## DARPA/DSO 101

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## Breakthrough Technologies for National Security

	Precision Guidance & Navigation					
Communication	ns/Networking	IR Night Vision		/ision		
	Stealth	Radar /	Arrays U	AVs		
1960s 1970s	1980s	1990s	2000s	2010s		
	Microelectror	<b>NICS</b> : VLSI, CAD,	manufacturing,	IR, RF, MEMS		
ARPAnet	Internet					
Information Te	chnology: times	sharing, client/s	server, graphics	, GUI, RISC, speech		
Materials Science: sem	iconductors, superall	oys, carbon fib	ers, composite	s, thermoelectrics, c		

New capabilities require a healthy ecosystem across Service S&T, universities, and industry

#### DARPA's role: pivotal early investments that change what's possible

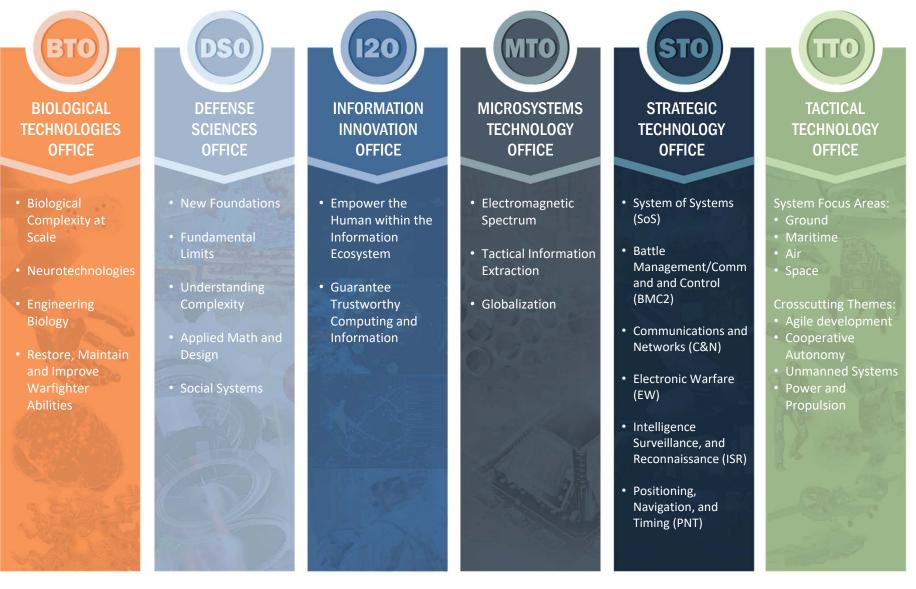


- DARPA's funding primarily falls into basic, applied and technology development categories
- Efforts range from proof of concept to technology demonstration

Underst fundame of phene	and the ental aspects omena and of ble facts	Applied (6.2) Understand the means to meet a recognized and specific need	Tech Dev (6.3 Development and integration of hardware for field tests	B) Dem & Val Evaluate integr technologies in realistic operat environment	rated
TRL 1 Basic principles observed and reported	TRL 2 Concept and application formulated	I/or TRL 3 Proof of concept	TRL 4 Validation in a laboratory environment	TRL 5 Laboratory scale validation in relevant environment	TRL 6 System validation in relevant environment



## **DARPA** Technical Offices





## DARPA – Community Engagement

Stellar program managers (PMs)

Technology leadership

Adventurous spirit

Conviction and drive to change the world

### Discussions

- Emails, conferences, visits with PM
- Exchange of ideas/concepts
- Often precursor to seedling

## Seedlings

- Usually through an Office-Wide BAA
- Small, short duration (6-9 months)
- Move from "disbelief" to "mere doubt"
- May lead to the next generation ideas

#### **Programs**

- Specific program BAAs
- Often multi-year, multi-disciplinary
- Move from "possibility" to "capability"

#### Robust technology community

Universities

Labs

# Companies small and large

Military services and agencies

Off-scale impact	
on scale inpuce	

Risk taking

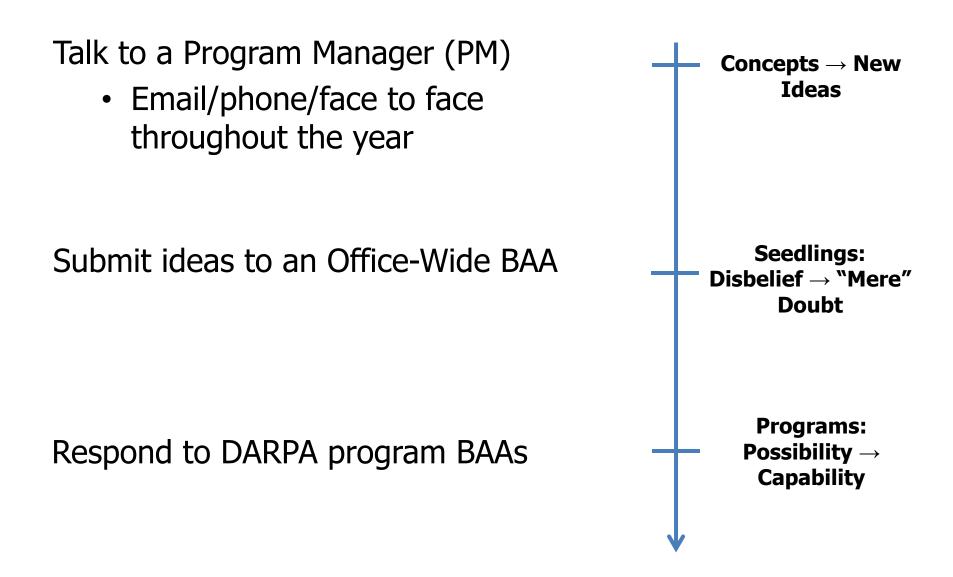
Honor in public service

Heilmeier Catechism

**DARPA** Culture

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**DARPA** Three Ways to Engage with DARPA



