

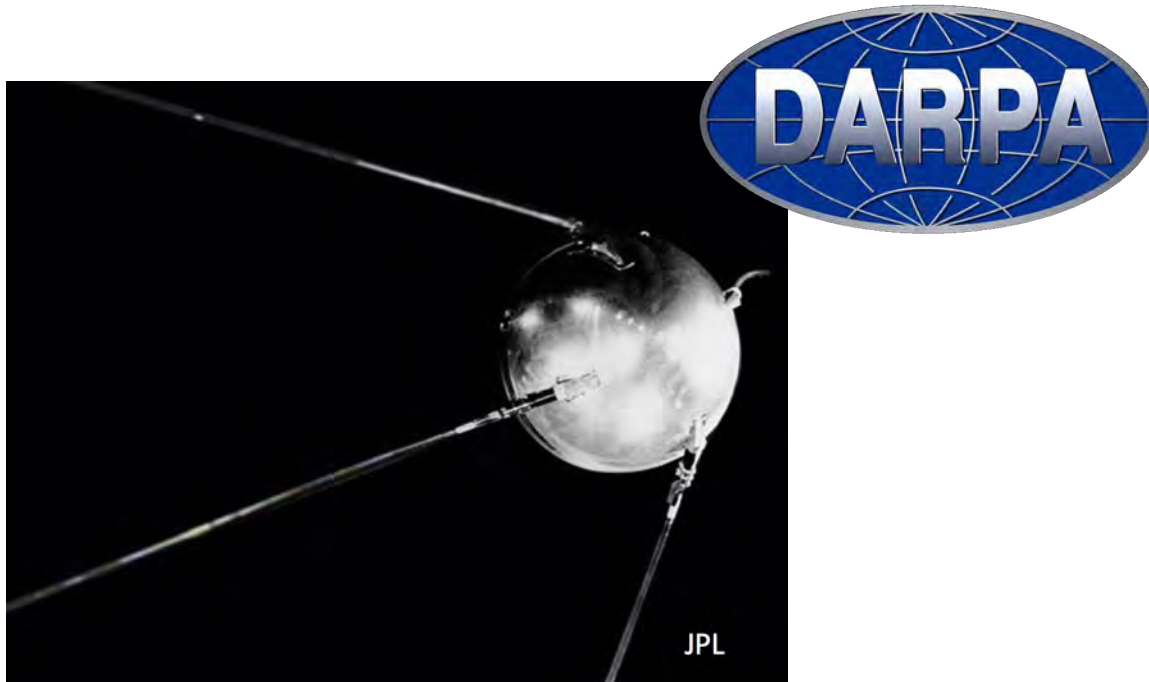
Peter at DARPA

Peter Lee

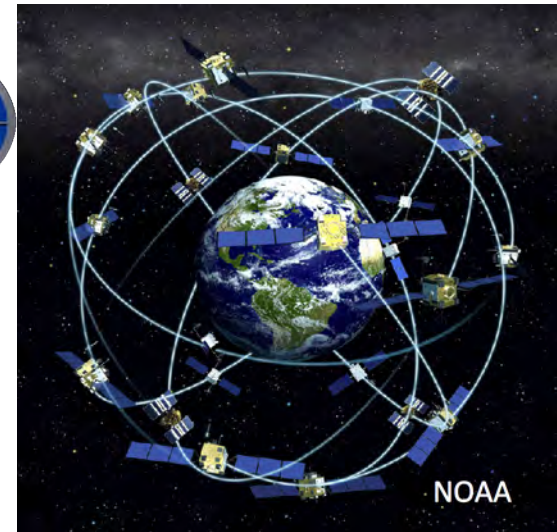
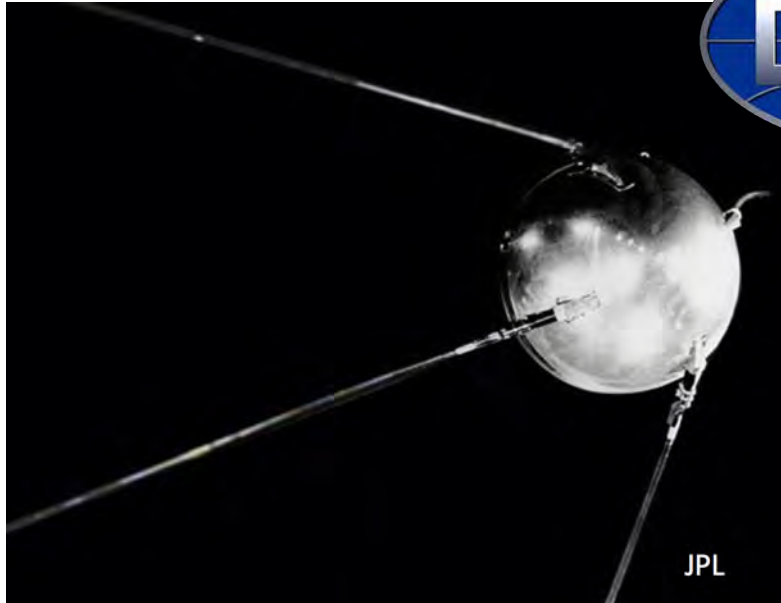
December 2009



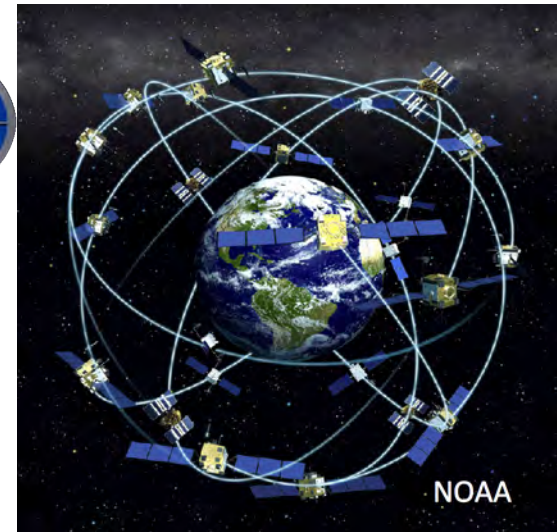
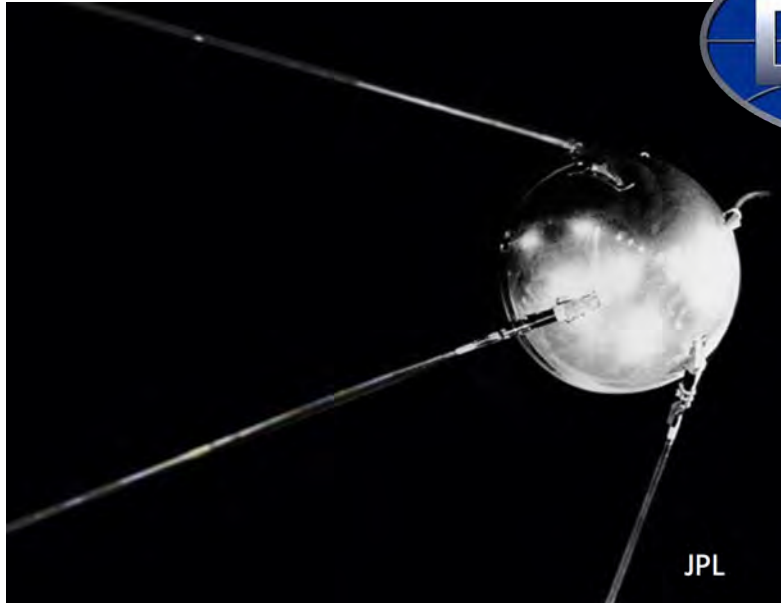
Formed in 1958 to **PREVENT** and **CREATE** strategic surprise



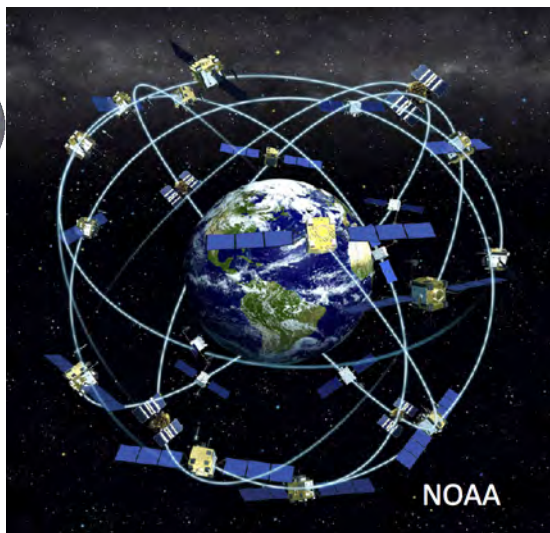
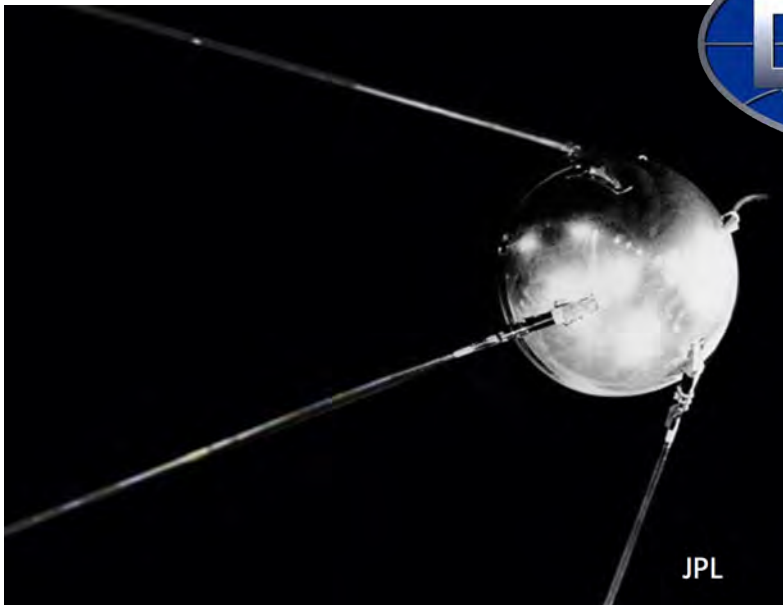
Formed in 1958 to **PREVENT** and **CREATE** strategic surprise



