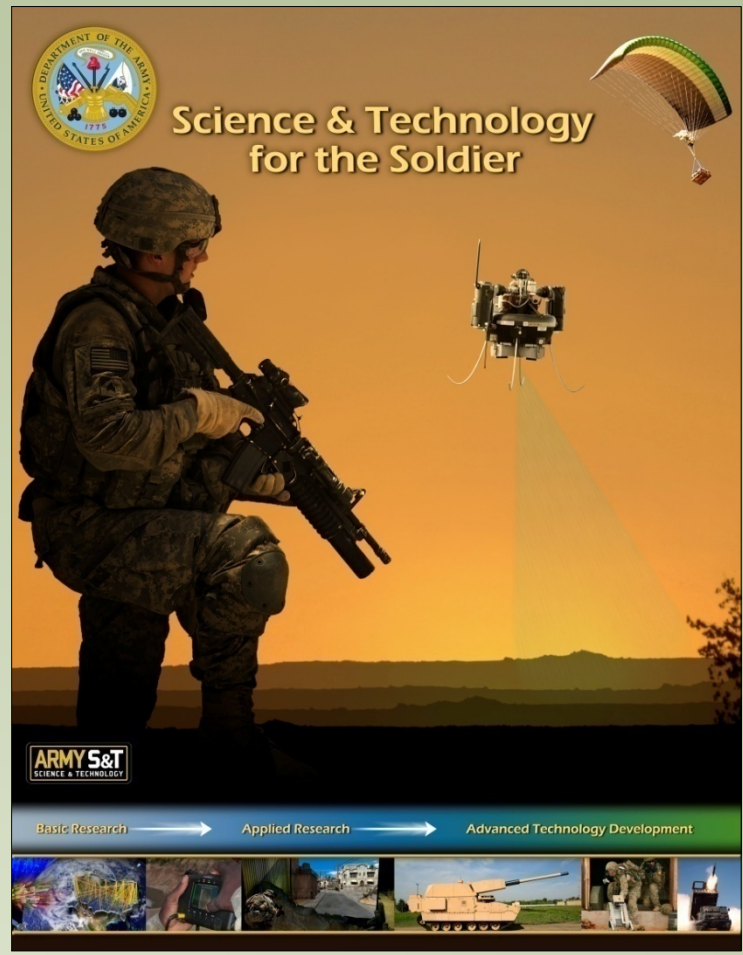
Army and Independent Research and Development

NDIA

10th Annual Science & Engineering Technology Conference

Empowering Soldiers through High Technology

23 April 2009



Dr. Jagadeesh Pamulapati
Deputy Director for Laboratory Management

Introduction

- *Army Science and Technology (S&T) Priorities*
- *The Next Generation of Revolutionary Technologies*
- *Independent Research and Development (IR&D)*

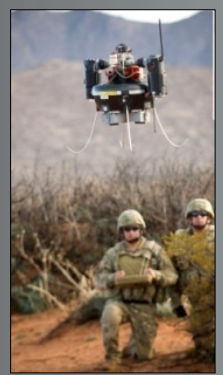
Strategy—what is Army S&T working to achieve

Foster innovation and accelerate/mature technology to enable Future Force capabilities while exploiting opportunities to rapidly transition technology to the Current Force

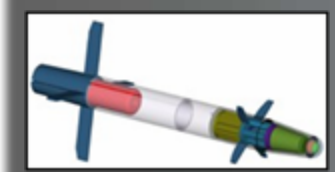
Current Force

Modular Protective Systems

Add on Armor for Tactical Vehicles



Micro Air Vehicle

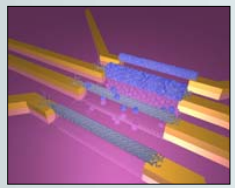


120mm Mid-Range Munition

Enabling the Future Force

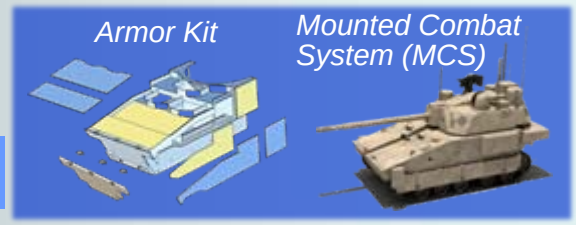
Future Force

Immersive Training



Virus-based Self-Assembling Electrodes—Advanced Batteries

Wearable Flexible Displays



Enhancing the Current Force

echnology Area Investments to Achieve Wa[illegible] S&T Outcomes

FY09 $1.8B

- Force Protection $370M
- ISR $149M
- C4 $144M
- Lethality $161M
- Medical $140M
- Soldier $135M
- Logistics $92M
- Rotorcraft $72M
- Classified $62M
- Unmanned Vehicle $54M
- Mil Eng & Environment $47M
- Advanced Simulation $37M
- Basic Research $379M

