroPharma INCORPORATED
Nasdaq: VPHM

LTC Lithium
Technology Corporation

k Technology
a division of THERMACORE

neat

HEALTH MARKET SCIENCE

anysource MEDIA

AgileSwitch

MoreCom
Acquired by Liberate (NAS:LBRT); Acquired by COMCAST

agi
Analysis software for land, sea, air, & space
Private
Bought out investors

PayQuik
Empowering Global Remittances

viridityenergy
power economics redefined

CDNOW
Never miss a beat.
Nasdaq: CDNW
Acquired by Bertelsmann

Sage
Acquired by Multex
Nasdaq: MLTX

BioNanomatrix

COATES ANALYTICS
AN AFFILIATE OF PERSHING

ClickEquations
truth in search

bulogics

InstaMed
Healthcare Payments Simplified

TicketLeap

BFTP/SEP 2000-2011

Ben Franklin Technology PArtners
Southeastern Pennsylvania

- ✓ **Committed > $55 million to over 450 early-stage companies**
- ✓ **Client companies created or retained over 3000 high-tech jobs**
- ✓ **Client companies raised more than $1B in follow-on investment**
- ✓ **University partnerships leveraged $700M into the region**
- ✓ **A lead partner in securing $130M DOE Innovation Cluster**

Knowledge: *Partnerships*

Ben Franklin Technology PArtners
Southeastern Pennsylvania

Managed Partnerships

THE NANOTECHNOLOGY INSTITUTE

BFTP/SEP,
Drexel/UPENN lead
13 partner universities
$21M PA funding
$280M leveraged
>700 IP assets
36 company spinouts

ENERGY COMMERCIALIZATION INSTITUTE

BFTP/SEP,
Drexel/UPENN, PSU lead
$2.2M PA funding
$10M leveraged

INNOVATION PARTNERSHIP
www.innovationpartnership.net

BFTPs, SBDCs, Bio Greenhouses,
Science Center, Universities, IRCs
$2M PA funding
70 SBIR/STTR awards = $18.1M

Commercialization Partnerships

TEMPLE UNIVERSITY

Pennsylvania Environmental Technologies for the Pharmaceutical Industry (PETPI)

BFTP/SEP
$1.6M PA funding

WATER AND ENVIRONMENTAL TECHNOLOGY CENTER

Temple lead
BFTP/SEP
$1M NSF funding,

Pennsylvania Green Growth Partnership

Phila U/CMU lead
BFTP/SEP, Temple, Villanova, others
$3M PA funding
Assisted 150+ companies

PHILADELPHIA UNIVERSITY 1884

Pennsylvania Advanced Textile Research & Innovation Center (PATRIC)

Phila U lead
BFTP/SEP, Drexel
$1.2M PA funding

Translational Research Partnerships

QED Program
PROOF OF CONCEPT FUNDING

Science Center
9 companies funded

FOX CHASE CANCER CENTER

Fox Chase Innovators Fund

Drexel UNIVERSITY

Health Innovation Partnership (HIP)

WALLACE H. COULTER Foundation

Drexel
Funded 10+ companies

Knowledge: *Nanotechnology Institute*

Ben Franklin Technology PArtners
Southeastern Pennsylvania

- **Nation's first, organized, regional partnership to accelerate nano commercialization**
- **Ben Franklin, the University of Pennsylvania, & Drexel University founders**
- **13 Member Institutions**
  - University of Pennsylvania
  - Drexel University
  - Children's Hospital of Philadelphia
  - Fox Chase Cancer Center
  - Harrisburg University of Science & Technology
  - Lehigh University
  - Millersville State
  - Philadelphia University
  - Temple University
  - Thomas Jefferson University
  - University of the Sciences
  - Villanova University
  - Widener University

Direct Impact Since Inception

Category		2000 - 2007	2008-2010	Total Since Inception
IP Assets	New Disclosures	169*	215	740
	Patent Applications		180	
	Issued Patents		21	
Licenses (including Option)		12	26	48
Start-Up/Spin-Out		11	14	31
Jobs Created/Retained		NR**	132	>150
Businesses Assisted		NR	43	60
Follow-on Funding/Leverage		$160M	$95.6M	$280M

The NTI's Unique Legal Agreements

Ben Franklin Technology PArtners
Southeastern Pennsylvania

- Common CDA-both Individual and Corporate
- NanoCommercialization Group
- Collaboration Agreement--MOU on Intellectual Property
  - Governance
  - Invention and License Procedures
  - Joinder Agreement
  - Inter-Institutional Agreement
  - Revenue Sharing Agreement

