First Step Toward Commercialization: Fund the R&D

SBIR/STTR
Small Business Innovation Research Program

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What is the SBIR Program?
- Small Business Innovation Research
- Highly competitive
- Three-phase award system
  - $850,000 over ~ 3 years
- Provides small businesses the opportunity to propose innovative ideas that meet federal R&D needs

What is STTR?
- Small Business Technology Transfer Program
- Cooperative R&D between a small business and research institution
  - Entrepreneurial skills
  +
  - High-tech research efforts
Reasons to Be Interested in SBIR

- Funding for high-risk R&D
- Verification of innovative technology
  - Peer reviewed (1 in 10 funded at Phase I)
  - Reduces technological risk for investors

Reasons to Be Interested in STTR

- A great vehicle for faculty working with companies or starting companies
- More flexible than SBIR
  - Collaboration between company and research institution
    » PI can come from university or company
  - Works with an academic schedule
History of SBIR Program

- 1982 - Congress passed the Small Business Innovation Development Act
  - $44.5 million awarded FY 82
- 1986 - Reauthorization
- 1992 - Congress extended SBIR, created STTR
- 2000 - Renewal through FY 2008
  - Over $2.2B awarded FY 2007

Reasons to Be Interested in SBIR

- Builds value in your business
  - Not equity or loan
    » Grants and contracts
  - Develop Intellectual assets
  - Retain intellectual property and commercialization rights
  - Royalties, new venture partnerships
Three Phases of SBIR/STTR

- **Phase I**: Scientific and technical feasibility
  - (SBIR: 6 months/STTR: 12 months)
- **Phase II**: Concept refinement, generally leading to prototype
  - (2 years)
- **Phase III**: Commercialization
  (non-SBIR funded phase)

SBA Monitors, Coordinates and Reports to Congress

- Federal agencies participating in SBIR have individual agency responsibility for:
  - (a) selecting SBIR topics
  - (b) releasing SBIR solicitations
  - (c) evaluating SBIR proposals
  - (d) awarding SBIR funding agreements on a competitive basis
Eligibility for SBIR/STTR

- American-owned, independently operated
- For-Profit business fewer than 500 employees
- Not dominant in the proposed field of operation
- PI employed by the business over 50% time
  - For SBIR; STTR depends on the agency
- Research direction must be controlled by the SBIR grantee - facilities

Comparative Number of SBIR Awards

- Department of Defense 3,248
- Health and Human Services 1,898
- National Aeronautics and Space Administration 440
- Department of Energy 369
- National Science Foundation 340
- Department of Agriculture 133
- Homeland Security 68
- Department of Commerce 35
- Environmental Protection Agency 52
- Department of Transportation 21
Contract vs. Grant Agencies

Contracts:
- Dept. of Defense
- NASA
- Dept. of Energy
- Homeland Security
- Dept. of Education
- NIH (5%)
- Dept. of Transportation

Grants:
- HHS (primarily NIH) (95%)
- National Science Foundation
- Environmental Protection Agency
- Dept. of Commerce
- Dept. of Agriculture

NYS History with SBIR 1983-2002

New York Companies received:
- 1,949 Phase I awards
  » $132,673,460
- 700 Phase II awards
  » $355,042,509
- Total awards = $487,715,969
NYS History with SBIR

- **FY 95:**
  - $94,577,311
  - Second highest award year
- **2004:**
  - ~$100,000 – highest awards
- **Average annual current awards**
  - $80-85 million

Why Should NYS be Involved?

- Every $1 spent by the state on SBIR support programs generates $10 federal
- Every $1 federal spent through the SBIR program generates $60 in the commercial market (when the technology is commercialized)
**Why Should NYS be Involved?**
- Technology-based companies (TBCs) relocate by “shopping” for states based on perceptions about how friendly they are to TBCs.
- TBCs attend National SBIR conferences and ask state representatives about programs for SBIR awardees.
- Being on a list for having an SBIR program identifies a state as being “technology-friendly.”