Shaping the FY09/10 Portfolio

Enabling the Future Force

Enhancing the Current Force

List of 37 Tier One Warfighter S&T Outcomes (1 of 2)

- Battle Command Network*
- Counter IED and Mine*
- Power & Energy*
- Human Dimension*
- Training*

"Big 5" Warfighter S&T Outcomes

10 Comprehensive Warfighter Outcomes— includes "Big 5"

- Battle Command Network
- Counter IED and Mine
- Power and Energy
- Human Dimension
- (JCA) Training
- (JCA) Force Protection
- (JCA) Battlespace Awareness
- (JCA) Force Application
- (JCA) Logistics
- (JCA) Unmanned Systems Operations

Includes all Army Tier I Outcomes—aligned with S&T portfolio

092308_Killion_ASTWG_Final

- Prognostics & Diagnostics
- Alternative Energy Sources
- Force Health Protection Initiative
- Increase control of unmanned systems
- Future Force Multi modal Human Computer Interface
- Increase Future Force Soldier Cognitive Functions While Under Stress
- Language and cultural awareness
- Dismounted soldier virtual training environment
- Adaptive training system

Big-Five Warfighter Outcomes that Guide S&T Investment

Battle Command Network

- *Beyond-line-of-sight*
- *Optimized for mobile operations*
- *Increase access to the individual Soldier*

Counter IED and Mine

- *Detect, identify and neutralize CBRNE obstacles*
- *Safe standoff distance*
- *Maintains maneuver force momentum while protecting Soldiers and platforms*

Power & Energy

- *Enhanced agility to operate worldwide, reducing weight and volume*
- *Sufficient pulsed power enabling advanced lethality options*
- *Increased continuous power and fuel economy*
- *Dismounted Soldiers to possess twice available power, at half the tactical weight*

Human Dimension

- *Enhance & restore cognitive and physical performance*
- *Soldiers incorporated into highly trained and competent small units*
- *Access on potential vs. high school performance*
- *Mitigate the increase in physiological and psychological tress*
- *Improving mental, moral and physical capacity and performance*

Training

- *Live, virtual, constructive and mixed venues*
- *Impart more skills, faster, at lower cost, with greater retention than currently achievable*
- *Use non-traditional home station training techniques; train prior to employment*
- *Enhance and account for individual proficiencies and learning rates (outcome based)*

Army S&T Priorities

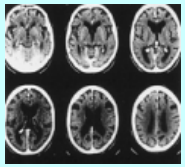
- **Battle Command Network**
- **Counter IED and Mine**
- **Power and Energy**
- **Human Dimension**
- **Training**
- **Force Protection**
- **Battlespace Awareness**
- **Force Application**
- **Logistics**
- **Unmanned Systems Operations**