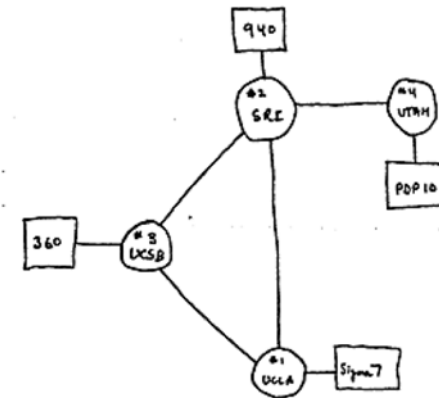
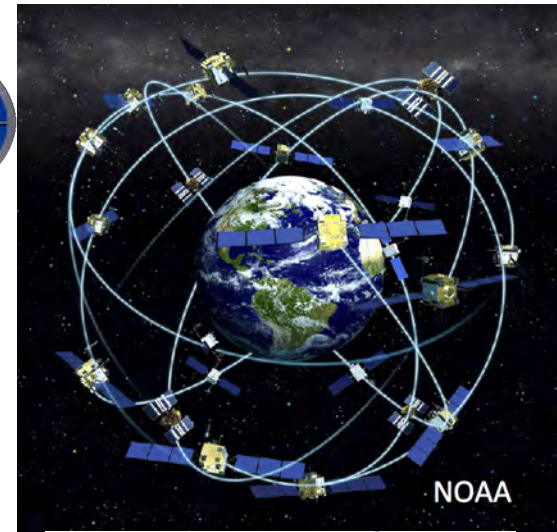
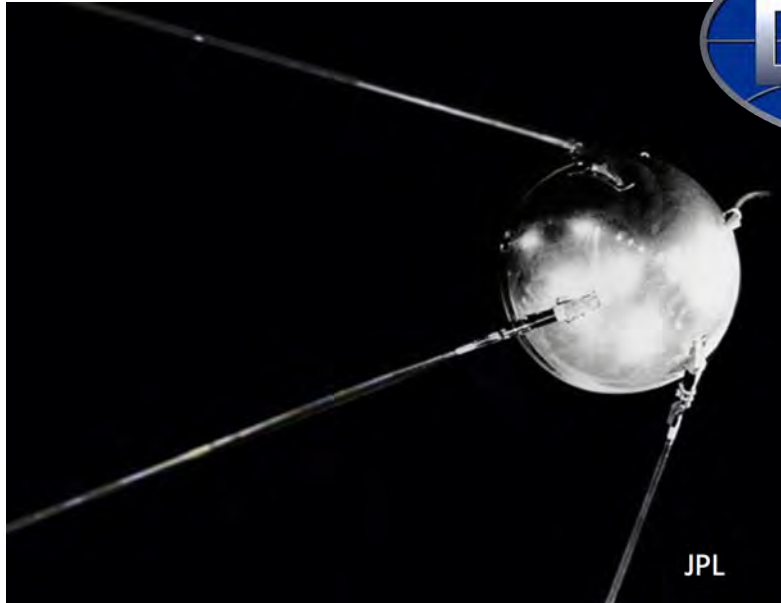
Formed in 1958 to **PREVENT** and **CREATE** strategic surprise



Formed in 1958 to **PREVENT** and **CREATE** strategic surprise



Formed in 1958 to **PREVENT** and **CREATE** strategic surprise



THE ARPA NETWORK

DEC 1969

4 NODES

Re-Envisioning DARPA

Peter Lee
Carnegie Mellon University

Randy H. Katz
UC Berkeley

Version 6: December 12, 2008¹

As recently described by Secretary Gates, the defining principle of the new National Defense Strategy is *balance*: balance in timeframe (today's conflicts vs. the future), types of conflict ("small war" vs. conventional war), and culture (change vs. building on existing strengths). The concept of balance is also pertinent to DARPA. Indeed, the central management challenge of the Agency is how to strike the right balance between the immediate problems faced by today's military (e.g., the problem of improvised explosive devices) while simultaneously fostering the kind of long-term exploration essential to maintaining the technological edge we currently enjoy. The fact of the matter is that both are important.

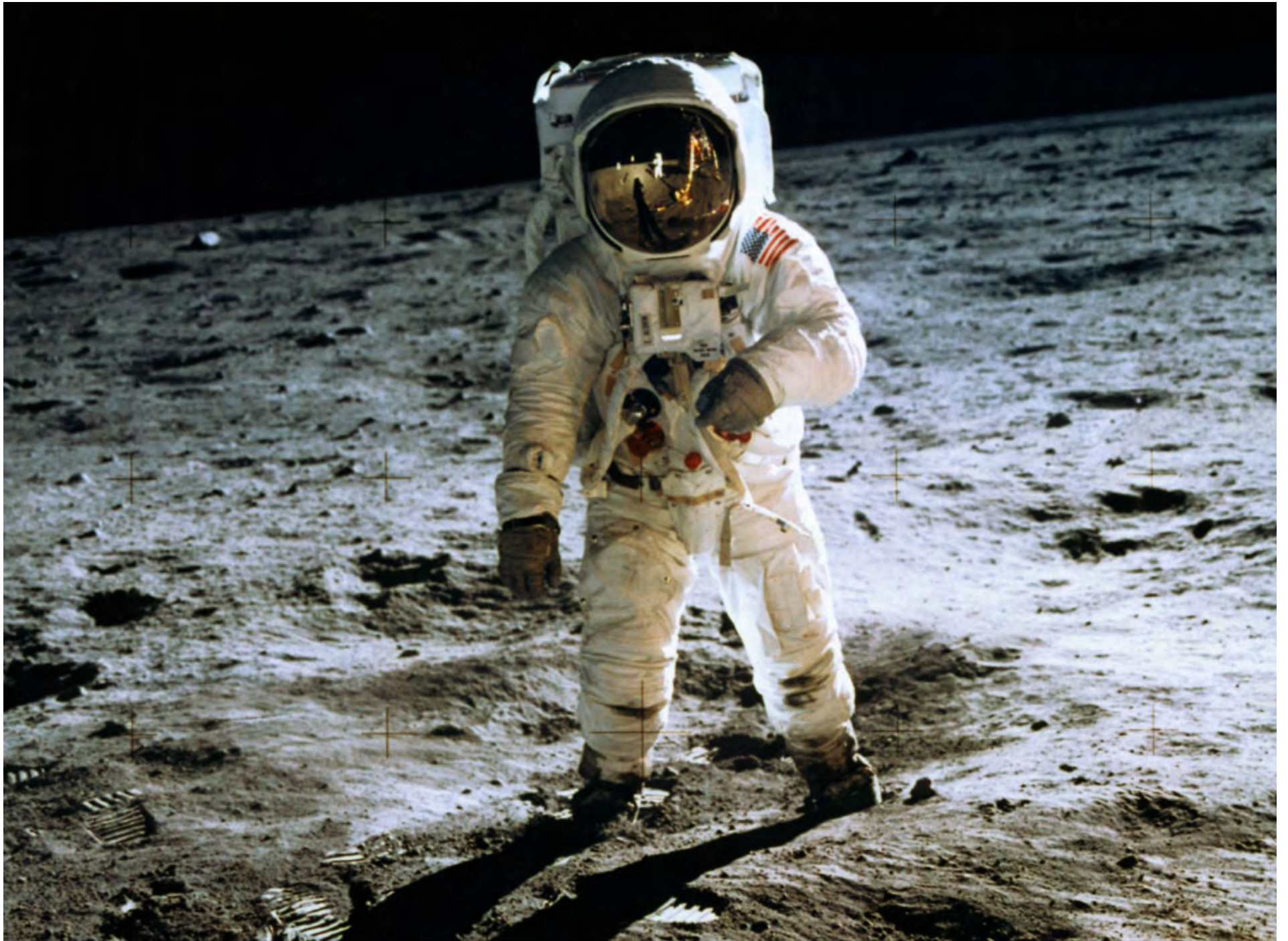
<http://www.cra.org/ccc/initiatives>



- It's early days
- I'm one of you
- DARPA is a mission-oriented agency

My mission

- Focus on strategic surprise



“By ‘augmenting human intellect’ we mean increasing the capability of a man to approach a complex problem situation, to gain comprehension to suit his particular needs, and to derive solutions to problems. We do not speak of isolated clever tricks that help in particular situations...”



...We refer to a way of life in an integrated domain where hunches, cut-and-try, intangibles, and the human ‘feel for a situation’ usefully coexist with powerful concepts... and high-powered electronic aids.”

— Doug Englebart, 1962



Which had more impact?