**What does SBIR/STTR fund?**
- Exploitation of scientific breakthroughs.
- Innovative use of emerging technologies.
- New application or major improvements to existing technologies.
11 Agencies Offer SBIR and 5 Largest Offer STTR Awards

- Department of Defense - also STTR
- Department of Energy - also STTR
- Department of Homeland Security
- Health and Human Services -
  - National Institutes of Health - also STTR
  - Health Care Financing Administration
- National Aeronautics and Space Administration - also STTR
- National Science Foundation - also STTR

5 Agencies Offer Only SBIR

- Department of Agriculture
- Department of Commerce
- Department of Education
- Department of Transportation
- Environmental Protection Agency
SBIR “Innovation” Model

Phase I
Feasibility Research

Phase II
Research toward Prototype

Phase III
Product Development to Commercial Market

Federal Investment

Private Sector Investment

STTR “Innovation” Model

Phase I
Feasibility Research

Phase II
Research toward Prototype

Phase III
Product Development to Commercial Market

Federal Investment

Private Sector Investment

Taxes
NSF SBIR Program

- NSF Emphasizes
  - High-risk, high-payback innovations rather than evolutionary advances
  - Proposals that tie to NSF’s mission: advancements in science, engineering, and education
  - Commercial potential

Program Information

Doing Business with NSF

- NSF is not the Final Customer
- NSF is not buying product/process or software or intellectual property
- NSF wants to see grantees to successfully commercialize high-tech research
- Investment $ beyond NSF SBIR is needed
Nanotechnology Thrusts at NSF

- Synthesis, fabrication and processing of nanostructures
- Materials, devices, systems and architectures
  - Techniques for processing and converting molecules and nanoprecursors into functional nanostructures, nanostructured materials, nanocomponents and nanodevices
- Nanomanufacturing
  - Techniques for synthesis and scale-up of structures, devices and systems employing nanostructured materials and processes with nanoscale control

Major Product Areas Funded

- Nanoparticle composites
- Nanofilter membranes
- Nanocrystalline coatings
- Nanobiomaterials
- Nanoelectronics
- Nanophotonics
- Nanomagnetics
- Nanomanufacturing
Topics Related to Nanotechnology from NSF

- Nanostructured WC/Co Coatings for Enhanced Wear Resistance Applications
- Novel Wafer Fabrication Technology for Semiconductor Sensors
- Novel OptoCeramic Materials for High Efficiency Ceramic Lasers
- Millimeter Wave Transceivers on Large Metamorphic Wafers

Topics Related to Nanotechnology from DOD

- Microfluidic Optical Biosensor for Detection of Biowarfare Agents (STTR - Army)
- nanoFET Satellite Propulsion System for Defensive Counter Space (STTR - Air Force)
- Nanocomposite thin films for capacitors (SBIR - OSD)
- Solid State Hypergolic Chemical Leak Detector (SBIR-MDA)
- Explosives Detection in Residential Building Ventilation Systems (SBIR-DARPA)
Topics Related to Nanotechnology from NIH

- Bioengineering Nanotechnology Initiative (STTR)
- Development of Anti-Cancer Agents
- Antibody Array for Cancer
- Glycan Arrays for Biomarker Discovery and Validation
- Early Diagnostics Using Nanotechnology-Based Imaging and Sensing
- Multifunctional Therapeutics Based on Nanotechnology

Topics Related to Nanotechnology from NASA

- Novel Solar Cell Nanotechnology for Improved Efficiency and Radiation Hardness
- A Nanotechnology Approach to Lightweight Multifunctional Polyethylene Composite Materials for Use Against the Space Environment
- Thermal Management of Solid-State Devices Using Nanotechnology
- High-Performance Carbon Nanotube-Based Composites
- Manufacturing Technologies for Human and Robotic Space Exploration
Topics Related to Nanotechnology from DoE

- Nanomaterials for Industrial and Building Applications
- Nanotechnology Applications in Electronics, Sensors, and Controls
- Nanotechnology Applications in Renewable Energy Conversion
- Nanomaterials for Lithium-Ion Batteries Used in Energy Storage

Other Agencies With Topics Related to Nanotechnology

- Environmental Protection Agency - EPA
- Homeland Security - HSARPA
- Department of Commerce – NIST
- Department of Agriculture - Plant Production and Protection – Engineering; Air, Water and Soil; Food Science and Nutrition; Industrial Applications
- Department of Transportation - Nanotechnology tools for Internal Corrosion of Pipelines
Nanotechnology Priority Research Needs

2007

Instrumentation, Metrology, and Analytical Methods

- Develop methods to detect nanomaterials in biological matrices, the environment, and the workplace.

- Understand how chemical and physical modifications affect the properties of nanomaterials.
Instrumentation, Metrology, and Analytical Methods

3. Develop methods for standardizing assessment of particle size, size distribution, shape, structure, and surface area.

4. Develop certified reference materials for chemical and physical characterization of nanomaterials.

5. Develop methods to characterize a nanomaterial’s spatio-chemical composition, purity, and heterogeneity.

Nanomaterials and Human Health

- Overarching Research:

  Priority: Understand generalizable characteristics of nanomaterials in relation to toxicity in biological systems.
Nanomaterials and Human Health - Broad Research Needs

- Develop methods to quantify and characterize exposure to nanomaterials and characterize nanomaterials in biological matrices.