NTI's Impact: The Model Works

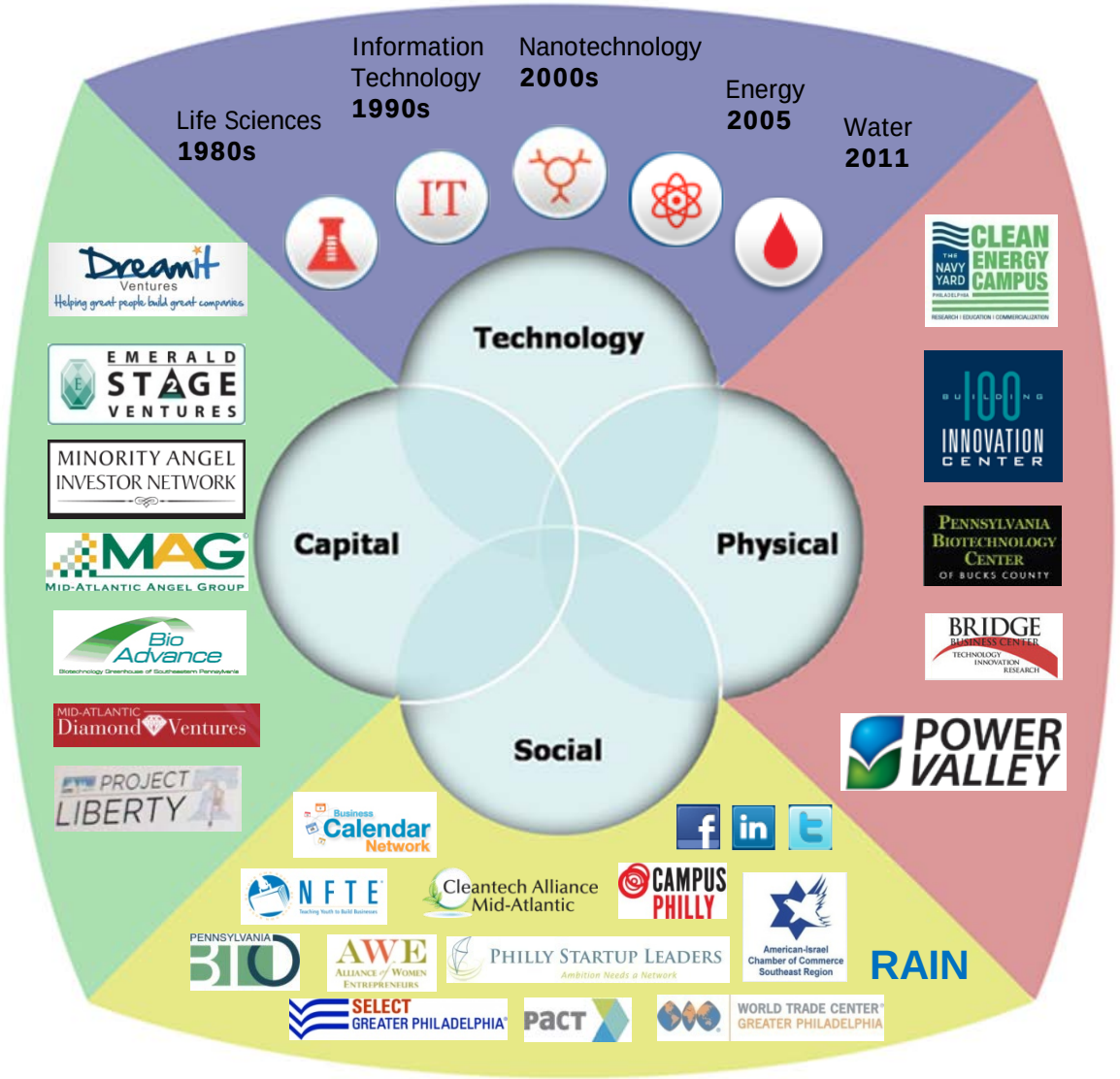
Comparison with National Proof-of-Concept Centers

Ben Franklin Technology PArtners
Southeastern Pennsylvania

	Von Liebig Center	MIT Deshpande Center	NTI
Location / affiliation	Jacobs School of Engineering, UCSD	School of Engineering, MIT	13 Southeastern PA Research Institutions + BFTP/SEP
Initial funding	$10,000,000	$17,500,000	$9,000,000
Source	Gift from the von Liebig Foundation	Gift from Jaishree and Guraraj Deshpande	PA Department of Community and Economic Development
Grant sizes	Seed Grants: $15,000 - $50,000	Ignition Grants: up to $50,000; Innovation Grants: up to $250,000	Up to $120,000 for individual projects; $750,000 for multi-institutional projects
Number of funded proposals	82	80	116
Total amount of grants awarded	$4,600,000	$11,000,000	$16,744,492
Number of licenses	>6	>20	48
Number of start-ups	26	23	31
Number of jobs created / retained	>180	>400	>130

Networks: *Strengthening the Region's Innovation Infrastructure*

Ben Franklin Technology PArtners
Southeastern Pennsylvania



National Nanomanufacturing Network

InterNano

Panel Session: Forward Looking Problem Solving, Improved Models, and Policy and Legislative Proposals

Jeffrey Morse
National Nanomanufacturing Network
University of Massachusetts Amherst

Panelists:
Deb Newberry, Dakota County Technical College
Rick Pleus, Intertox
Mujdat Karatas, INSCX
Matt Laudon, NSTI
Tony Green, Ben Franklin Partnership
Ross Kozarsky, Lux Research

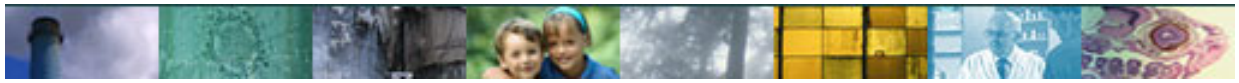
National Nanomanufacturing Network

InterNano

How do we go forward from here?

- Roadmapping RSLs
  - -information and analysis
    - -aggregated annual performance data on RSLs
    - -the good, the bad and the ugly
    - -develop and refine models
  - -what are the gaps?
    - -consistently diversified RSL models
    - -geography and industry sector considerations
    - -beyond nano for effective RSLs
  - -future opportunities
    - -NNMI, where's the Nano?
    - -sustainability, value propositions
  - -Policy and Legislative
    - -lead by example
    - -proactive and responsible

Addressing the Need For Reliable Toxicological Information



Regional, State, & Local Initiatives in Nanotechnology Workshop
1-2 May 2012

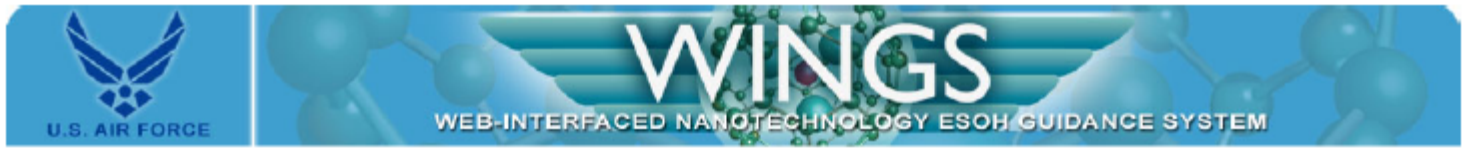
Portland, OR

Richard C. Pleus, Ph.D.
Intertox, Inc.
Seattle, WA

Needs

1. EHS is a critical component of global commerce.
2. We need reliable scientific data to make informed decisions.
3. We development of these data to be timely, cost-effective, and responsive to commerce.