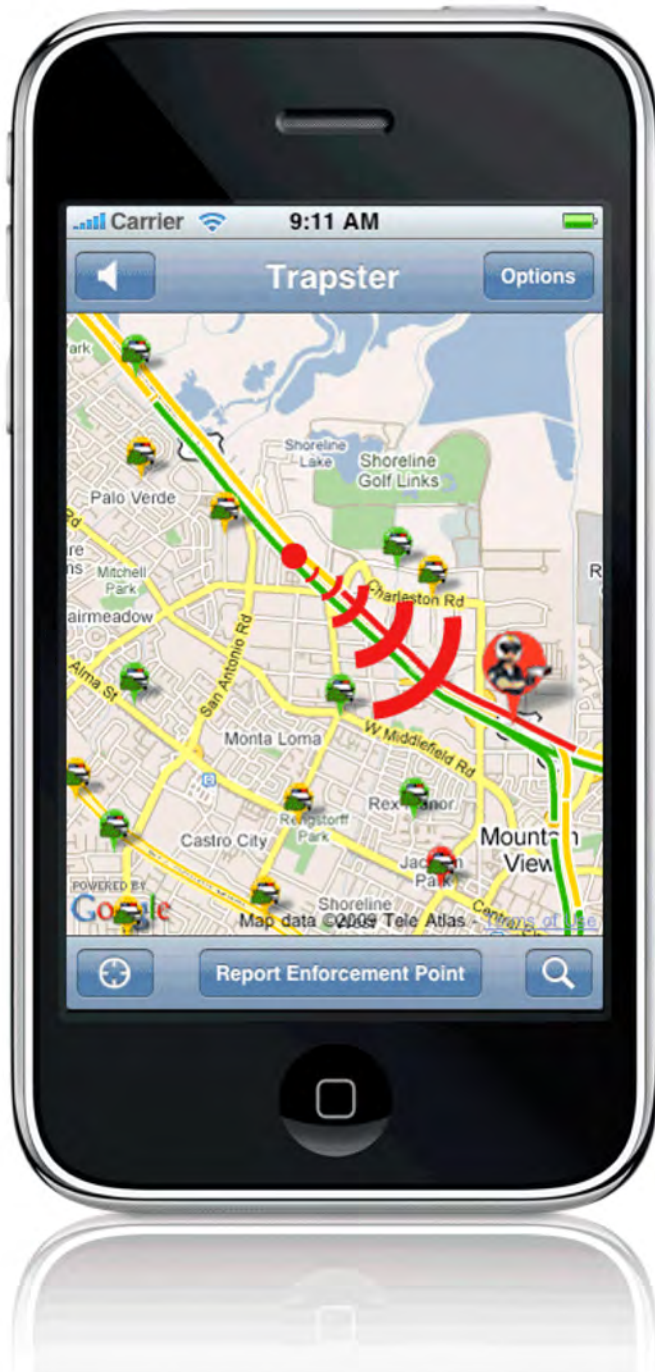


Which had more impact?



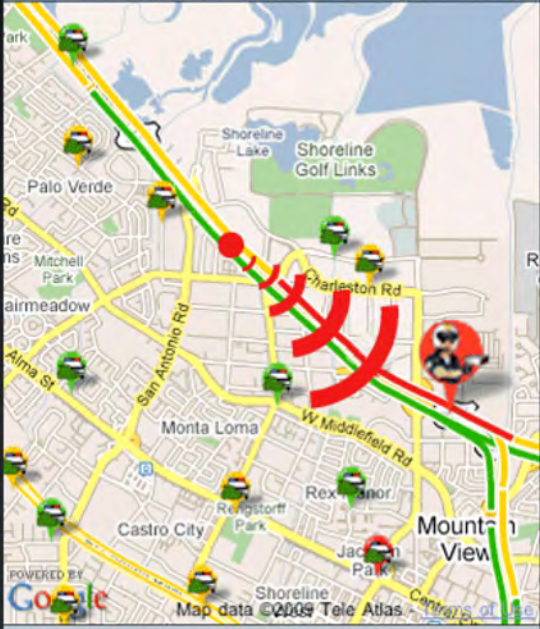
Source: Pat Lincoln, SRI

Has your child been to the moon?



Carrier 9:11 AM

Trapster Options



Report Enforcement Point

Trapster Speed Trap App Downloads Hit 50,000/Day

by Michael Arrington on October 6, 2009

41 Comments [210 retweet](#) [Share](#)



A must-have iPhone application for [View details on TweetMeme](#) people who drive a lot is **Trapster** – the app for avoiding speed traps. Or a better **description** by Paul Carr before he was fired from The Guardian: *"Yes, that's Trapster: the mobile distraction for when driving at high speed isn't dangerous enough."*

But anyway, Trapster is available on the iPhone, BlackBerry, Android, Windows Mobile and Nokia/Symbian (I wouldn't be surprised to see it for Palm in the near future, either). It's had more than 1 million downloads, and is "getting about 50,000 downloads a day right now" to add to that.

Which just makes it all the more valuable. Trapster relies on users to report speed traps when they see them, making the road safe for other Trapster users who come later. The more users, the more data, and the safer the roads are for speeders.

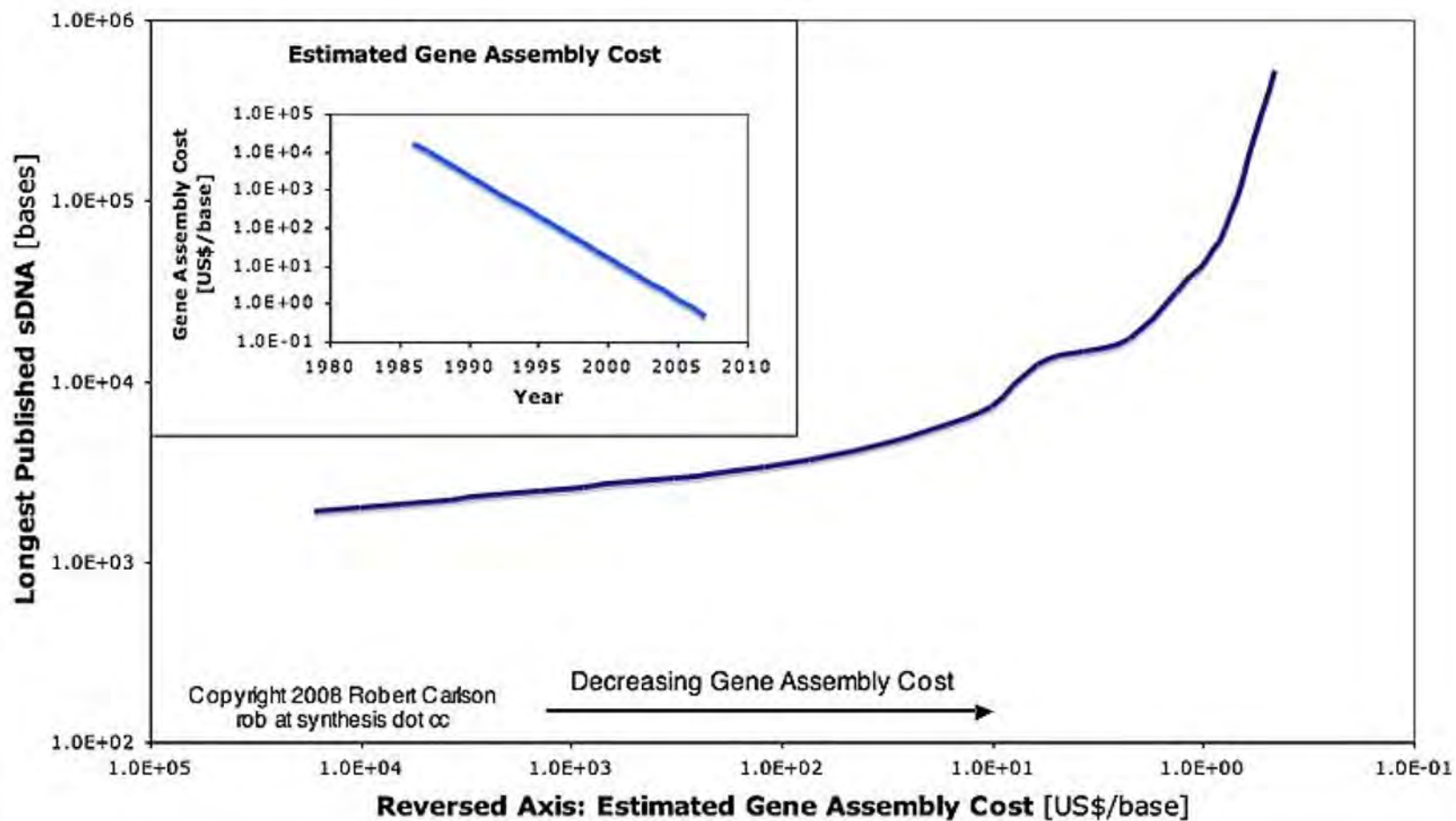
It's one of my personal favorites. And before anyone freaks out about how this encourages speeding, don't. The site has endorsements from various police officers and

organizations, such as *"If someone slows down because of (Trapster), it's accomplishing the same goal of trying to get people to obey the speed limit."* But Carr, in the link above, has a good point – the real danger is all the people grabbing their phone to add in a new speed trap. Jon Stewart says it best in the video below:

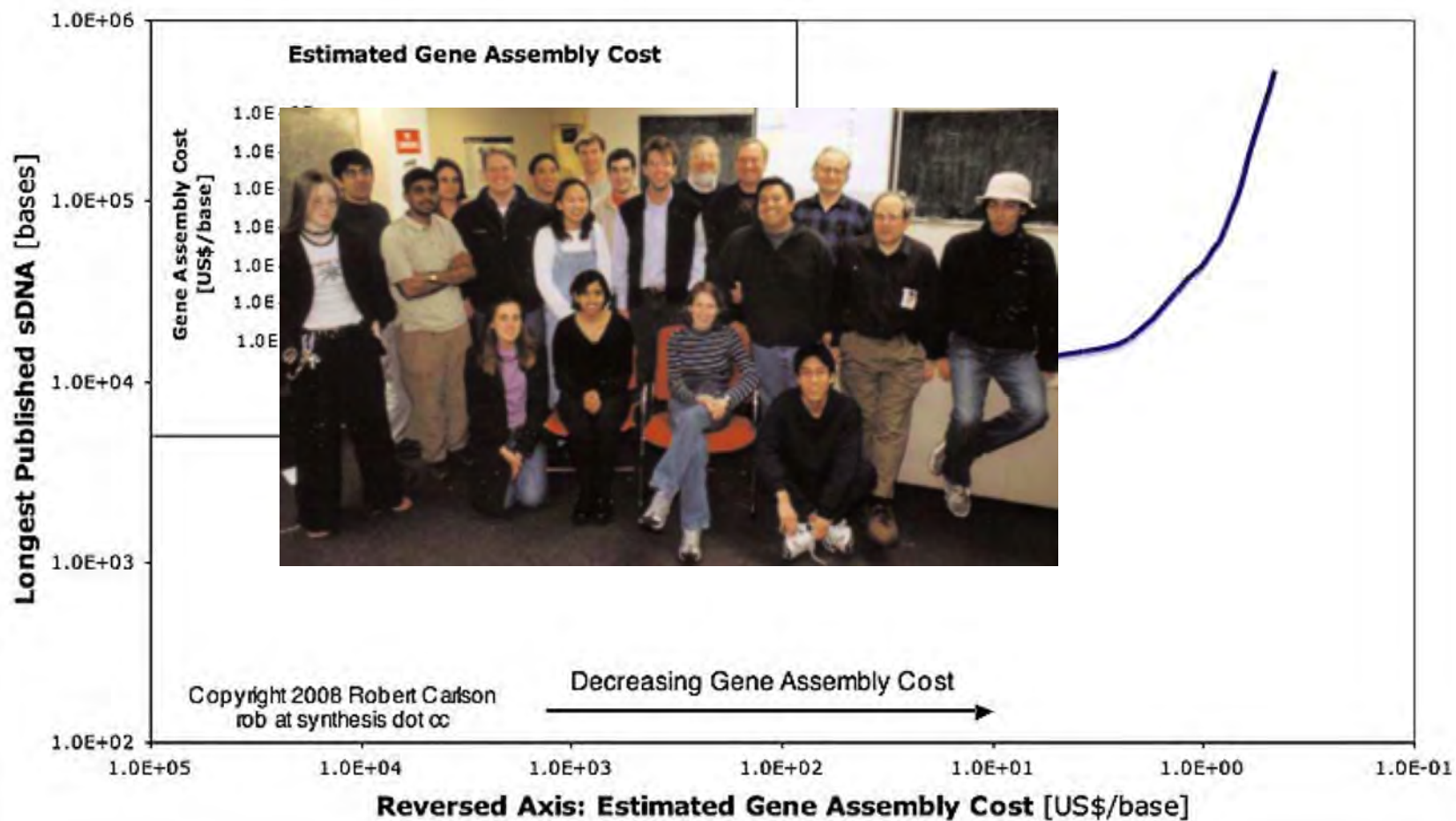
CNN Doing Their Part to Keep Driving Safe

