Reflections on the SBIR program

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SBIR/STTR program: substantial support to small business for innovative research

- Mandated by Congress
- **$21 billion** in research, 400k scientists and engineers 1982-2009
- Fraction of research funding (not construction, NNSA exception)
  - SBIR: 2.6% in 2012 to 3.2% in 2017
  - STTR: .35% for 2012 and 2013 to 0.45% in 2016
- Staged approach
  - Phase I: $150k for 9 months
  - Phase II: $1M for 2 years
- OR Fast track: All in one go

Today's talk

- Who am I, What is Tech-X?

- Finding the solicitations
- What is sought?
- Meeting agency needs and commercialization needs

- Marketing plans
- Setting up infrastructure
- Reality: funding success rate

- Where is Tech-X now, and where is it going?

Who is John Cary?

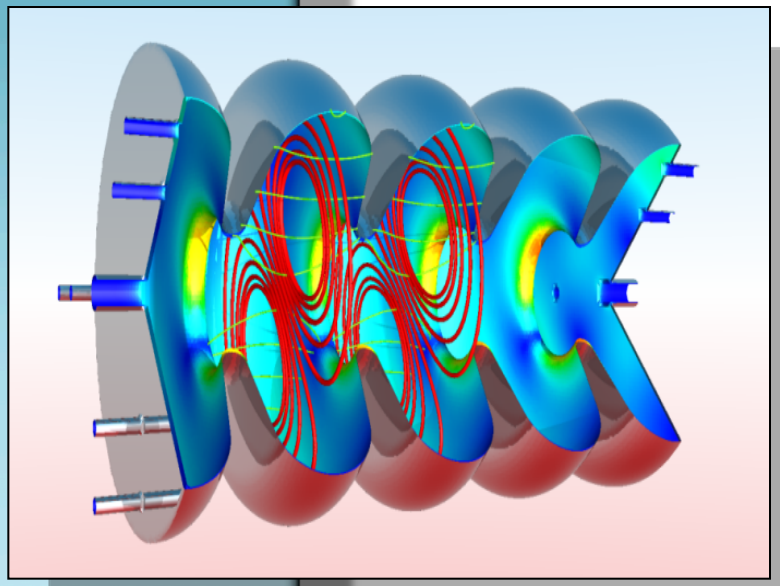
- Professor at CU since 1984, but only 20% time
- Expertise: plasma physics, accelerator physics, nonlinear dynamics, computational physics, EM modeling, fusion
- Papers on Google Scholar
- Cofounder and CEO at Tech-X Corporation

What is Tech-X Corporation (www.txcorp.com)?

- Founded in 1994
- ~65 people, 2/3 PHDs, Boulder, Buffalo, Daresbury
- Leader on multiple SciDAC (Scientific Discovery through Advanced Computation) projects
- Multiple computational physics products
- Providing services for
  - High-performance computational software for Engineering Simulation and Design
  - Enhancing code performance through porting to modern hardware (GPUs, MIC)
  - High-performance visualization and graphical user interfaces
  - Parallel data analysis of simulation and sensor data
  - Middleware for systems integration and real time data distribution
- 220 SBIRs from DOE, NASA and DOD, 74 Phases II

VSim Product: Electromagnetic and Kinetic Plasma Modeling

- VSim for Electromagnetic solutions
  - Antennas
  - Accelerator cavities
  - Photonic devices
- VSim for Microwave Devices
  - S-parameters
  - Multipacting impacts on performance
- VSim for Plasma Discharges
  - Plasma processing
  - Plasma medical devices
- VSim for Plasma Accelerator
  - Laser-plasma wakefield acceleration
  - Beam-plasma acceleration



TECH-X SBIR/STTR has strong national buy-in

- Motivations
  - Most jobs created by small business
  - Agencies need to be prodded to include small businesses
- Goals
  - Stimulate technological innovation
  - Meet Federal research and development needs.
  - Foster and encourage participation in innovation and entrepreneurship by socially and economically disadvantaged persons.
  - Increase private-sector commercialization of innovations derived from Federal research and development funding.