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## **DARPA** DSO Outreach Efforts

Young Faculty Award (YFA) program aims to identify and engage **rising stars** in junior faculty positions

#### The YFA program provides:

- Research funding
- DoD contacts
- Military visits/exercises
- PM Mentor

- The YFA program vields:
- Insight into DoD problems
- Novel ideas
- Career development
- Future DARPA performers

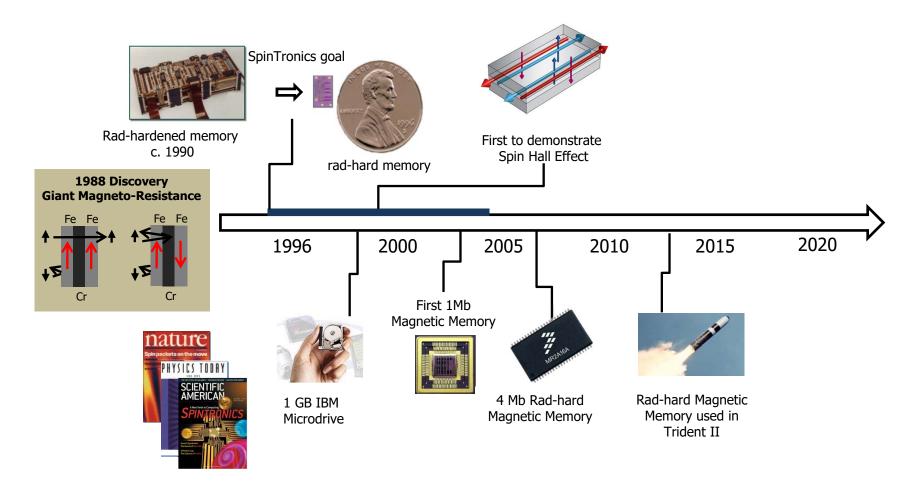


- Multiple outreach activities help inform the academic community regarding the DARPA mission
- BAA solicitations provide conduit for researchers to share their ideas with **DARPA PMs**
- Constant Contact used to notify broader community when BAAs, RFI, and SNs are released.
- There are 5K active contacts (66 HBCU/MIs)
- **DSO Constant Contact at** ٠ http://www.darpa.mil/work-withus/interact-with-DSO



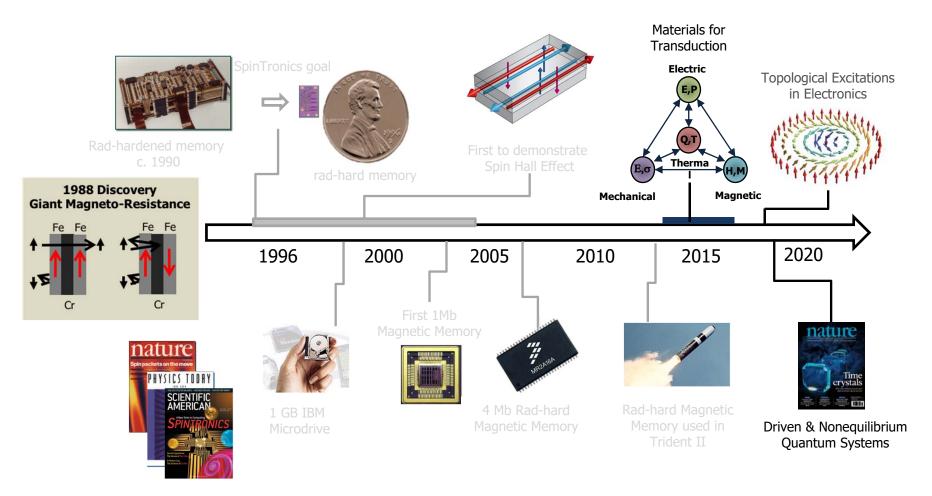


Can electron spin be used for logic & memory devices?





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- Alternative computing
  - Can we develop new computational primitives for modeling & simulating complex systems?
- Fundamental limits of machine learning
  - Can we explore and develop new learning approaches to model dynamic systems?
- Managing complexity and uncertainty in design
  - Can we develop new representations to enable complex design-space exploration?
- New sensing modalities
  - Can we develop new sensors to "see" through clutter and/or find hidden objects?
- Predictive social behavioral models
  - Can we use artificial simulations to validate social science modeling methods?
- Detection and/or deterrence of WMD/WMT threats
  - Can we develop scalable and affordable sensing technologies/networks to protect areas from chemical, biological, radiological, nuclear and explosive threats?

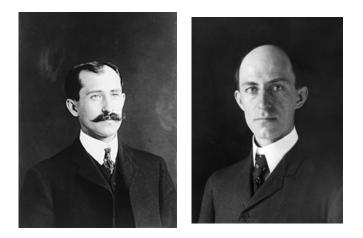
**DARPA** Revolutionary vs. Evolutionary R&D

"The flying machine which will really fly might be evolved by the combined and continuous efforts of mathematicians and mechanicians in from one million to ten million years"

- The New York Times
  - 9 October 1903

"We started assembly today"

- Orville Wright's Diary
  - 9 October 1903





## Questions