S&T portfolio aligned with Warfighter needs

The Next Generation of Revolutionary Technologies

Decade of the 1970's

Structural Imaging



1971 – First Practical X-ray Computed Tomography Image

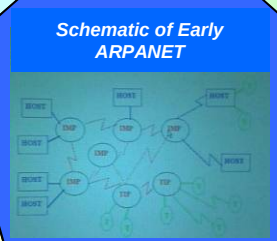
Artificial Intelligence

1970- Shakey the robot

Micro-processors

1971 – First 4-Bit Micro-Processor in Production

ARPANET



Super-computing

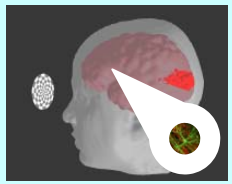
1975 – Cray I Supercomputer

Arcade Games

Genetic Engineering

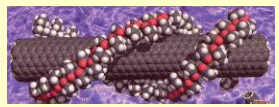
Today for 2020 and beyond…

Functional Brain Imaging & Beyond

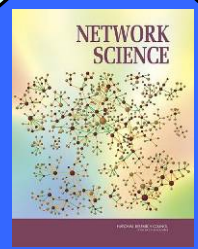


Robotics

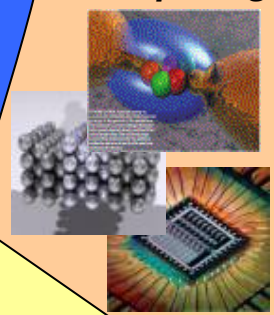
Nano-technology



Network Science

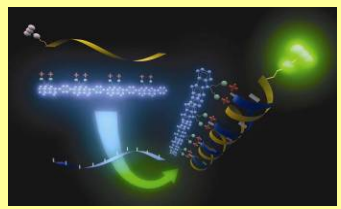


Quantum Computing



Immersive Environments

Bio-technology



Complexity Demands Disruptive Technology

Ground Combat Vehicle Evolution

M47 Patton
- *FM Radio*
- *Direct View Optics*
- *Engine Gauges*
- *Ballistic Periscopes*

M1A2 Abrams
- *Secure data/voice radio*
- *Thermal Viewer*
- *FBCB2 Digital Battle Command*
- *Digital Fire Control*
- *1 Color/3 Monochromatic Displays*

Soldier as System Evolution

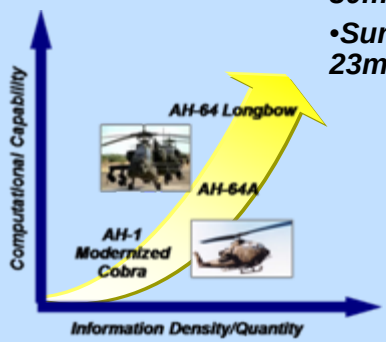
Late 1960s Soldier
- *FM radio*
- *Early I2 devices*
- *Binoculars*
- *M-16 with daylight scope*

Future Force Warrior (FFW)
- *Integrated body armor & equipment carriage suite*
- *Helmet mounted thermal imaging*
- *Radio digitally linked to unit communications network displaying individual locations*
- *Laser aided weapon precision fire control*
- *Embedded training*

Helicopter Evolution

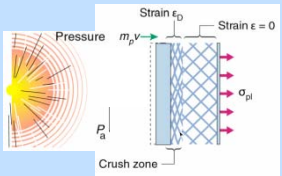
AH-1 G Cobra
- *FM Radio*
- *Direct View Optics*
- *2.75 inch rockets and 7.62mm machine gun*

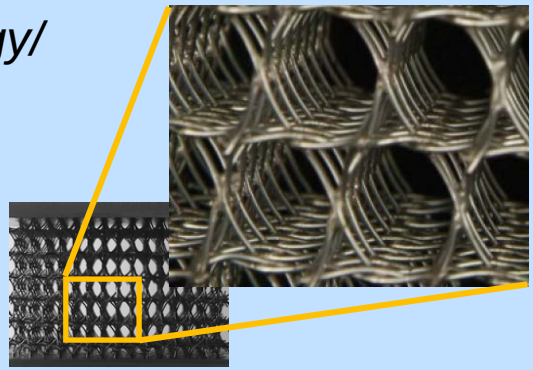
AH-64 Apache Longbow
- *Secure data/voice radio*
- *Integrated pilot night vision system*
- *Digital fire control linking gunners view & weapons systems*
- *Longbow MMW radar*
- *Hellfire missiles and 30mm cannon*
- *Survivable rotors—up to 23mm AA*