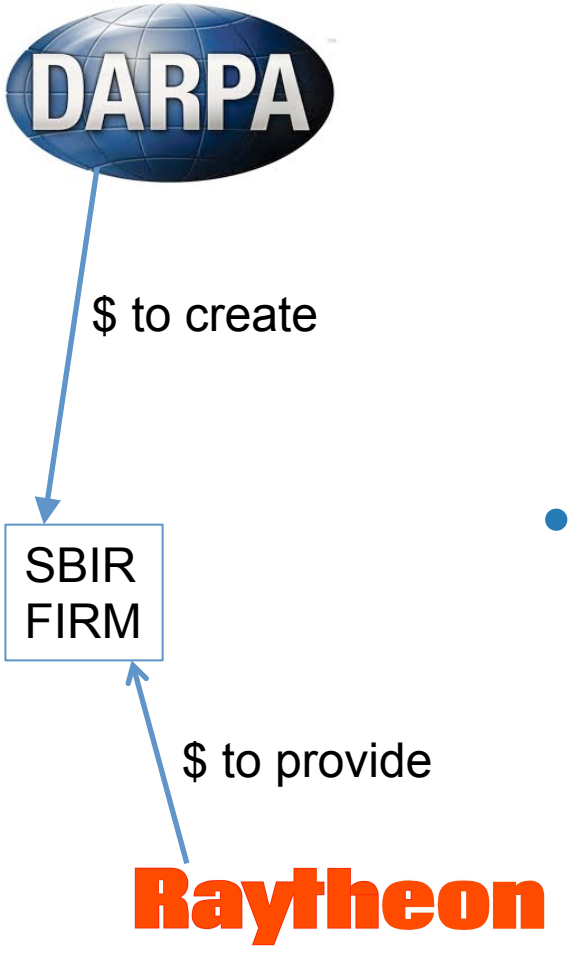
TECH-X Find and read the solicitations

- 11 agencies participate, including DOD, NIH, DOE, NASA, NSF (highly restrictive), Commerce (NOAA, NIST)
- http://www.sbir.gov/news/sbir-and-sttr-2013-solicitation-release-dates
- Currently, DOE has two SBIR releases
  - Release 1 (due Nov): Offices of Science and NNSA
  - Release 2 (due Feb): Offices of Electricity Delivery and Energy Reliability, Energy Efficiency and Renewable Energy, Environmental Management, Fossil Energy, Nuclear Energy

Increasing emphasis on commercialization implies agency, dual, or pure comm use

- Prior to reauthorization: producing something that the agency (e.g., for its lab infrastructure) wanted was enough
- Since reauthorization, one must show strong potential for commercialization, e.g.,
  - Agency purchase
  - Agency follow-on funding
  - Private sector funding or purchase
- Agency use
  - DOD (purchase), NASA (follow on funding)
- Dual use
  - DOE (no follow on), NASA
- Pure commercialization (no agency mission)
  - NSF, NIH?

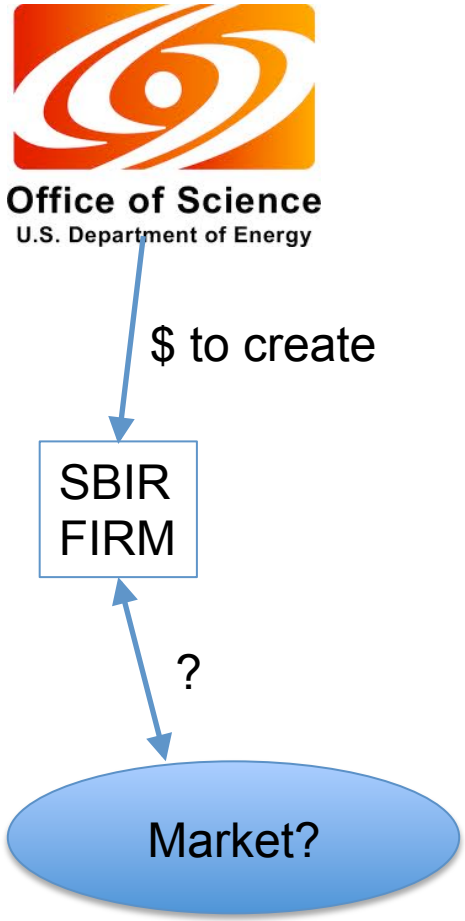
Agency-Use project results in something the agency or its surrogates will buy