**Radar
detector,
or 50,000
eyes on
target?**

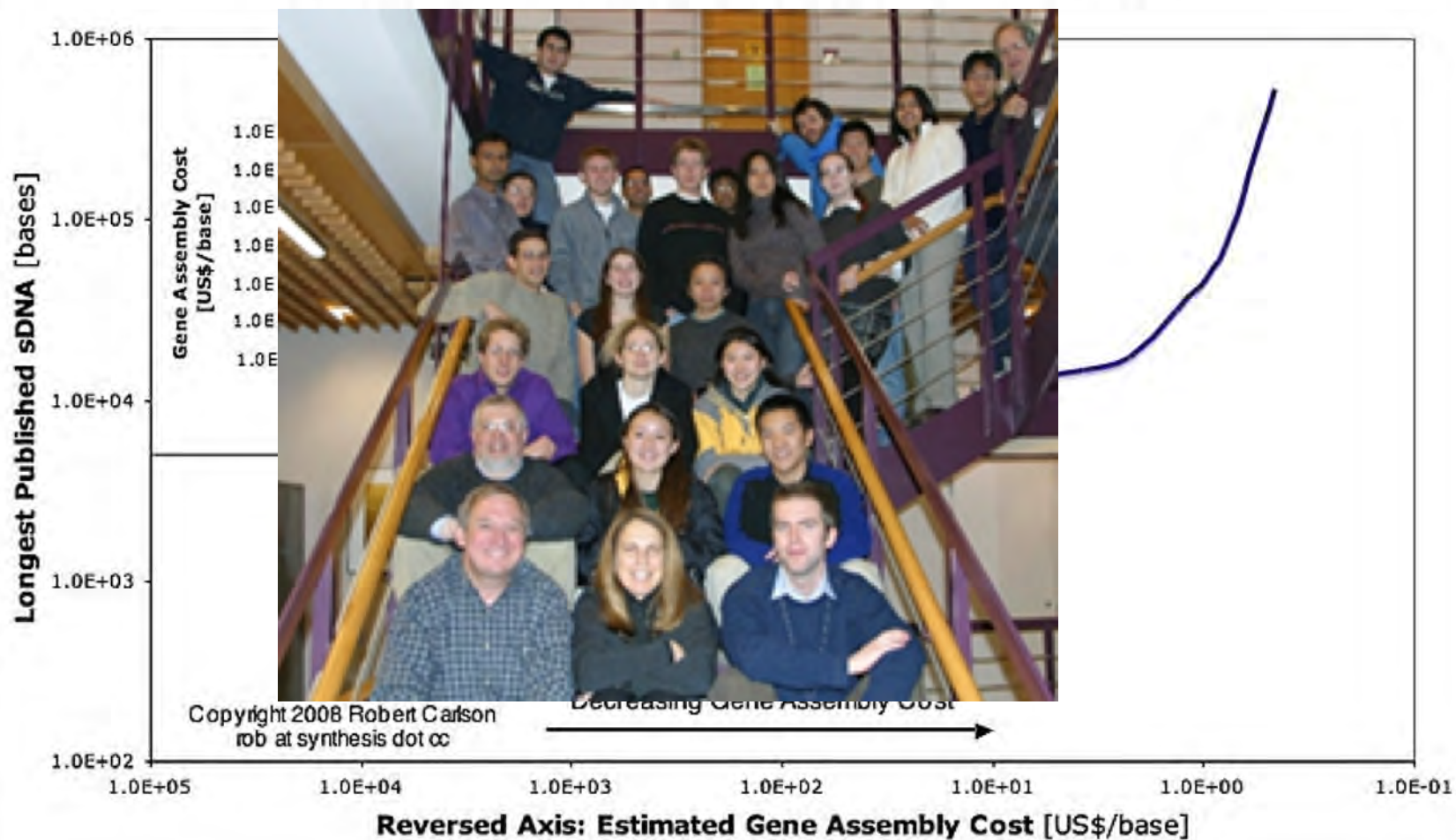
Longest sDNA vs. Estimated Gene Assembly Cost



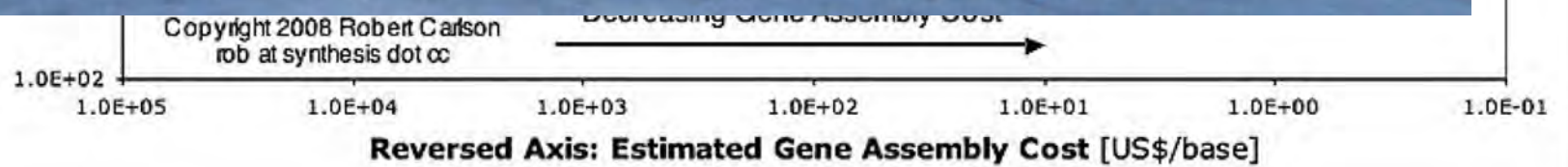
Longest sDNA vs. Estimated Gene Assembly Cost



Longest sDNA vs. Estimated Gene Assembly Cost



Longest sDNA vs. Estimated Gene Assembly Cost



Longest sDNA vs. Estimated Gene Assembly Cost



Copyright 2008 Robert Carlson
rob at synthesis dot cc

Decreasing Gene Assembly Cost →

1.0E+02

1.0E+05

1.0E+04

1.0E+03

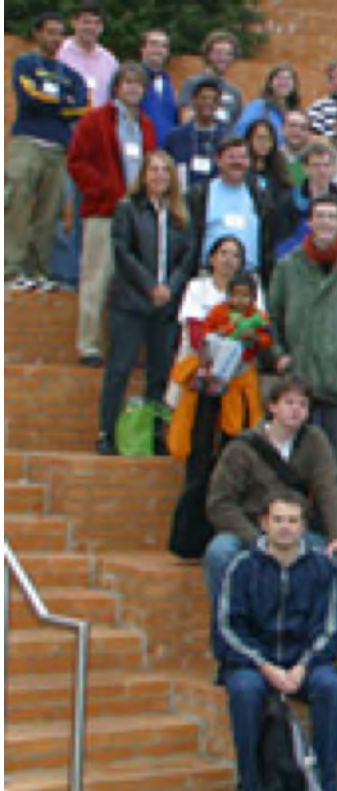
1.0E+02

1.0E+01

1.0E+00

1.0E-01

Reversed Axis: Estimated Gene Assembly Cost [US\$/base]



1.0E+02
1.0E+01



1.0E+00
1.0E-01
e]





My mission

- Focus on strategic surprise

My mission

- Focus on strategic surprise
 - Power of exponential trends
 - Influence of globalization, tech democratization
 - Basic research plus high-impact demonstrations

My mission

- Focus on strategic surprise
- Explore novel approaches to tech innovation



Foldit

Pull Mode

This hydrophobic sidechain is exposed. It should point inward!