MCDA Web Interface



Multi Component Decision Analysis

A tutorial on using the MCDA Tool can be found here

Material Information

1. Nanomaterial: Carbon Nanotubes
2. Lifecycle Stage: Technology Development
3. Product, Part Number, or Case Number: Luna #1881-01
4. Exposure Site Scored: Luna, Blacksburg VA
5. Other Comments: Composites Lab Manufacture of panels for program H00147-09-C-7010

MCDA Web Interface

1. Waste volume <1 kg/year

2. Disposal method Landfilling

Potential for exposure to sensitive receptors 3.2

3. Biodegradeable Yes, slightly

4. Soluable in water Yes, slightly (very biodegredable)

5. Bioaccumulative Don't know

6. Leaching potential Leaches

7. Potential for material wear/degradation that releases particulate Extremely likely

Relative environmental toxicity of bulk material 3.3

1. Acute aquatic toxicity of bulk material Green algae LC50 or Daphnia magna LC50 or Fathead minnow LC50 >10-100 ppm

2. Acute terrestrial toxicity of bulk material Meadow vole LD50 >500-2000 mg/kg or American robin LD50 >500-2000 mg/kg

Submit

NanoIntegris

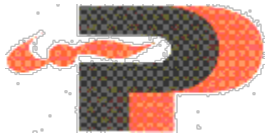
Continental Carbon Nanotechnologies, Inc.

nano-c® nanostructured carbon materials that power our world

ANGSTRON MATERIALS

Solid Carbon Products

Hanwha Nanotech



SWeNT

NANO LAB

NANOSHEL Creating Miracles in Black

Unidym Carbon for Electronics

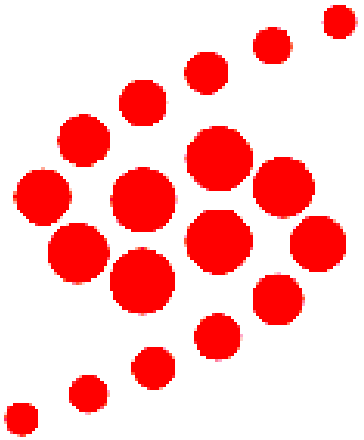
CheapTubes.com

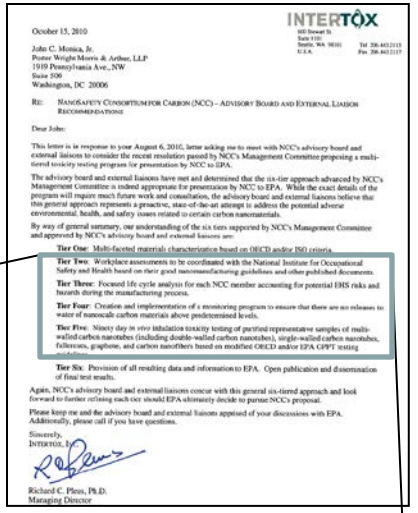
ASI

- http://www.nanosafetyconsortium.com/home.h

Purpose

- NCC's initial purpose is to address global legal, regulatory, environmental, health, and safety ("EHS") issues related to the responsible commercialization of its members' nano-related products.





October 15, 2010

John C. Monica, Jr.
Porter Wright Morris & Arthur, LLP
1919 Pennsylvania Ave., NW
Suite 500
Washington, DC 20006

RE: NANOSAFETY CONSORTIUM FOR CARBON (NCC) – ADVISORY BOARD AND EXTERNAL LIAISON RECOMMENDATIONS

Dear John:

This letter is in response to your August 6, 2010, letter asking me to meet with NCC's advisory board and external liaisons to consider the recent resolution passed by NCC's Management Committee proposing a multi-tiered toxicity testing program for presentation by NCC to EPA.

The advisory board and external liaisons have met and determined that the six-tier approach advanced by NCC's Management Committee is indeed appropriate for presentation by NCC to EPA. While the exact details of the program will require much future work and consultation, the advisory board and external liaisons believe that this general approach represents a proactive, state-of-the-art attempt to address the potential adverse environmental, health, and safety issues related to certain carbon nanomaterials.

By way of general summary, our understanding of the six tiers supported by NCC's Management Committee and approved by NCC's advisory board and external liaisons are:

Tier One: Multi-faceted materials characterization based on OECD and/or ISO criteria.

Tier Two: Workplace assessments to be coordinated with the National Institute for Occupational Safety and Health based on their good nanomanufacturing guidelines and other published documents.

Tier Three: Focused life cycle analysis for each NCC member accounting for potential EHS risks and hazards during the manufacturing process.

Tier Four: Creation and implementation of a monitoring program to ensure that there are no releases to water of nanoscale carbon materials above predetermined levels.

Tier Five: Ninety day *in vivo* inhalation toxicity testing of purified representative samples of multi-walled carbon nanotubes (including double-walled carbon nanotubes), single-walled carbon nanotubes, fullerenes, graphene, and carbon nanofibers based on modified OECD and/or EPA OPPT testing guidelines.

Tier Six: Provision of all resulting data and information to EPA. Open publication and dissemination of final test results.

Again, NCC's advisory board and external liaisons concur with this general six-tiered approach and look forward to further refining each tier should EPA ultimately decide to pursue NCC's proposal.

Please keep me and the advisory board and external liaisons appraised of your discussions with EPA. Additionally, please call if you have questions.

Sincerely,
INTERTOX, Inc.

