



Integrity ★ Service ★ Excellence

NSPAA Workshop New Orleans, LA

June 7, 2018

**Edward J. Lee
DO-III
RTB-2**

Air Force Office of Scientific Research





AFOSR Science and Technology Strategy

“excellence in science and transformative capabilities for the Air Force”



Mission: Discover, shape, and champion basic science that profoundly impacts the future Air Force

Identify breakthrough research opportunities here & abroad

- 30 Arlington-based Program Officers and 18 International Program Officers interacting with leading scientists and engineers across the globe
- 3 International offices (London, Tokyo, Santiago)



Foster revolutionary basic research for Air Force needs

- 1215 research projects in FY17
 - 209 U.S. institutions
 - 47 States
- 325 intramural projects at Air Force Research Laboratory, U.S. Air Force Academy, and Air Force Institute of Technology in FY17
- In FY16 303 international efforts in 33 countries in 5 continents

Transition to DoD and industry

- AFRL is the principal technology transition path
- 43 Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) contracts funded with FY17 funds
- Entrepreneurial impact: >1600 patents; 74 spin-off companies
- Human capital from academe to AFRLs (Visiting Faculty/Students; Thesis Internship, ...)





Air Force Research Laboratory



**Assistant Secretary
of the Air Force
(Acquisition)**



**Air Force
Materiel Command
(AFMC)**



**Materials &
Manufacturing
(RX)**



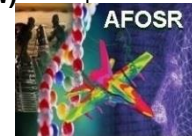
**Sensors
(RY)**



**Aerospace
Systems
(RQ)**



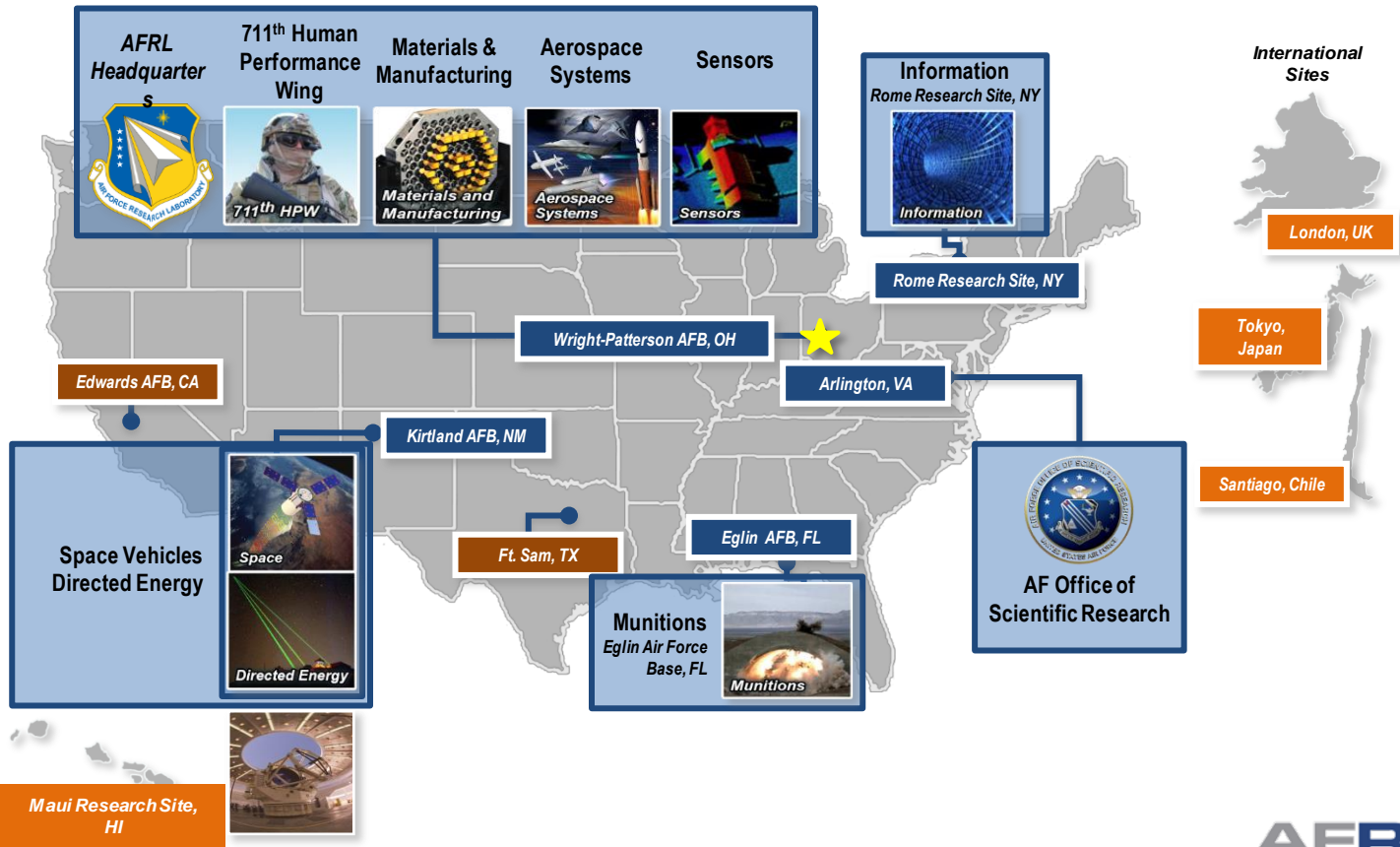
**711th Human
Performance Wing
(711 HPW)**