😊 Watch Tutorial Video
 🛠 Use tool (Tweak)
 🛠 Use tool (Rebuild)

✖ Focus view on click

Rank: 119 (soloist)
 Score: 9133
 123: Grand Challenge 7

Group Competition
 Soloist Competition

117	autumndays	-	9141
118	Cosi	-	9137
119	JonathanCline	9133	9133
120	Tae1	-	9131
121	firejuggler	-	9131
122	richard c	-	9130
123	corbet	-	9127
124	Hugo_kln	-	9126

Chat - Puzzle

MikeCassidyToo: since you have not played a competition puzzle you probably dont have any

MikeCassidyToo: play 123 it will close tomorrow and you will get some points fro trying

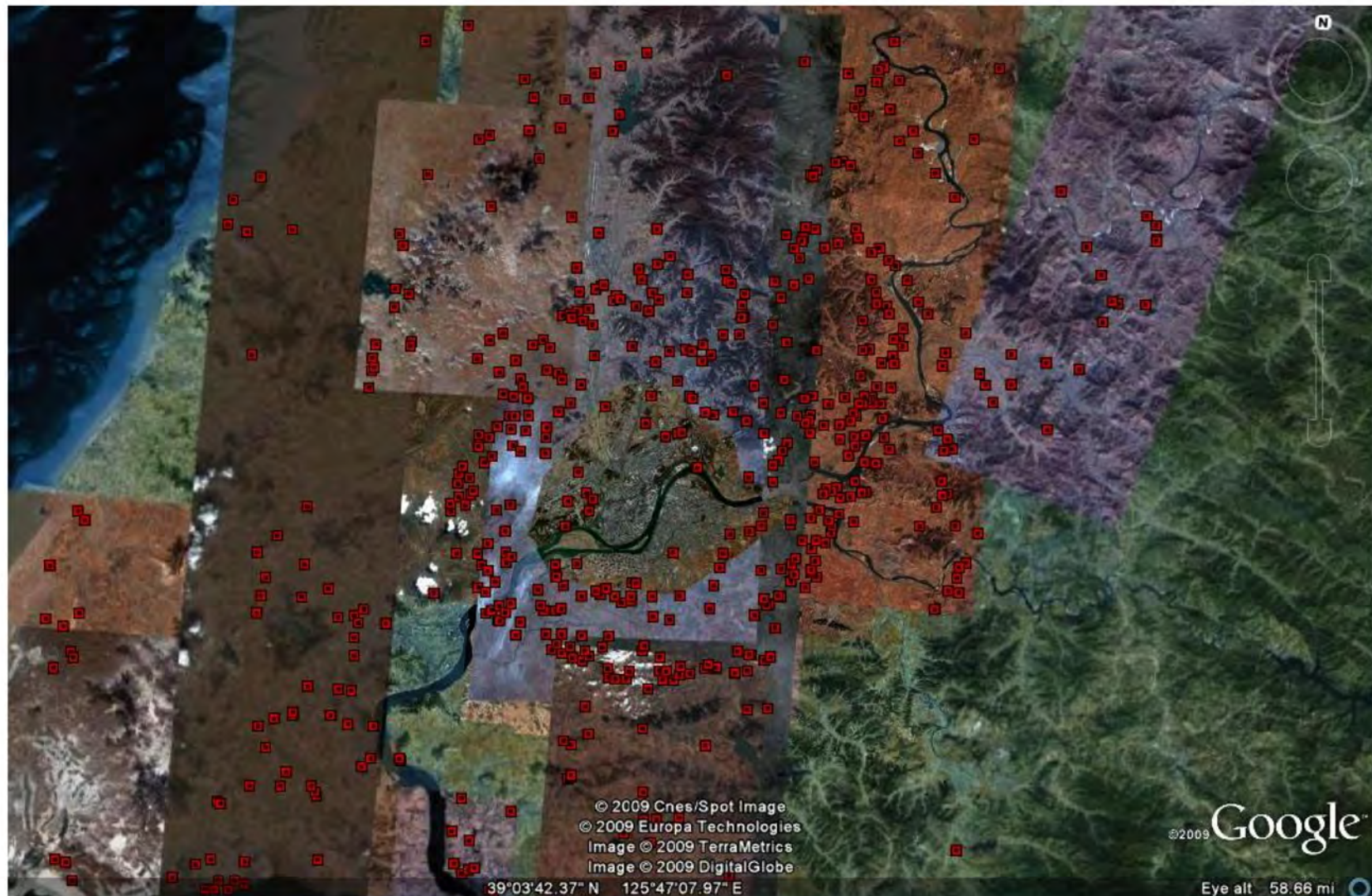
LNR: alright thanks

Send

Chat - Global
 Notifications

Actions | Undo | Duels | Modes | View | Menu

\$B satellite or 30,000 analysts?



DARPA NETWORK CHALLENGE



DARPA Network Challenge Final Standings

Place	Name	Hometown	# Balloons	Date/Time
1	MIT Red Balloon Challenge Team	Cambridge, MA	10	6:52:41 PM
2	GTRI "I Spy a Red Balloon" Team	Atlanta, GA	9	6:59:11 PM
3	Chris Rodriguez and Tara Chang	Cambridge, MA	8	6:52:54 PM
4	Dude It's a Balloon	Glen Rock, NJ	8	7:42:41 PM
5	Groundspeak Geocachers	Seattle, WA	7	4:02:23 PM
6	Army of Eyes - Mutual Mobile, Inc.	Austin, TX	7	4:33:20 PM
7	Team DeciNena	Evergreen, CO	7	6:46:37 PM
8	Anonymous	Anonymous	7	7:16:51 PM
9	Nerdfighters	Missoula, MT	7	8:19:24 PM
10	iSchools DARPA Challenge Team	State College, PA	6	6:13:08 PM
11	i-Neighbors.org Red Balloon Team	Philadelphia, PA	6	7:18:00 PM
12	Team 40K for LAF	West Chester, PA	6	7:22:23 PM
13	Jon Cannell's Red Balloon Challengers	Port Charlotte, FL	5	4:19:06 PM
14	Google & Friends	New York, NY	5	5:01:40 PM
15	Anonymous	Anonymous	5	5:28:18 PM
16	Fark.com		5	5:35:56 PM
17	10RedBalloons.com Team	Charlottesville, VA	5	7:24:29 PM
18	Team AR15.com		5	7:24:51 PM
19	Anonymous		5	8:25:10 PM
20	Anonymous		4	3:59:24 PM

DARPA Network Challenge Final Standings

Place	Name	Hometown	# Balloons	Date/Time
1	MIT Red Balloon Challenge Team	Cambridge, MA	10	6:52:41 PM
2	GTRI "I Spy a Red Balloon" Team	Atlanta, GA	9	6:59:11 PM
3	Chris Rodriguez and Tara Chang	Cambridge, MA	8	6:52:54 PM
4	Dude It's a Balloon	Glen Rock, NJ	8	7:42:41 PM
5	Groundspeak Geocachers	Seattle, WA	7	4:02:23 PM
6	Army of Eyes - Mutual Mobile, Inc.	Austin, TX	7	4:33:20 PM
7	Team DeciNena	Evergreen, CO	7	6:46:37 PM
8	Anonymous	Anonymous	7	7:16:51 PM
9	Nerdfighters	Missoula, MT	7	8:19:24 PM
10	iSchools DARPA Challenge Team	State College, PA	6	6:13:08 PM
11	i-Neighbors.org Red Balloon Team	Philadelphia, PA	6	7:18:00 PM
12	Team 40K for LAF	West Chester, PA	6	7:22:23 PM
13	Jon Cannell's Red Balloon Challengers	Port Charlotte, FL	5	4:19:06 PM
14	Google & Friends	New York, NY	5	5:01:40 PM
15	Anonymous	Anonymous	5	5:28:18 PM
16	Fark.com		5	5:35:56 PM
17	10RedBalloons.com Team	Charlottesville, VA	5	7:24:29 PM
18	Team AR15.com		5	7:24:51 PM
19	Anonymous		5	8:25:10 PM
20	Anonymous		4	3:59:24 PM

DARPA NETWORK CHALLENGE



- Over 4,300 teams registered, world-wide
- Many thousands of people participated
- Winning team got all 10 in less than 9 hours!
- Lots of misinformation, decoys, etc.
- Teams took many different approaches
- Significant scientific value was gained
- Continues a tradition of open competition
- It was lots of fun for all!

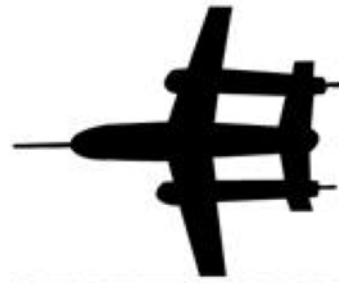
U.S. AIR FORCE AIRCRAFT IDENTIFICATION CHART



WEATHER BALLOON



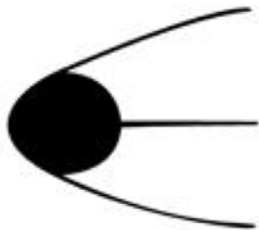
WEATHER BALLOON



WEATHER BALLOON



WEATHER BALLOON



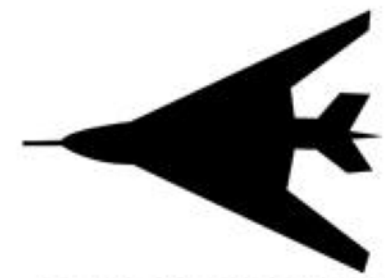
WEATHER BALLOON



SWAMP GAS



WEATHER BALLOON



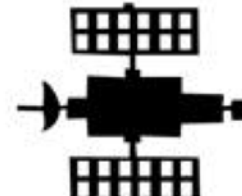
WEATHER BALLOON



WEATHER BALLOON



WEATHER BALLOON



WEATHER BALLOON



WEATHER BALLOON



My mission

- Focus on strategic surprise
- Explore novel approaches to tech innovation

My mission

- Focus on strategic surprise
- Explore novel approaches to tech innovation
 - Open innovation models
 - Competitions and grand challenges
 - Inspire new S&T interest, re-establish communities
 - Challenge conventional thinking; break things



My mission

- Focus on strategic surprise
- Explore novel approaches to tech innovation
- Establish a new “megatrends” office