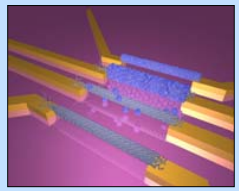
Revolutionary Technologies

Nanotechnology/ Biotechnology

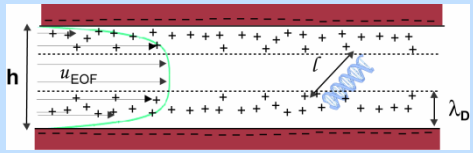


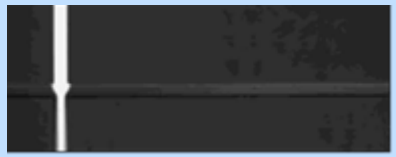


Bio-Inspired Energy-Dispersive Materials



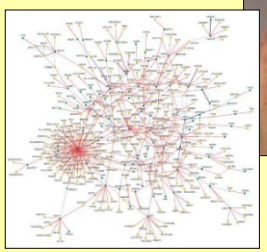
Virus-based Self- Assembling Electrodes





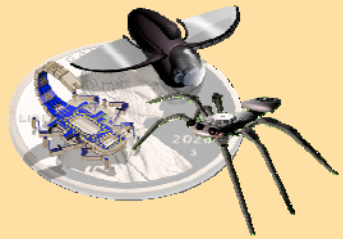
Nanofluidics

Network Science



Autonomous Systems

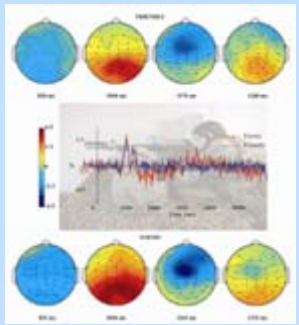
Nanoflyer

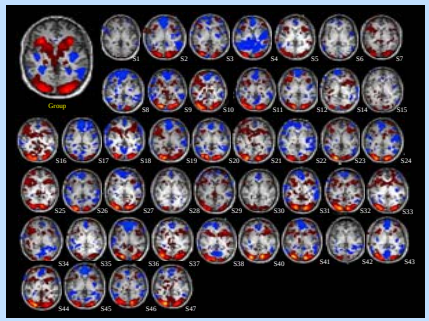


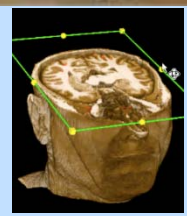
Micro Autonomous Systems Technology CTA

Revolutionary Technologies

Neuroscience

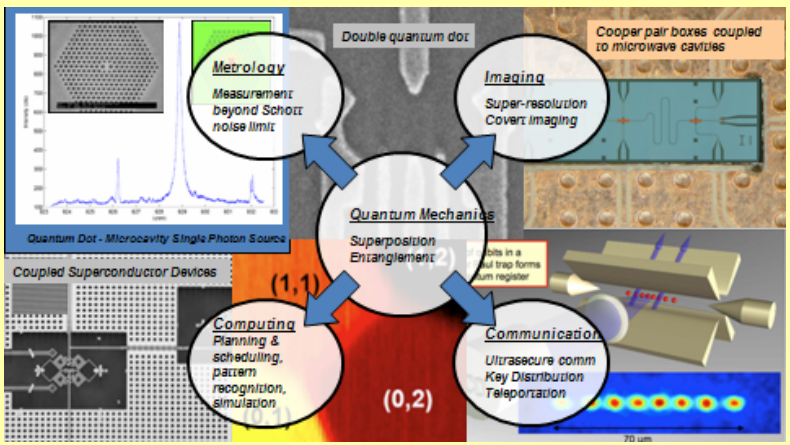






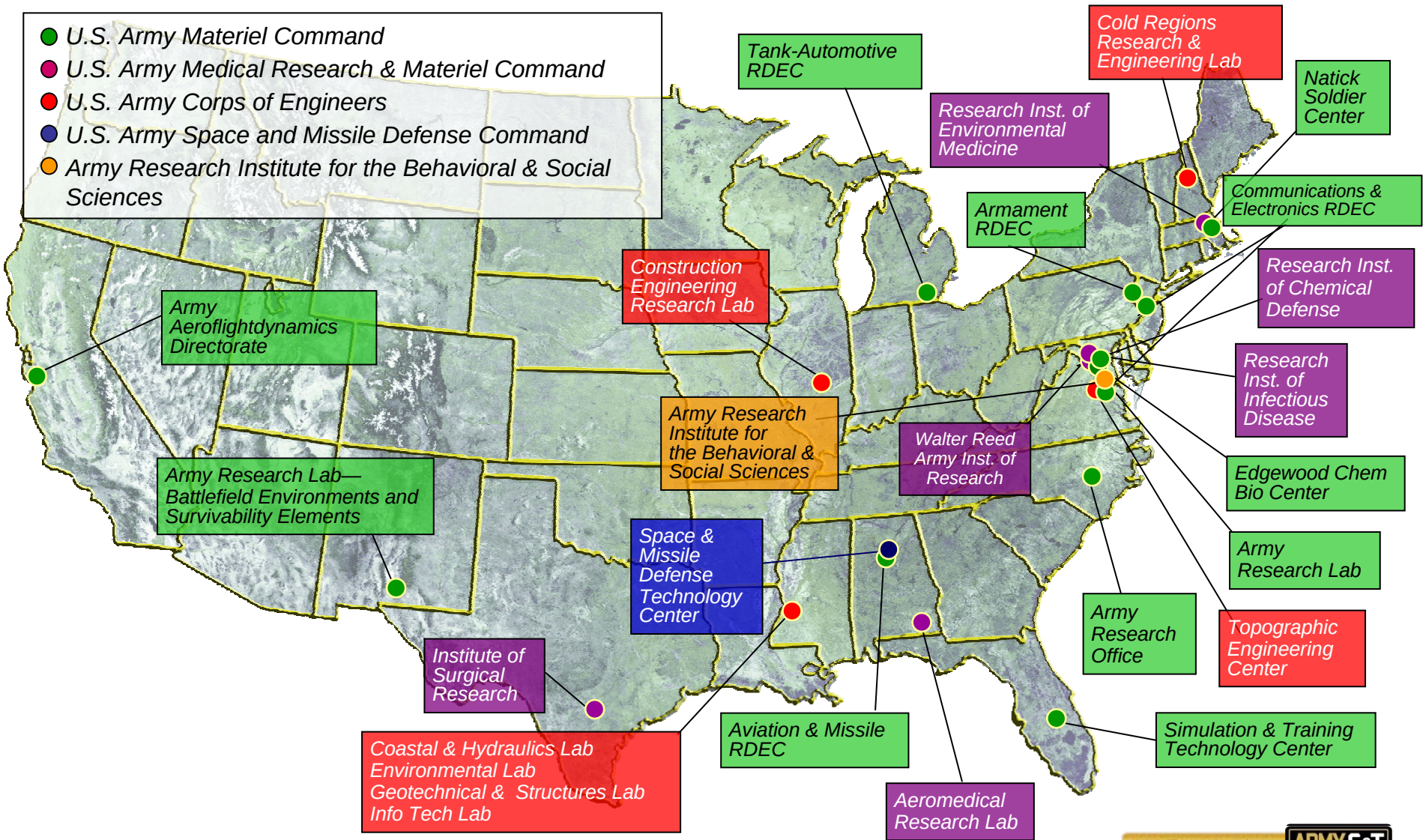
fMRI

Quantum Information Science



Immersive Technology

Army S&T Enterprise—Research, Development & Engineering Centers & Labs

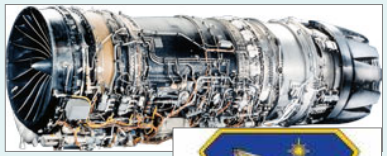


Partnering—leveraging other Services, Agencies, Academia, Industry & International

Other Services
- Air Force
- Navy/USMC

PTSD treatment

Versatile, Affordable, Advanced Turbine Engine



Agencies
- DARPA
- DTRA
- DoE labs
- DHS
- NIH
- NASA

Micro Air Vehicle

NLOS-LS

Academia
- Georgia Tech
- MIT
- Penn State
- USC
- UMd
- UC System
- Delaware
- Michigan
- Arizona State

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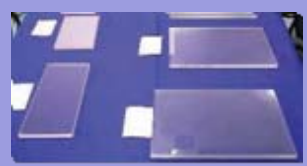