Richard C. Pleus, Ph.D.
Managing Director

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Advisory Board

Nanotechnology Industries Association

Dr. Steffi Friedrichs

Dr. Bettye Maddux

Dr. Jeffrey Morse

Dr. Günter Oberdörster

Dr. Kent Pinkerton

Dr. Mark Tuominen

External Liaisons

National Institute for Occupational Safety and Health
NIOSH

NIST
National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

ERDC
US Army Engineer Research and Development Center

Dr. Vince Castranova

Dr. Chuck Geraci

Dr. Jeffrey A. Fagan

Dr. Laurie Locascio

Dr. Jeffery A. Steevens

Dr. Anthony Bednar

Dr. Mark Chappell

Dr. Alan Kennedy

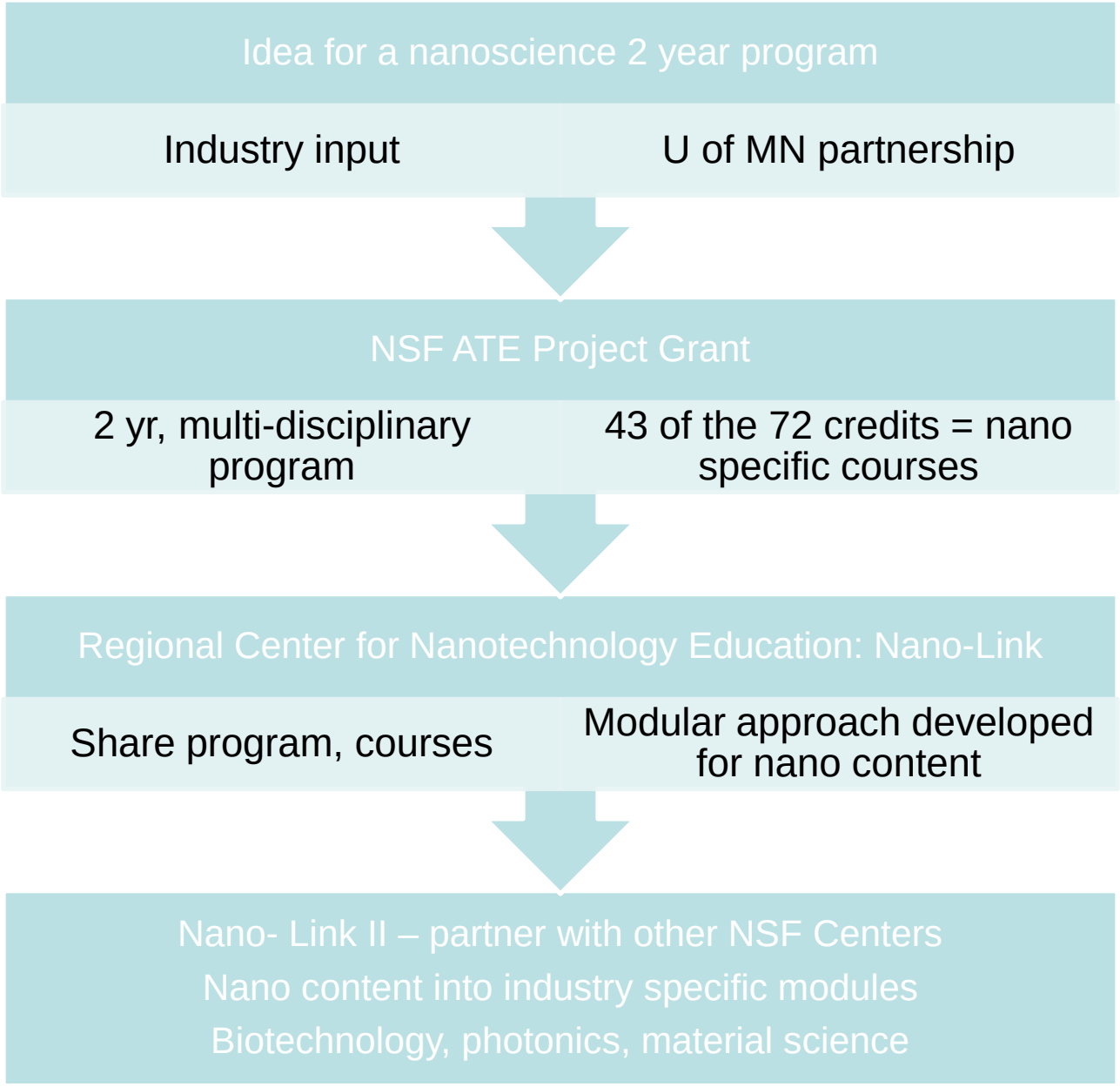
Observations and Thoughts

Deb Newberry

Dakota County Technical College

Nano-Link: Regional Center for Nanotechnology Education

dmnewberry2001@yahoo.com


Idea for a nanoscience 2 year program
Industry input
U of MN partnership
NSF ATE Project Grant
2 yr, multi-disciplinary program
43 of the 72 credits = nano specific courses
Regional Center for Nanotechnology Education: Nano-Link
Share program, courses
Modular approach developed for nano content
Nano- Link II – partner with other NSF Centers
Nano content into industry specific modules
Biotechnology, photonics, material science