Defense
Sciences Office

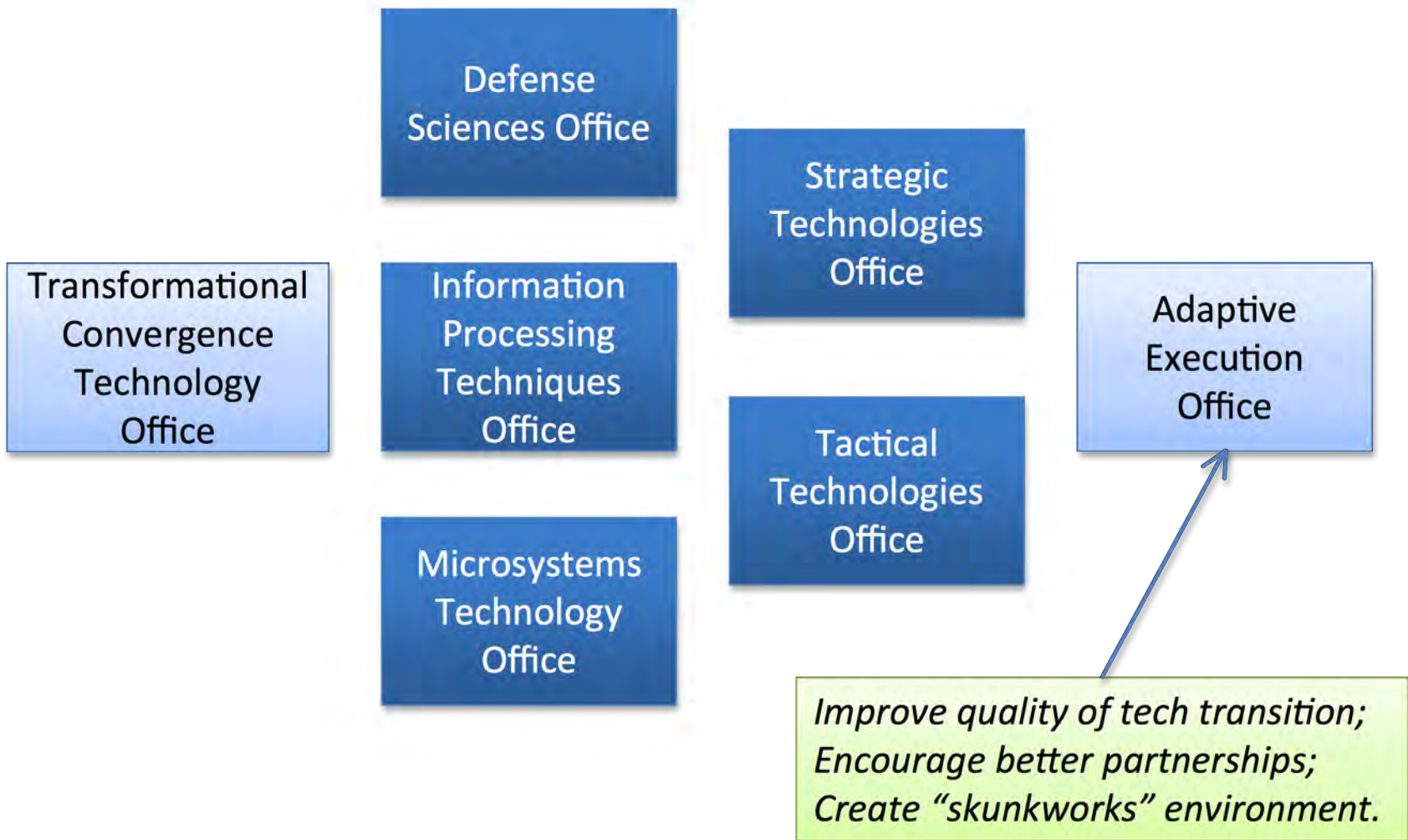
Information
Processing
Techniques
Office

Microsystems
Technology
Office

Strategic
Technologies
Office

Tactical
Technologies
Office





*Focus on disruptive trends;
Encourage interdisciplinary research;
Challenge DoD conventional thinking.*

Transformational
Convergence
Technology
Office

Defense
Sciences Office

Information
Processing
Techniques
Office

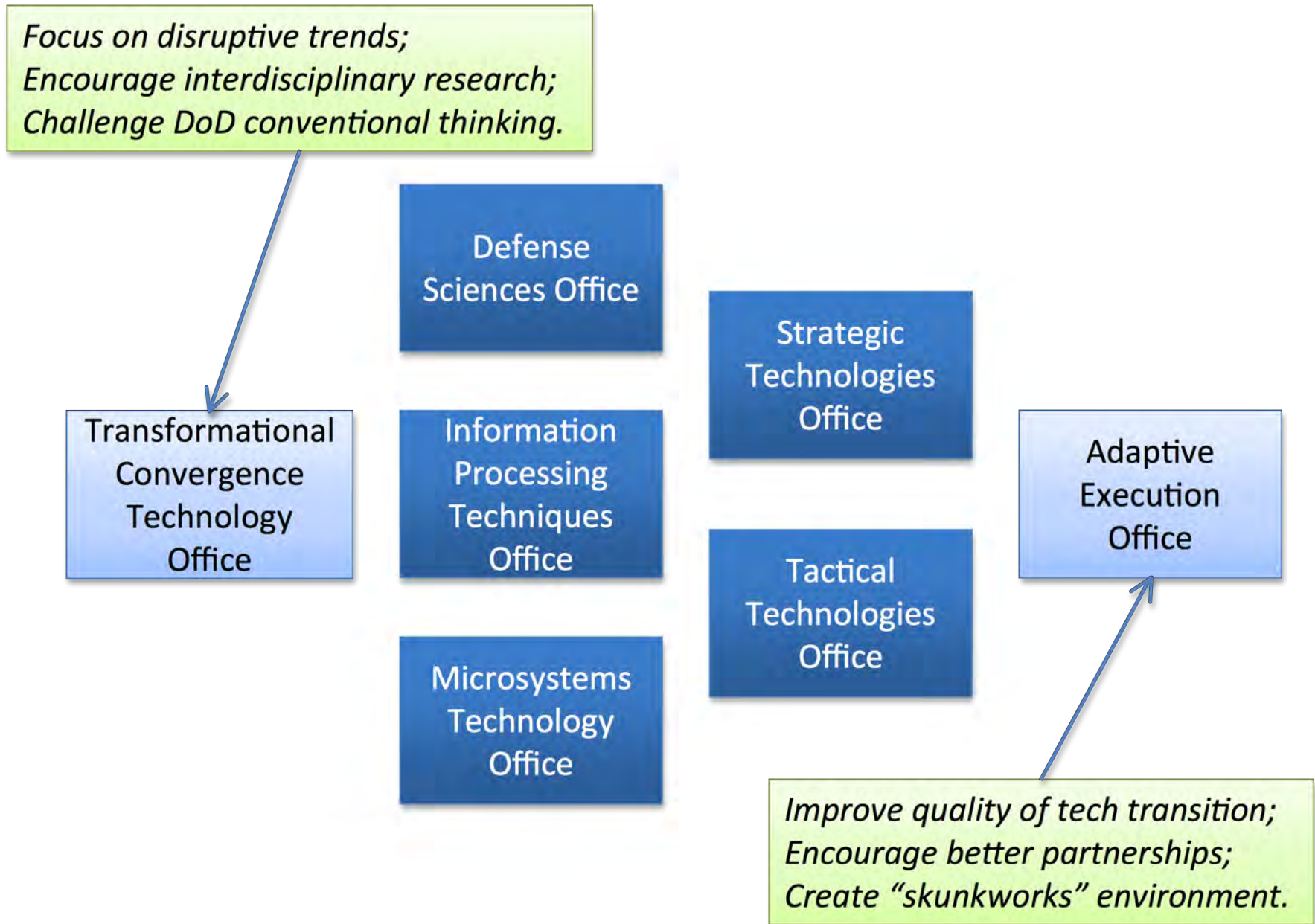
Microsystems
Technology
Office

Strategic
Technologies
Office

Tactical
Technologies
Office

Adaptive
Execution
Office

*Improve quality of tech transition;
Encourage better partnerships;
Create "skunkworks" environment.*



Conventional Warfare

Irregular Warfare

Deny Equalizers

Fill in gaps, increase dynamic range of PE at distance/match to ISR

Optimize for adaptability (training/systems)

Overmatch: Army, Navy,
Air Force, Marines

Space, Nuclear

Human Performance:
Training/Preparation
Survivability
Care/Restoration

Examples:

Take Bio off the table
Adapt/rapid response

Take Cyber off the table
Bio analogy (detect,
deter, vaccinate,
attribute, treat, etc.)

Space (Hegemonic vs. GCs)

Rogue nukes/decrease
proliferation

Other...

Prototyping, system engineering (LMQ1)

Edge finding in a globalized world

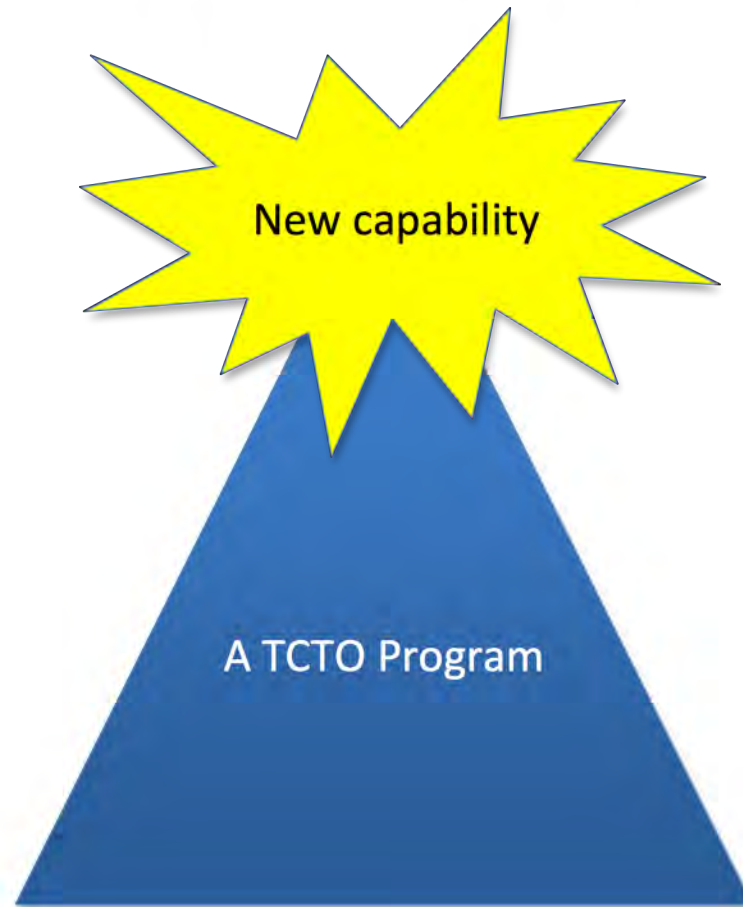
Capture best minds/global mindshare

Other...