- DOD
  - Works through primes (Lockheed, Raytheon, Boeing)
  - Invent something that a prime wants
  - DOD uses SBIR to fund you through design
  - Sell result to a prime
  - Example: First RF antennas (http://www.firstrf.com/FIRST%20RF%20SBIR%20Summmaries%2005302011.html)
- NASA
  - Has labs, wants research done
  - Develop something to get that research done
  - Sometimes NASA will provide follow-on funding to do more research with the tools you have developed

Dual-use project results in something the agency and private sector want

- Agency either does not purchase or purchases only small amounts
- Agency has no plans for follow-on funding
- DOE
- Example
  - ORNL needs to computed performance of its front-end EC sources
  - Similar methods could predict plasmas in processing machines
- Anti-example
  - RHIC needs improved spin-tracking software
  - RHIC won't buy the product, provide funds to maintain it, and neither will anyone else
  - Improve by creating a product which use gives RHIC what they want



With increasing commercialization emphasis, marketing plan is critical

- What is changing that requires your product?
  - New need?
  - New opportunity?
- How big a market is there for your product?
- How big is the industry that might buy our product?
- How will you launch your product?
- How will you protect your product's position?

Market research is as hard a physics research, with outcomes that are much less certain

I'm going to write an SBIR; what else do I need?

- Incorporation
- Registration with federal systems
- Accounting system(s)
  - Federal taxes
  - Federal grants accounting
  - Local property taxes
  - Each of these has its own set of rules
- Payroll and associated taxes
- Conflict of interest management

As long as you don't make money, taxman does not care, but federal grants auditors do!

Look at your odds before starting

2009 SBIR success rates	%
DOE	18.7
NASA	18.4
DoD	14.9
DHS	9.6
NSF	15.4
NIH	24.2

But 2012 NIH SBIR success rates for Phase I is 15.6%

Ultimate goal: Transition technology to the marketplace

- If you do only SBIRs, your company will have no value (for sale, e.g.)
- Emulate companies that use SBIR to develop high-risk ideas, but then transition a number of those to the marketplace
  - First RF
  - Creare
- Tech-X shifting to a similar strategy
  - SBIRs de-emphasized relative to commercialization
  - Not pursuing SBIRs that have no/little possibility of producing a product even if there is a specific DoE need
  - Each SBIR has to have a real product as its goal

Which brings us back to the Tech-X product lines

- VSim for Electromagnetic solutions
  - Antennas
  - Accelerator cavities
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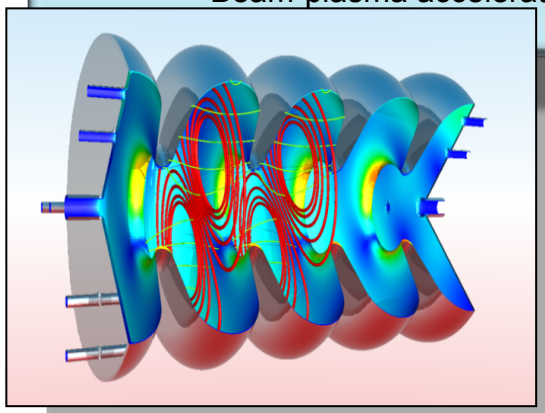

- USim Hypersonics
  - Navier-Stokes with anisotropy
  - Reaction chemistry
  - Multiple species
  - Real gas equation of state
  - General equation of state
- USim High Energy Dense Plasmas
  - Gas dynamic MHD
  - Separate evolution of electrons and ions
  - General equation of state
  - Full Maxwell's equations

- GPULib: High-performance IDL addon
- PtSolve: high-performance math libraries
- PyDDS: Python bindings for the data distribution service