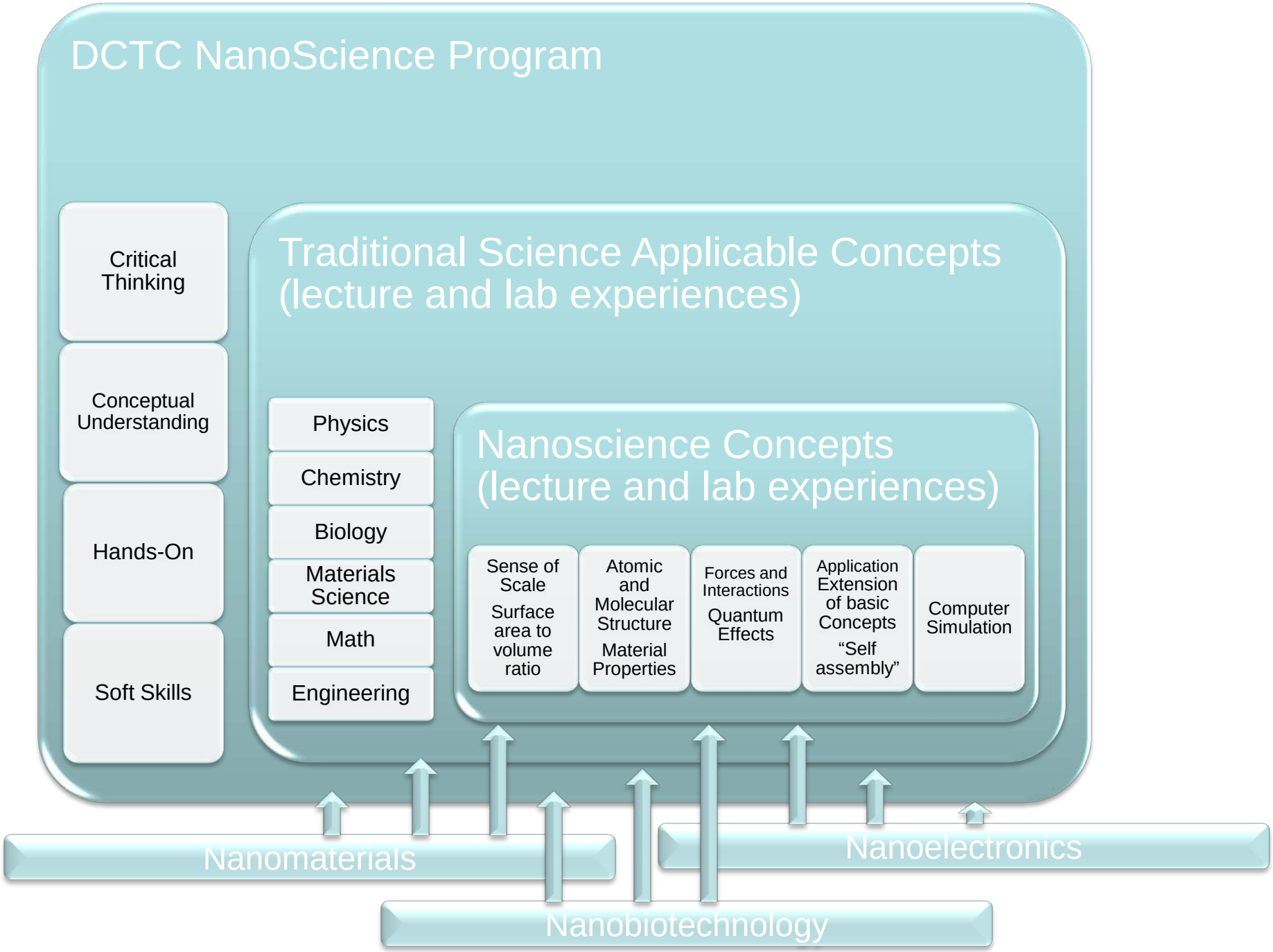
Dakota County Technical College
Nanoscience Technology Program Course Outline and Credit Allocation