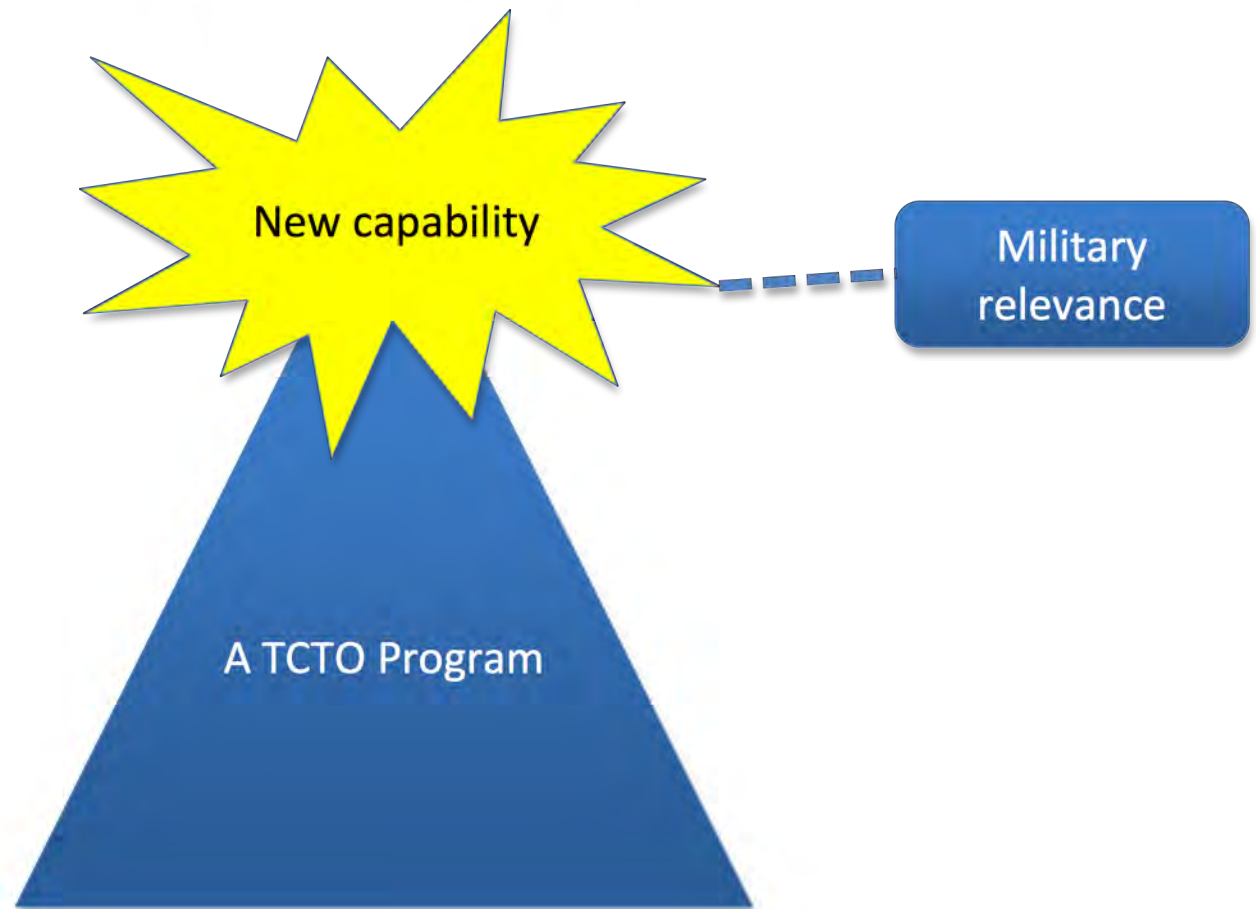
TCTO programs



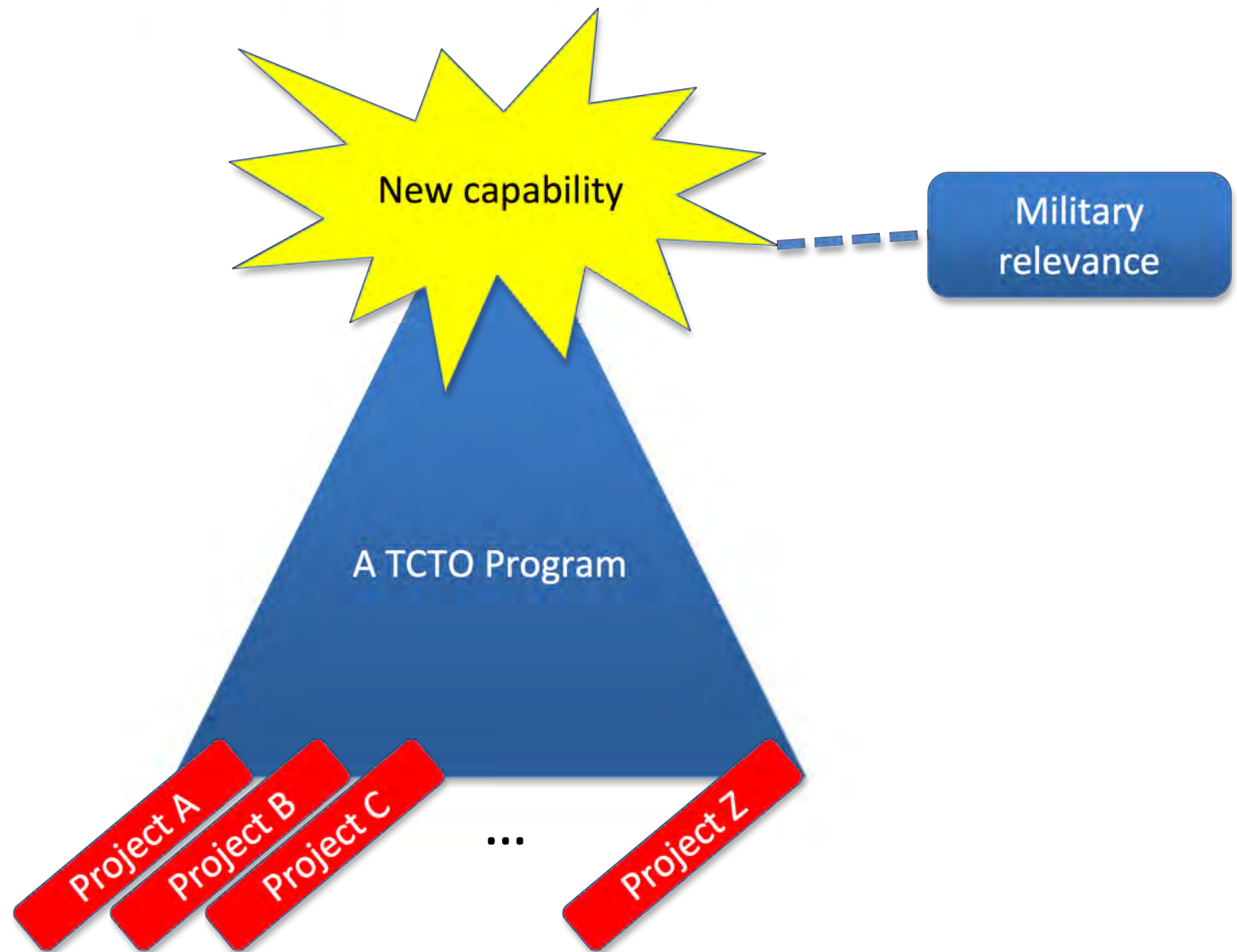
TCTO programs



TCTO programs



TCTO programs

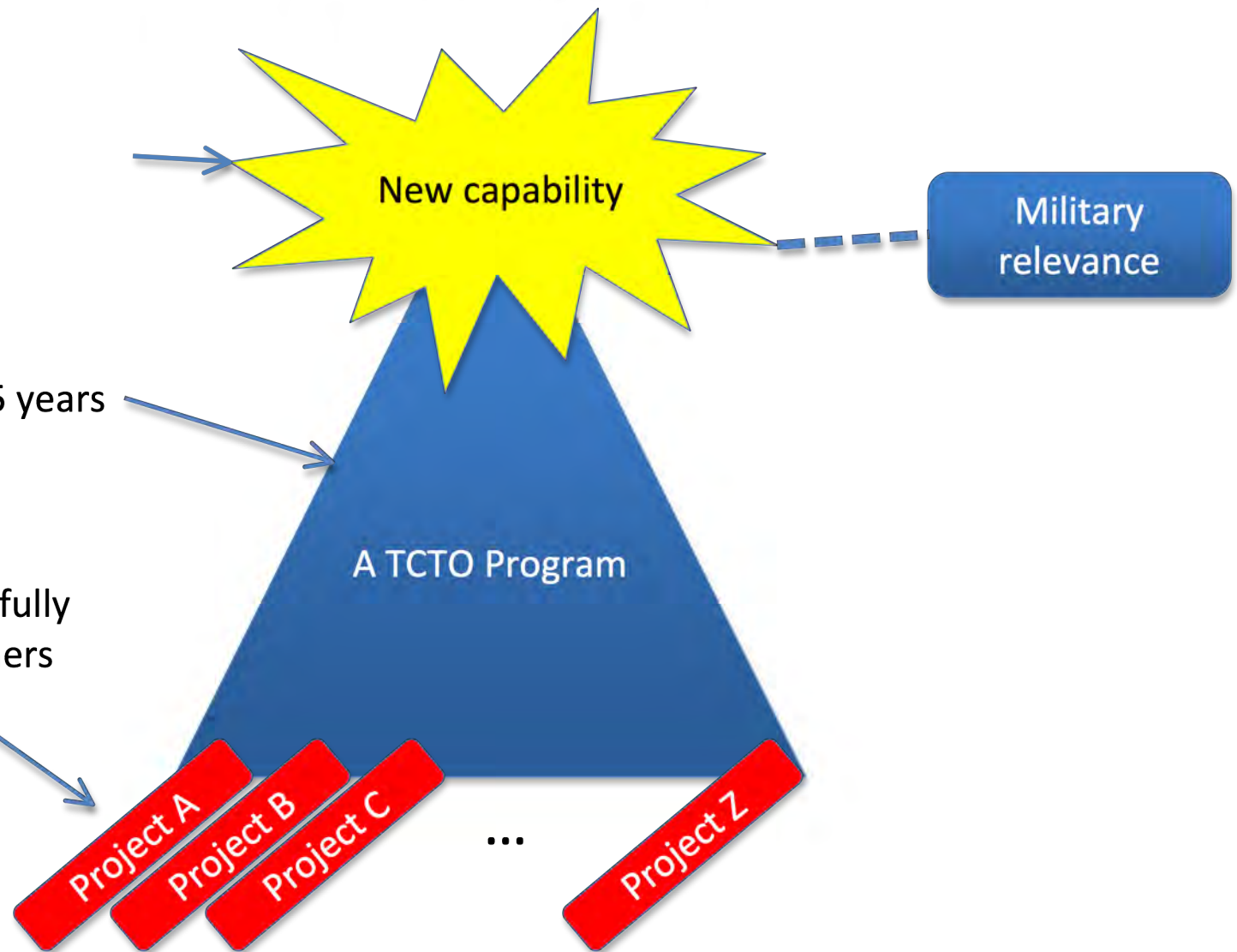


TCTO programs

1. Potential for transformational impact

2. Funding for 3-5 years

3. Community of fully devoted researchers



TCTO areas of interest

- **Edge finding**
 - Analyzing and harnessing complex graphs, networks, and social systems; quantitative social and behavioral sciences
- **Connecting everyone and everything**
 - Resilient, adaptable, secure, globally available networks and software systems; technology for strategic communications
- **Engineered biological systems**
 - Synthetic biology
- **Human-machine collaborative robotics and systems**
 - Intelligent, collaborative systems (esp. robotics)
- **Data-intensive, energy-intensive computing**
 - Next-generation architectures, algorithms, and systems for high-throughput, low-power computing
- **Core Computer Science and Engineering**
 - High-performance computing
 - Next-generation networking
 - Computer security

TCTO areas of interest

- **Edge finding**
 - Analyzing and harnessing complex graphs, networks, and social systems; quantitative social and behavioral sciences
- **Connecting everyone and everything**
 - Resilient, adaptable, secure, globally available networks and software systems; technology for strategic communications
- **Engineered biological systems**
 - Synthetic biology
- **Human-machine collaborative robotics and systems**
 - Intelligent, collaborative systems (esp. robotics)
- **Data-intensive, energy-intensive computing**
 - Next-generation architectures, algorithms, and systems for high-throughput, low-power computing
- **Core Computer Science and Engineering**
 - High-performance computing
 - Next-generation networking
 - Computer security

**PMs will have
major influence!**

First 100 Days' Status

- Norm Whitaker, Deputy Director
- Five Program Managers
- Several pending PM offers
 - Would like more mainstream academic CS people!
- Internal reorganization is ongoing

My mission

- Focus on strategic surprise
- Explore novel approaches to tech innovation
- Establish a new “megatrends” office

My mission

- Focus on strategic surprise
- Explore novel approaches to tech innovation
- Establish a new “megatrends” office
 - Achieve the above
 - Engage in collaborative, interdisciplinary research
 - Do basic research; when possible develop at-scale demonstrations

My mission


- Focus on strategic surprise
- Explore novel approaches to tech innovation
- Establish a new “megatrends” office
- **Re-engage with academic research**

Pentagon Research Director Visits Universities in Bid to Re-energize Partnerships

By JOHN MARKOFF
Published: October 6, 2009


The new director of the Pentagon's research arm has started visiting university campuses around the country in an effort to rebuild bridges that were severed under the Bush administration.


RSS Feed