**Air Force Office of
Scientific Research
(AFOSR)**



AFRL Locations





What is Basic Research?



*“Basic research is **systematic study** directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts **without specific applications** towards processes or products in mind. It includes all scientific study and experimentation directed toward **increasing fundamental knowledge** and understanding in those fields of the physical, engineering, environmental, and life sciences **related to long-term national security needs...**”*

(DoD Financial Management Regulation)





Supporting AFRL Technical Directorates



RI – Assured command & control



RX – Energetic materials



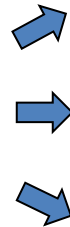
RV – Space science



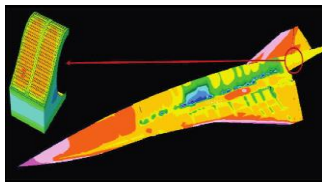
RH – Neural stimulation



AFOSR



RD – Fiber lasers



RQ –Hypersonics



RX – Printed electronics



RW - Nature-inspired flight





Scientific Partnerships



- Hypersonics Research
- Non-equilibrium flow
- Digital Twin
- Nanocomposites
- Living With a Star Steering Committee



NIST

- Nanophotonics



- Origami Structures, aero
- Solar and heliospheric physics
- Decision Making, Social and Behavioral Science, plasma chemistry, and others



Working with many industry and international teams on various research topics



- Ultracold atoms, Quantum sensor-magnetometry
- Microplasma for counter HPM
- Plasma-based logic circuits for rad-hard applications
- Photonics, High-power energy,
- Many more...



- Nanoenergetics: co-crystallization
- Combustion



- Many joint reviews
- Metamaterials research
- Laser propagation
- Graphene research
- Alt Navigation
- Other areas



- Complex Networks
- OSTP/NITRD committee member



National Institutes of Health

- Cognition



- Combustion Working Group
- Multi-Agent Sys.



- Alternative energy Interagency
- Pulse Power Energy
- High temperature superconductors



Space Weather





AFOSR Supports University Individual Investigators



Goals

- Provide revolutionary scientific breakthroughs to maintain military air, space, and information superiority
- Build collaborations between AFRL and universities

General Submission Process

- Researchers submit white papers to AFOSR program managers
- Promising white papers lead to request for full proposals
- Proposals merit reviewed for *excellence* and *relevance*
- Individual grants awarded for up to 5-years in duration

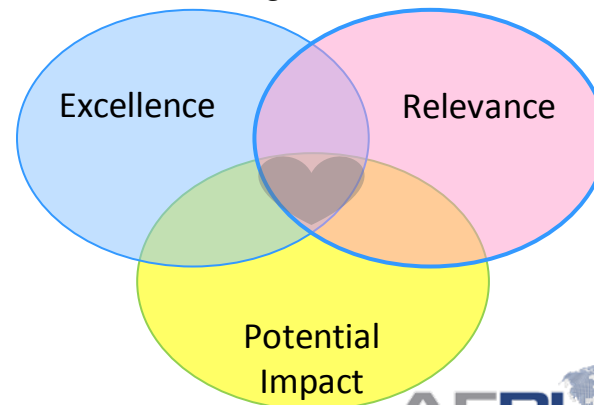




How To Do Business With AFOSR



- **General GRANT Submission Process**
 - Researchers submit white papers to AFOSR program officers (PO)
 - Promising white papers lead to request for full proposals
 - Individual grants awarded for up to 5-years in duration
- **POs weighs several factors in selecting proposals for funding**
 - White paper process to identify overlap with program interests
 - Encourage proposals with high potential for breakthroughs
 - Peer review to gauge scientific merit
 - Programmatic issues
 - Strategic directions
 - Portfolio coverage
 - Budget realities