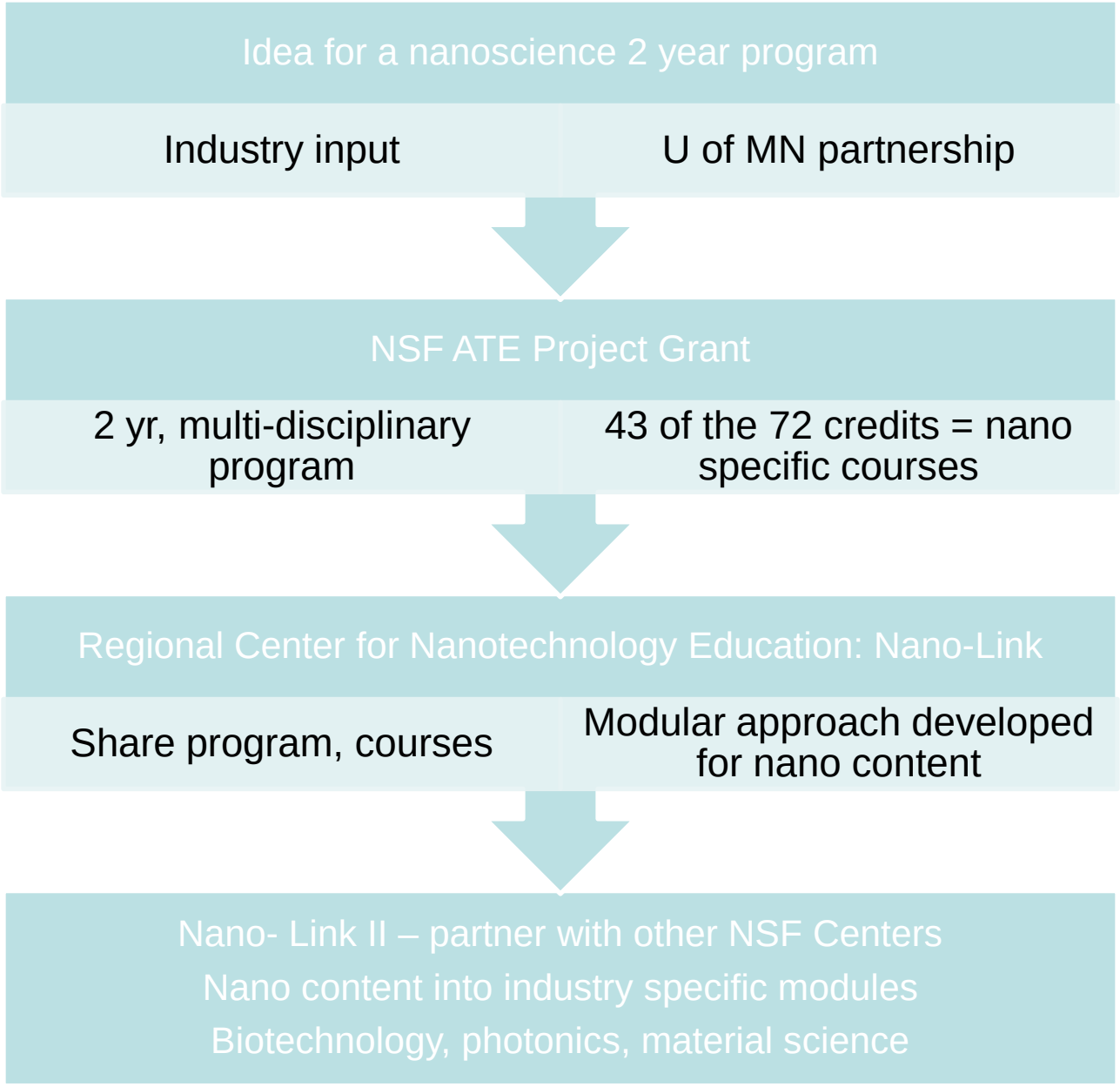
rev. 2011

Semester 1 at DCTC			Semester 2 at DCTC			Semester 3 at DCTC			Semester 4 at		
Course	Name	Credits	Course	Name	Credits	Course	Name	Credits	Course	Name	Credits
BIOL 1500	General Biology	4	CHEM 1500	Introduction to Chemistry	4	NANO 2101	Nano Electronics	3	MT 3111	Elem. of Micro Manufacturing	3
PHYS 1100	College Physics I	4	PHYS 1200	College Physics II	4	NANO 2111	Nanobiotechnology/ Agriculture	3	MT 3112	Elem. of Micro Mfg Lab	1
			NANO 1211	Student Research	3	NANO 2121	Nanomaterials	3	MT 3121	Thin Films Deposition	3
ENGL 1100	Writing & Research Skills	3	SPEE 1020	Interpersonal Communication	3	NANO 2131	Manufacturing, Quality Assurance	2	MT 3131	Intro to Materials Characterization	3
MATS 1300	College Algebra	4	MATS 1250	Principles of Statistical Analysis	4	NANO 2140	Interdisciplinary Lab	3	MT 3132	Materials Characterization Lab	1
NANO 1100	Fund. of Nano I	3	NANO 1200	Fund of Nano II	3	NANO 2151	Career Planning and Industry	1	MT 3141	Principles and Applications of Bionanotechnology	3
			NANO 1210	Computer Simulation	1				MT 3142	Nanoparticles & Biotechnology Lab	1
									NANO 2970	Internship	2
Credits		13 to 21	Credits		19	Credits		15	Credits		17

DAKOTA COUNTY
TECHNICAL COLLEGE

72 Credit program,
43 credits nano-specific courses


DCTC NanoScience Program
Critical Thinking
Conceptual Understanding
Hands-On
Soft Skills
Traditional Science Applicable Concepts (lecture and lab experiences)
Physics
Chemistry
Biology
Materials Science
Math
Engineering
Nanoscience Concepts (lecture and lab experiences)
Sense of Scale
Surface area to volume ratio
Atomic and Molecular Structure
Material Properties
Forces and Interactions
Quantum Effects
Application Extension of basic Concepts
"Self assembly"
Computer Simulation
Nanomaterials
Nanoelectronics
Nanobiotechnology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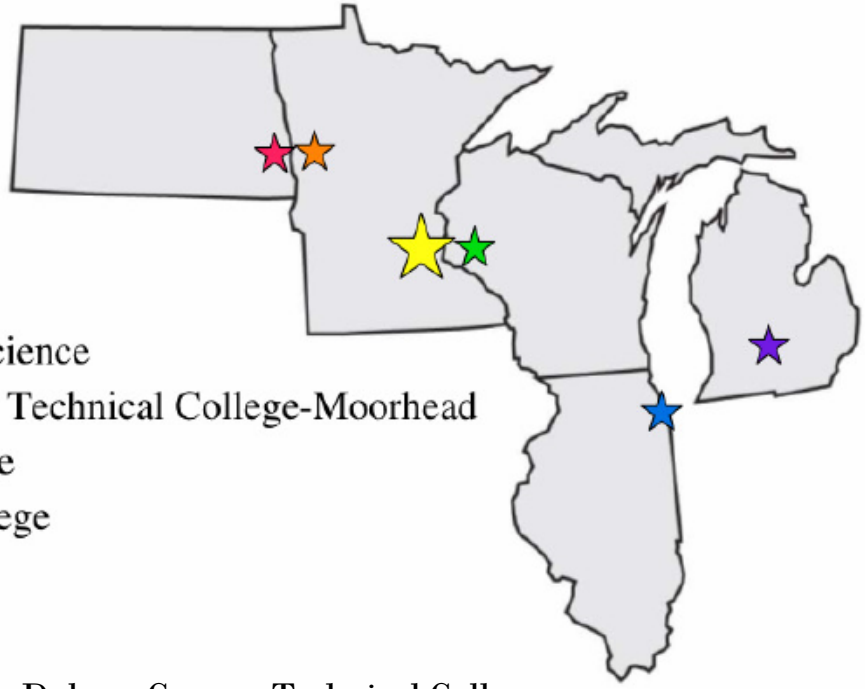
Nano-Link