- Understand the absorption and transport of nanomaterials throughout the human body.

- Establish the relationship between the properties of nanomaterials and uptake via the respiratory or digestive tracts or through the eyes or skin, and assess body burden.

Nanomaterials and Human Health

- Determine the mechanisms of interaction between nanomaterials and the body at the molecular, cellular, and tissular levels.

- Identify or develop appropriate *in vitro* and *in vivo* assays/models to predict *in vivo* human responses to nanomaterials exposure.
Nanomaterials and the Environment

- Understand the effects of engineered nanomaterials in individuals of a species and the applicability of testing schemes to measure effects.
- Understand environmental exposures through identification of principle sources of exposure and exposure routes.
- Evaluate abiotic and ecosystem-wide effects.
- Determine factors affecting the environmental transport of nanomaterials.
- Understand the transformation of nanomaterials under different environmental conditions.

Health and Environmental Exposure Assessment

- Characterize exposures among workers.
- Identify population groups and environments exposed to engineered nanoscale materials.
- Characterize exposure to the general population from industrial processes and industrial and consumer products containing nanomaterials.
- Characterize health of exposed populations and environments.
- Understand workplace processes and factors that determine exposure to nanomaterials.
**Risk Management Methods**

- Understand and develop best workplace practices, processes, and environmental exposure controls.
- Examine product or material life cycle to inform risk reduction decisions.
- Develop risk characterization information to determine and classify nanomaterials based on physical or chemical properties.
- Develop nanomaterial-use and safety-incident trend information to help focus risk management efforts.
- Develop specific risk communication approaches and materials.

**What to Ask About SBIR/STTR**

- **How Do I Apply?**
- **What Do I Need To Know About Writing the Proposal?**
- **ANSWER: Read the Guidelines**
SBIR/STTR APPLICATION PROCESS

How Do I Apply?

- Identify Topics
- Contact Agencies
- Prepare the Proposal
- Follow Up
- Resubmit

Preparing to Sell Your Idea

- Homework - Search the Literature
- Know how your approach is different from competing technologies
- Evaluate the topic “fit”
**How Do I Apply?**

1. Identify topics funded by each agency that relate to your company’s R&D interest:

   http://www.sbirworld.com/

2. Review Solicitation information:
   - Presolicitation preparation and contacts
   - SBIR/STTR Solicitation Schedules
   - Guidelines
     » Requirements - technical and personnel
     » Award amounts, application details
   - Research funded in the past
   - Sample or model proposals
How Do I Apply?

3. Contact each agency

Treat each agency as you would treat any customer - “market to them”

Learn why the agency is funding the topic

Preparing a Phase I Proposal

- Read (and follow) the Guidelines
- No more than 25 pages for Phase I
- Elements of the Application
  - Abstract
  - Technical Description and Work Plan
  - Personnel and Facilities
  - Budget and Justification
  - Commercial potential
Why SBIR/STTR Proposals Win and Lose

Basic Requirements to Win:
- Follow guidelines
- Title indicates important problem area
- Initial appearance favorable
- Important problem
- Quality proposal upon careful reading

(continued):
- Commercial applications
- Related research
- Qualifications of PI, Consultants, Sub-contracts
- Facilities and equipment
- Budget and justification
Commercial Applications

- Persuade the reviewer that commercial market exists
- Provide detailed supporting statements
- Demonstrate knowledge of the commercial area
- Think creatively about possible applications

Commercial Applications

- Concisely describe the plan to commercialize
- Describe previous success in converting R&D into new products
- Focus on large potential markets
- Include government applications
Description of Commercial Potential

- Significant competitive advantages the new technology has over the existing in:
  - Major competitive products
  - Application
  - Performance
  - Technique
  - Efficiency
  - Cost
- Your plan to move from research to market

What the Company Does or Will Do

- Mission statement
  - What the company aspires to become
- Company background
  - Founding
  - Structure
  - Stage of development
  - Compelling points regarding origins of company
Management Team

- The less complete your team, the more difficult it will be to raise financing
- Relevant experience
- A sales and marketing professional is usually a must
- Identify business and scientific advisory boards and marquee advisors

Market

- Identify and describe
- Trends and growth
- Demonstrate understanding
  - Note: Investors expect you to understand your targeted markets and customers at least as well as anyone else
Unmet Need/Problem Statement

- First, new or superior solution
- By the end of this slide, it should be obvious why the world needs your product

Product and Attributes

- Don’t overemphasize the technology at the expense of the business opportunity
- No more than 2-3 slides max
- Status of intellectual property
Market Validation

