Dr. Thomas Doligalski
Director, Engineering Science
US Army Research Office
March 2015
ARL provides underpinning Science, Technology, and Analysis to the Army

ARO is ARL’s Principal Conduit to Engage the University Research Community
Changing the Paradigm

S&T Campaign Plans

- Human Sciences
- Information Sciences
- Computational Sciences
- Materials Research
- Assessment and Analysis

Extramural Basic Research

- Sciences for Lethality & Protection
- Sciences for Maneuver

Open Campus Business Model

Transformation Principles
Flow, Agility, Quality, Efficiency & Effectiveness

- ATTRACT AND RETAIN BEST & BRIGHTEST
- OPEN CAMPUSES
- SHARED MODERN FACILITIES
- INNOVATION PRACTICES

“We will need new technology over the next 10 years to make a leaner and more capable Army.”

GEN Raymond T. Odierno
38th Chief of Staff, Army

“Technology Driven. Warfighter Focused.”
ARO Organization

Director

Chief Scientist
Military Deputy
Special Assistant
Legal Counsel

Physical Sciences Directorate
- Chemical Sciences Division
- Life Sciences Division
- Physics Division

Engineering Sciences Directorate
- Electronics Division
- Materials Science Division
- Mechanical Sciences Division
- Earth Sciences Division

Information Sciences Directorate
- Computing Sciences Division
- Network Sciences Division
- Mathematical Sciences Division
- Outreach Division

Operations Directorate
- Support Management
- Information Management Division
- Acquisition Center

~100 employees at RTP, NC
37 PhD Program Managers
Army Research Office Goals

Utilize the vast intellectual capital of our nation’s universities to:

- **Create and Exploit Scientific Opportunities for Revolutionary New Army Capabilities**
- **Drive Science to Develop Solutions to Existing Army Technology Needs**
- **Accelerate Transition of Basic Research**
- **Leverage S&T From Outside Sources**
- **Create and Strengthen University, Industry, Government Partnerships**
- **Unbiased expert assessments for HQs**
- **Educate and Train the Future S&E Workforce for the Army**
- **Prevent Technological Surprises**

Research ranges from atom optics for underground bunker/tunnel detection to nano-energetics for more powerful and insensitive munitions and propellants

### Research Domains

- Chemistry
- Materials
- Computing & Info Science
- Mechanics
- Electronics
- Network Science
- Environmental Life Sciences
- Nanoscience
- Mathematics
- Physics

- 270+ Institutes of Higher Learning
- 1121 Individual Investigators
- 47 Research Centers
**Mission**

Provide innovative science, technology, and analyses to enable full spectrum operations.

**Vision**

America’s Laboratory for the Army: Many Minds, Many Capabilities, Single Focus on the Soldier

**ARL Extramural and In-House**

tightly integrated and collaborative through numerous mechanisms

---

**ARL S&T Campaigns**

- Assessment/Analysis
- Materials Research
- Computational Sciences
- Human Sciences
- Information Sciences
- Sciences for Maneuver
- Sciences for Lethality & Protection

**ARO Basic Research Thrusts**

- Chemistry
- Computing Sciences
- Electronics
- Life Sciences
- Materials
- Mathematics
- Mechanics
- Physics
- Network Sciences

**TRADOC/ARCIC S&T Lines of Effort**

- Human Performance Optimization
- Information to Decision
- Robotics
- Mobile Protected Platforms
- Aviation
- Improved Lethality & Effects
- Logistics Optimization

---

**ARO an Integral part of ARL**
Exploit a Unique Understanding of Both the Warfighter and Basic Research

- Know what the warfighter needs now
- Determine what the warfighter needs in the future
- Understand the current cutting-edge of science and engineering
- Drive the cutting-edge in new directions to create new solutions for the warfighter

Utilize a Coordinated and Cohesive Set of Mechanisms

Utilize and Help Create Strategic Guidance

<table>
<thead>
<tr>
<th>ASD(R&amp;E) S&amp;T Priorities for FY13-17</th>
<th>OSD High Interest Basic Science Research Areas</th>
<th>ASAALT Special Focus Areas</th>
<th>TRADOC Top 5 Warfighter Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data to Decisions</td>
<td>Synthetic Biology</td>
<td>Biotechnology</td>
<td>Battle Command Network</td>
</tr>
<tr>
<td>Engineered Resilient Systems</td>
<td>Quantum Information Science</td>
<td>Nanotechnology</td>
<td>Counter IED and Mine</td>
</tr>
<tr>
<td>Cyber Science and Technology</td>
<td>Computational Modeling of Human Behavior</td>
<td>Neuroscience</td>
<td>Unmanned Systems Opns</td>
</tr>
<tr>
<td>Electronic Warfare / Electronic Protection</td>
<td>Cognitive Neuroscience</td>
<td>Network Science</td>
<td>Battlespace Awareness</td>
</tr>
<tr>
<td>Counter Weapons of Mass Destruction</td>
<td>Nano-Science and Nano-Engineering</td>
<td>Immersive Technology</td>
<td>Human Dimension</td>
</tr>
<tr>
<td>Autonomy</td>
<td>Engineered Design and Transport of Energy / Information in New Materials</td>
<td>Quantum Effects</td>
<td></td>
</tr>
<tr>
<td>Human Systems</td>
<td></td>
<td>Materials Modeling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Autonomous Systems</td>
<td></td>
</tr>
</tbody>
</table>
ARL Basic Research Portfolio
From Ideas to Technology

- Single Investigator Program: $78M
- University Research Initiative: $73M
- University Affiliated Research Centers (UARCs): $30M
- University Centers of Excellence: $17M
- Collaborative Technology Alliances: $48M

FY2014 Data

Complementary programs cohesively managed
**Objective of Each Approach**

- **University Single Investigators**
  - Utilize world-class academic expertise world-wide
  - Rapid, agile exploitation of novel scientific opportunities
  - Very Cost Effective
  - 3yr grants, ~$120K.yr, No Automatic Renewal

- **Multidisciplinary University Research Initiatives**
  - University-led, multidisciplinary initiatives
  - 3-5 year duration, $1.25 M/year efforts

- **University Affiliated Research Centers**
  - University-led consortium
  - High intensity centers for emerging opportunities
  - 5-8 year duration, $5-10M/year efforts

- **University Centers**
  - University-led, focused initiatives
  - 5 year duration plus options;
  - $1-10M/year efforts

- **In-house Research**
  - Maintain Army “smart-buyer” capability
  - Army-unique facilities
  - Provide world-class researchers in Army critical areas

- **Collaborative Technology Alliances (CTAs)**
  - Partnership with in-house labs, academia, and industry
  - Focused technology initiatives and rapid transition
  - (staff rotation) 5-8 year duration;
  - 20-30 man-year, $5-8M/year efforts

---

**Goal of Research Approach**

- Exploit Scientific Opportunities
- Overcome Technical Barriers
- Both