Midwest Regional Center for Nanotechnology Education

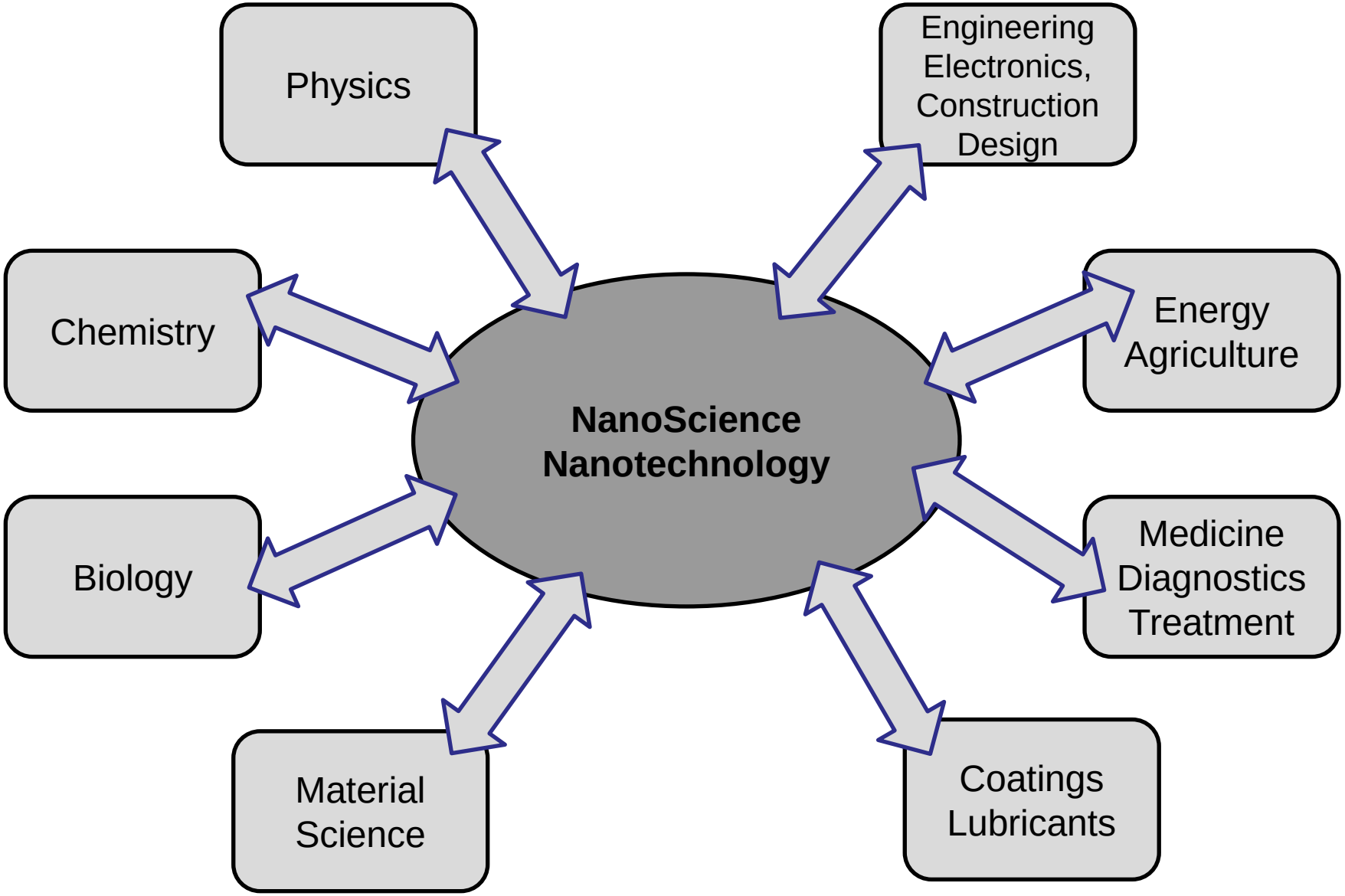


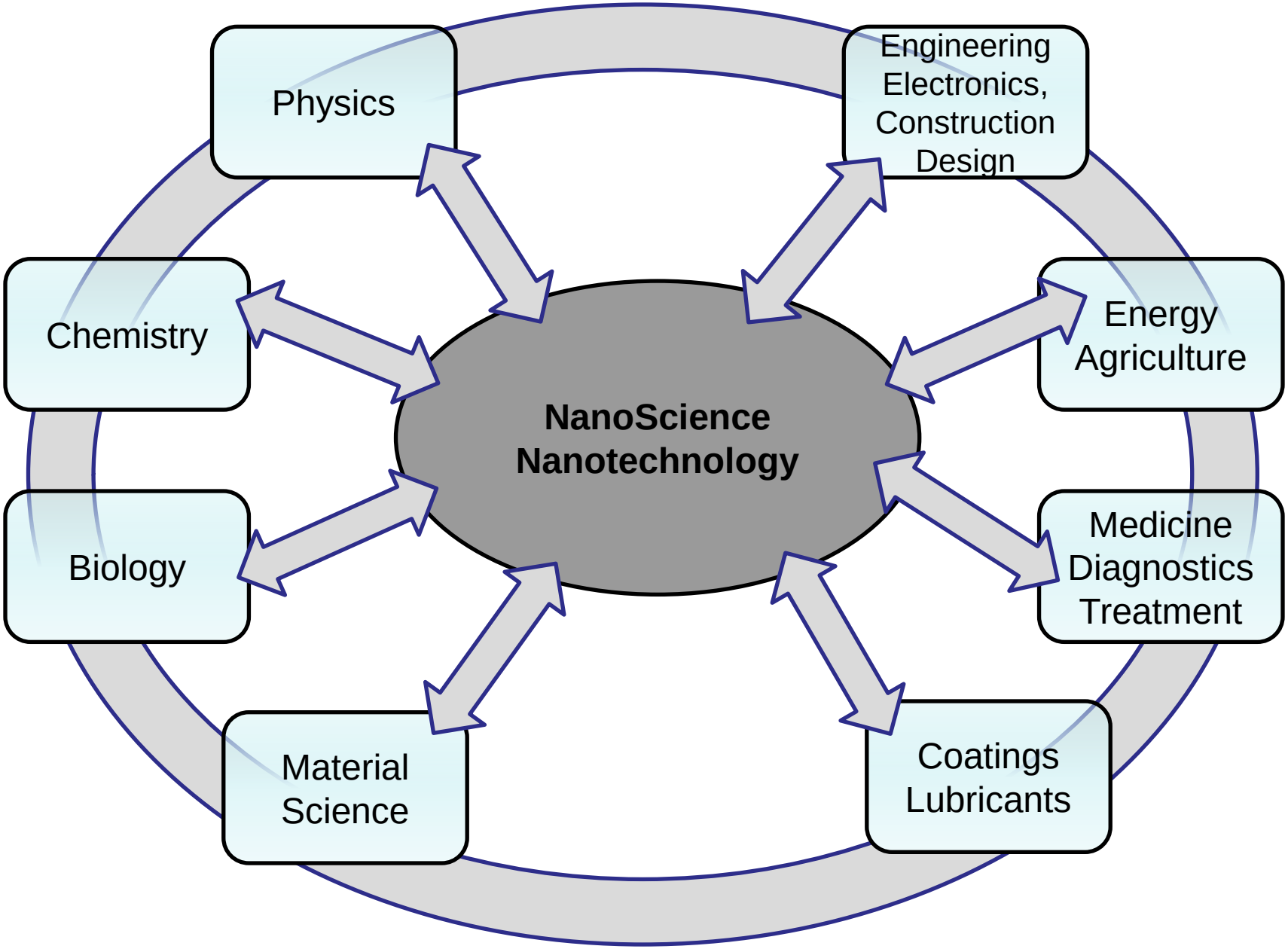
- North Dakota State College of Science
- Minnesota State Community and Technical College-Moorhead
- Dakota County Technical College
- Chippewa Valley Technical College
- William Rainey Harper College
- Lansing Community College