- Market research
- Sales
- Beta testing
- Business partnerships
- Testimonies from prospective customers

Competitors

- Every product has competition
- List individually or by category
- Competitive matrix
  - Matrices allow the presentation of lots of information is a useable format
  - X-axis – critical evaluation criteria
  - Y-axis – Key competitors or groups
Competitors

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- Competitive matrix
  - Matrices allow the presentation of lots of information in a usable format
  - X-axis – critical evaluation criteria
  - Y-axis – Key competitors or groups
  - Criteria 1 – Price
  - Criteria 2 – Speed
  - Criteria 3 – Useful life

Competitive Advantage

- Unfair advantage
- How you differentiate yourself from your competitors in a manner that is compelling to your prospective customers
- Advantage that is sustainable
- Barriers to entry
Sales and Distribution

- Should be well-thought out and demonstrate your knowledge of the industry

Milestones

- Significant achievements to date
- Demonstrate that a momentum is building
Financial model

- Revenue streams
- Margins higher than industry norms
- Hockey stick growth curve

Financial Projections

- Revenue and EBIT for 3-5 years
- Identify key financial assumptions
- Investors want “bottom-up” sales projections beginning with your first sale
Exit Strategy

- What will get the technology to the market fastest?
- How are we going to cash in and get rich?

How SBIR/STTR Technology is Commercialized

- Venture capital, private investment
- Economic development funds
- Strategic partnerships, joint ventures
  - Larger versus smaller companies
- Self-funding by company
- Licensing out
Some General Overall Questions

- Is there a need for this technology?
- Is the assembled team good enough to have a successful program?
- Who will benefit from this technology?
- Are the tasks and budget reasonable for the program being proposed?
- Who are the customers and who will invest?
- Has ownership of intellectual property been addressed?

Sources of Commercialization Assistance

- Local colleges and universities
  - Business and Management programs
  - Information Studies
  - Communications departments
- Regional Technology Development Centers
- Trade and professional associations
- State and Federal programs and events
Commercializing Nanotechnology

Nanotechnology has some unique challenges:
- The development of nanomaterials and devices most often requires highly specialized and expensive instruments.
- The scale-up of nanotechnology requires unique processes that have very low error rates.
- Quality control in nanomanufacturing requires lengthy evaluations and expensive equipment.

Forming R&D Partnerships

Working with Academic Research Institutions
Why University- Industry Partnerships?

- Develop students/future employees  
  - Increase options
- Continuing education
- Research
- Economic development
- Better commercially-oriented research due to the access to expertise, facilities, equipment

Terms of Partnerships

- One time event
- Now and then
- Ongoing relationship
- Strategic relationship
- New/changing models
Strategic Partnership

- Flexible
  - Different for each set of partners
- Cultural understanding
- Level of trust
- Commitment
- Master agreement

Universities & Industry

- Learning to work together
- Flexibility is key
- Understanding each other’s culture
- Understand the motivations and incentives
Universities Do Research To:

- Educate
- Make breakthroughs
- Keep professors happy, publishing
- Service (Economic development)

Professors Do Research:

For: Promotion
    Peer recognition
To: Train students
    Fund programs

They need to:
    Publish
    Present at professional meetings
Students Do Research To:

- Get a degree
- Get a job
- Build a resume portfolio

Need:
- Knowledge
- Experience
- Publications

Industry Does Research To:

- Solve problems
- Develop new products/processes
- Improve profitability

Need:
- Capital
- IP
- Timeliness
Universities are
creating technologies

Universities want

to transfer
to license
to do research

Universities are
sources of expertise
access to networks
excellent resources

Technology Transfer

Good for companies
for university
for faculty and students

Can be
Licenses
Research
Consulting
Facilities
Cost centers
Partnership Issues to be Addressed

- Confidentiality
  - Must protect investment of sponsors
- When it’s OK to disclose information before patenting
- Publications
- Agreeing on the benefits for both sides
- Managing the relationship
- Managing the paperwork

Things to Keep in Mind

- Commercial application is the focus
  - Provides good ROI evidence
- Market and customer need is the driving force
Things to Keep in Mind

- Economic prosperity for the U.S.
  - Job creation
  - Richer tax payers
  - Keep the U.S. globally competitive

Points to Remember

- Tremendous diversity among agencies, programs, solicitations, reviewers, and winning proposals
- No guaranteed “WIN” strategies
  - Maximize your chances
- The SBIR program is not static
  - Look for evolutionary changes
Parting Advice

- Follow the guidelines
- Know your “customer”
- If you need assistance:
  - Call me at 315-425-5144

Thank You

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