 **RSS** Get Science News From The New York Times »


The director, Regina E. Dugan, who was appointed in July to lead the [Defense Advanced Research Projects Agency](#), or Darpa, made visits last week to the [University of California, Berkeley](#); [Stanford University](#); the [University of California, Los Angeles](#); and the [California Institute of Technology](#). She had previously visited Virginia Tech and Texas A&M.


SIGN IN TO RECOMMEND


 TWITTER

 E-MAIL

 SEND TO PHONE

 PRINT

 REPRINTS

 SHARE

ARTICLE TOOLS SPONSORED BY



Re-engaging universities

- Empowering program managers
 - Not forced to use short-term, “go/no-go” contracts
- Fundamental research at universities
 - Virtually eliminates pre-publication review and ITAR
- Clarity on conflict-of-interest rules
 - Goal: PM’s institution may compete in PM program BAAs
- More university “primes”
 - And control “flow-through” requirements when “subs”
- Idea summits
 - For more high-value, “t-shirt & jeans” intellectual exchanges
- Re-startup package concept
 - In discussion

What makes DARPA unique...

Formed in 1958 to **PREVENT** and **CREATE** strategic surprise

Capabilities, mission focused

Finite duration projects

Diverse performers

Multi-disciplinary approach...from
basic research to system engineering

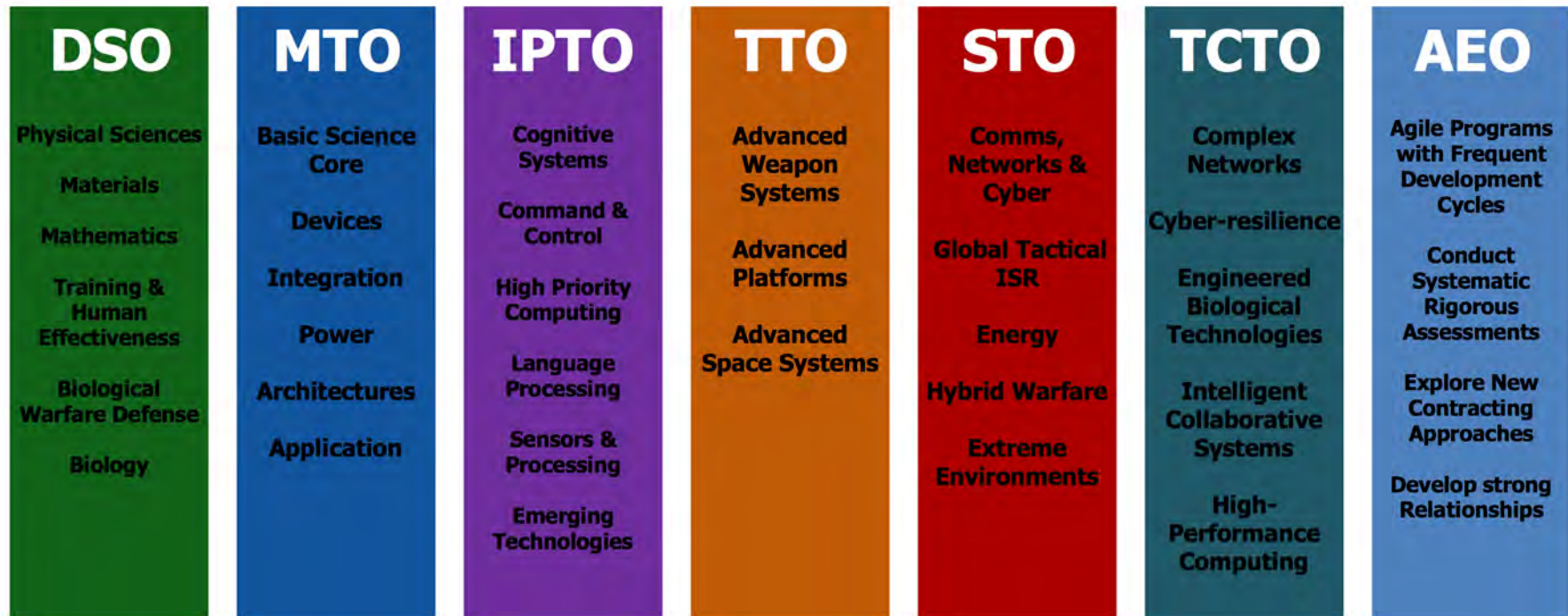
As the DoD's innovation engine, we
are committed to the boldest, creative leaps...



Doing business with DARPA...

- ✓ Become familiar with the challenges and opportunities of National Security.
- ✓ Put your ideas in writing. Draft a white paper.
- ✓ Approach a program manager; they are the key to working with DARPA.
- ✓ Look for Requests for Proposals (RFPs) and Broad Agency Announcement (BAAs) solicitations at www.darpa.mil, www.darpa.mil/sbir, or www.fedbizopps.gov.
- ✓ Think boldly. Embrace risk.

Engaging with DARPA...



If you have an idea that is high-risk, high-reward and would like to do business with DARPA, please contact the appropriate Office Director or Program Manager.

www.darpa.mil

Creative leaps require...

finding the...



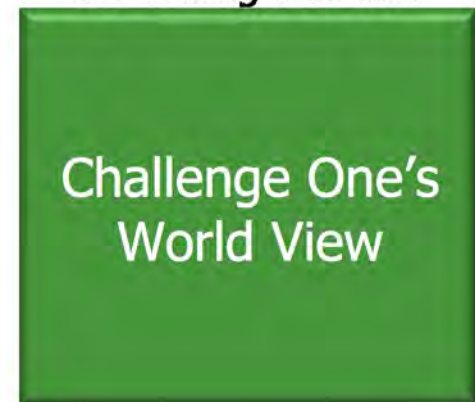
Bold, best-in-class
technical experts
and knowledgeable,
lean, adaptable
support staff...

the ability to...



...who recognize
opportunities and
are empowered to
act rapidly...

the willingness to...



...and are unafraid to
challenge
conventional
viewpoints
or methods.

Join me!

Join me!

- An historic opportunity, with impact that may last decades

Join me!

- An historic opportunity, with impact that may last decades
- PMs must think big and will get correspondingly big resources

Join me!

- An historic opportunity, with impact that may last decades
- PMs must think big and will get correspondingly big resources
- Only a small number of openings (fewer people, more pie for each)

Join me!

- An historic opportunity, with impact that may last decades
- PMs must think big and will get correspondingly big resources
- Only a small number of openings (fewer people, more pie for each)
- You will be a hero, and have fun doing it