Lead Institution: Dakota County Technical College
University Partner: University of Minnesota
PI: Deb Newberry deb.newberry@dctc.edu

>150 AAS degrees – all employed or seeking higher degree
70+ involved company reps
>500 high school educators trained
> 10,000 high school students reached

NSF


Physics
Engineering
Electronics,
Construction
Design
Chemistry
Energy
Agriculture
NanoScience
Nanotechnology
Biology
Medicine
Diagnostics
Treatment
Material
Science
Coatings
Lubricants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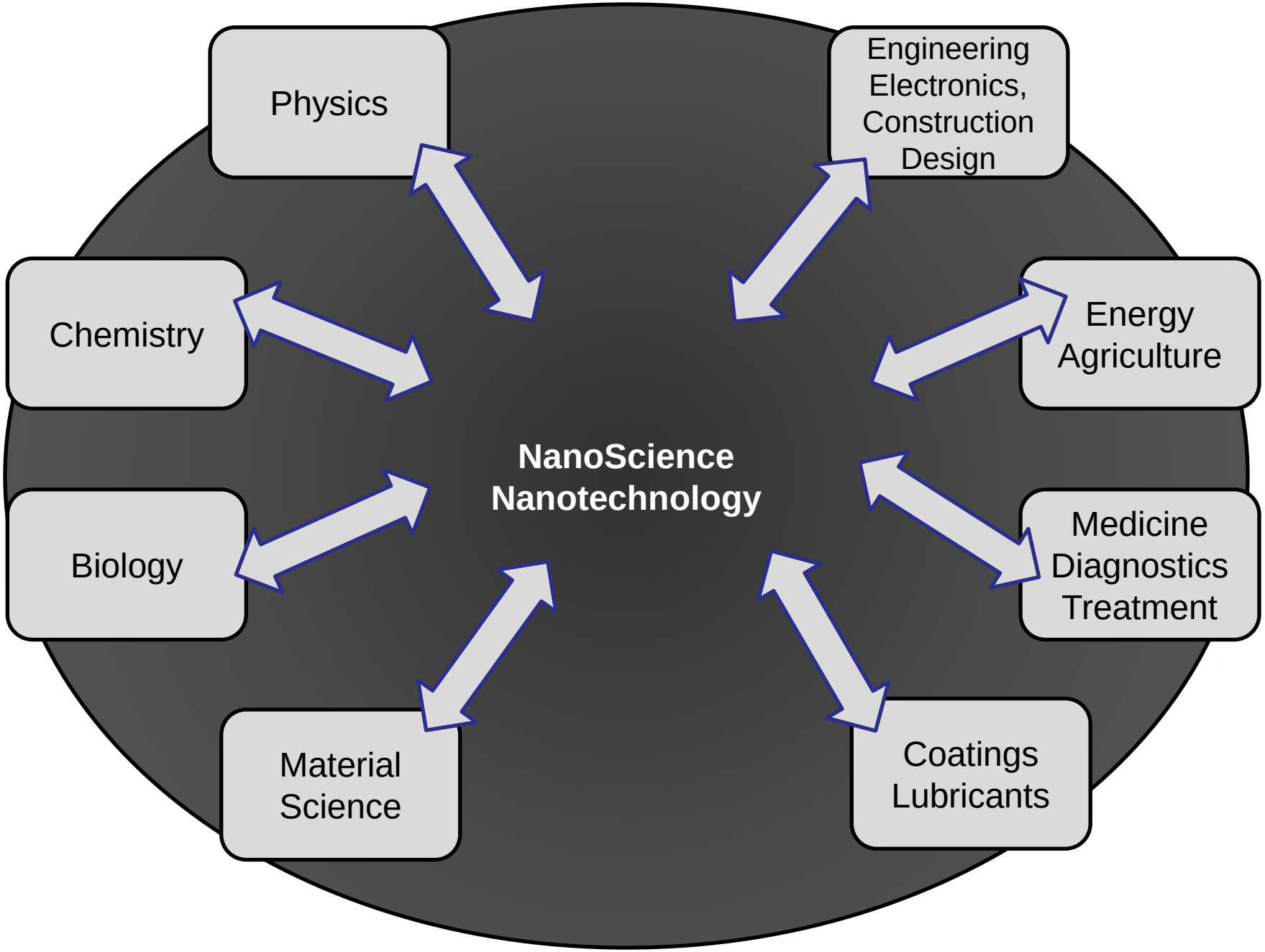
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Coatings
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We need to take advantage of this…..

…..evolution…
…….morphing……

Multi-disciplinary aspect of nanotechnology……..

Industry and Educators
They don't know what they don't know…….
Plus they may be afraid

- Assumptions……..
  - Companies are aware of nanoscience/technology
  - Companies know how nano will impact their products and market segments
  - Companies are aware of the new knowledge their employees need
  - Educators are excited about nanotechnology
  - Educators know how nano concepts fit into their curriculum and relate to education standards
  - Educators can find the nano information and activities that they need
- WRONG!!!!!!!!!

Nano-Link Response

- Tutorial “Nano Summits” for industry
- Hand held, individualized, guided, comprehensive educator training and material
- Partnerships with Science museums, public speaking in civic orgs

What is needed – Newberry thoughts

- For companies – we need to teach them (near term)
- Simple, generic info… on nano.gov (?)
  - Single, cohesive “Intro to Nano” ppt
  - Easily tailored
  - Case studies, stories, examples, directories, mentors
  - Broadly used – trade shows, ref in ads in trade magazines
  - Get expert led students in nano programs to write market assessment columns for trade journals

- For educators - formal – we need to help them
  - Easily understood - nano based standards
  - Hand hold them and guide them in integration of nano content
  - Cohesive, complete, rated repository of educational content

- For the public - informal
  - Support museums (NISEnet)
  - Multiple venues