Industry
- Primarily technology development to create options for PMs
- Small Business Innovation Research—solutions from non-traditional sources
- Army Venture Capital Initiative—dismounted Soldier power

Transparent Armor–Technology Assessment & Transfer, Inc.



International
- The Technical Cooperation Program (US, UK, CA, AUS, NZ)
- NATO Research & Technology Organization
- Bilateral Agreements (UK, CA, IS, FR, GE…)

Co-investment with UK to advance state-of-the-art in network science

Upcoming Events/Opportunities

- *TRADOC Information Information Exchange Program*
  - *http://www.arcic.army.mil/res_briefings.html*
- *AMRDEC*
  - *http://www.redstone.army.mil/amrdec/News/events.html*
- *CERDEC Technology Interchange Meetings*
  - *http://www.cerdec.army.mil/business/ird.asp*
- *TARDEC*
  - *http://tardec.army.mil/events.asp*
- *ARDEC*
  - *https://www.pica.army.mil/TechTran/policy/index.asp#4*
- *AUSA (Winter/Spring)*
- *Army Science Conference*

For More Information

- *Links to pertinent websites*
  - *RDECOM*
    - *http://www.army.mil/institution/organization/unitsandcommands/commandstructure/rdecom/*
  - *US Army Corps of Engineers*
    - *http://www.usace.army.mil/Pages/Default.aspx*
  - *US Army Medical Research and Materiel Command*
    - *https://mrmc-www.army.mil/*
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