Broad Agency Announcement (BAA) open at all times to innovative ideas
<http://www.wpafb.af.mil/afrl/afosr/>





Engineering and Complex Systems (RTA1)



DYNAMIC MATERIALS AND INTERACTIONS

MARTIN SCHMIDT

GHz - THz ELECTRONICS AND MATERIALS

KENNETH GORETTA

ENERGY, COMBUSTION AND Non-EQUILIBRIUM THERMODYNAMICS

CHIPING LI

UNSTEADY AERODYNAMICS AND TURBULENT FLOWS

DOUGLAS SMITH

HIGH SPEED AERODYNAMICS

IVETT LEYVA

LOW DENSITY MATERIALS

JAIMIE TILEY

MULTI-SCALE STRUCTURAL MECHANICS AND PROGNOSIS

JAIMIE TILEY

SPACE PROPULSION AND POWER

MITAT BIRKAN

TEST SCIENCE for TEST and EVALUATION

BRETT POKINES



Information and Networks (RTA2)



COMPUTATIONAL COGNITION and MACHINE
INTELLIGENCE

JAMES LAWTON

COMPUTATIONAL MATHEMATICS

JEAN-LUC CAMBIER

DYNAMICS AND CONTROL

FREDERICK LEVE

DYNAMIC DATA DRIVEN APPLICATIONS SYSTEMS

ERIK BLASCH

INFORMATION ASSURANCE AND CYBERSECURITY

TRISTAN NGUYEN

OPTIMIZATION AND DISCRETE MATHEMATICS

JEAN-LUC CAMBIER

SCIENCE OF INFORMATION, COMPUTATION,
LEARNING AND FUSION

DOUG RIECKEN

SYSTEMS AND SOFTWARE

JAMES LAWTON

TRUST AND INFLUENCE

BENJAMIN KNOTT



Physical Sciences (RTB1)



AEROSPACE MATERIALS FOR EXTREME ENVIRONMENTS

ALI SAYIR

ATOMIC AND MOLECULAR PHYSICS

TATJANA CURCIC

ELECTROMAGNETICS

ARJE NACHMAN

LASER AND OPTICAL PHYSICS

GERNOT POMRENKE

OPTOELECTRONICS AND PHOTONICS

GERNOT POMRENKE

PLASMA AND ELECTRO-ENERGETIC PHYSICS

JASON MARSHALL

QUANTUM ELECTRONIC SOLIDS

HAROLD WEINSTOCK

QUANTUM INFORMATION SCIENCES

GRACE METCALFE

REMOTE SENSING

STACIE WILLIAMS

SPACE SCIENCE

JULIE MOSES

ULTRASHORT PULSE LASER-MATTER INTERACTIONS

ENRIQUE PARRA





Chemistry and Biological Sciences (RTB2)



BIOPHYSICS

SOFI BIN-SALAMON

HUMAN PERFORMANCE AND BIOSYSTEMS

PATRICK BRADSHAW

MECHANICS OF MULTIFUNCTIONAL MATERIALS
AND MICROSYSTEMS

LES LEE

MOLECULAR DYNAMICS AND THEORETICAL
CHEMISTRY

MICHAEL BERMAN

NATURAL MATERIALS, SYSTEMS and
EXTREMOPHILES

SOFI BIN-SALAMON

ORGANIC MATERIALS CHEMISTRY

KEN CASTER





HBCU/MI Program



- **Historically Black Colleges & Universities and Minority Institutions (HBCU/MI) Program**
 - Provides grants for research and instrumentation at HBCU/MIs
 - 22 grants awarded at \$2.0M in FY09 and \$2.5M in FY11, FY12 and FY13
 - \$3.8M in 2014
 - \$4.5M in 2015
 - \$4.5M in 2016
 - \$4.5M in 2017
 - \$4.5M in 2018 (36 projects supported)
- **DoD Research and Education Program**
 - Solicitation open to all HBCU/MI's, closed on 10 August 2017
 - Research up to \$600,000 and two - four students
 - Three applications per institution
 - *Managed by the Army Research Office (ARO)
 - *Content of the solicitation changes every year



Defense University Research Instrumentation Program (DURIP)



Part of the University Research Initiative (URI).

Designed to improve the capabilities of U.S. institutions of higher education to conduct research and to educate scientists and engineers in areas important to national defense by providing funds for acquisition of research equipment. DURIP provides up to \$1,500,000 for instrumentation.

Recipients must:

- be accredited U.S. institutions of higher education**

- Public and State controlled institutions of higher education**

- Private institutions of higher education**

- have degree granting programs in science, mathematics and/or engineering**



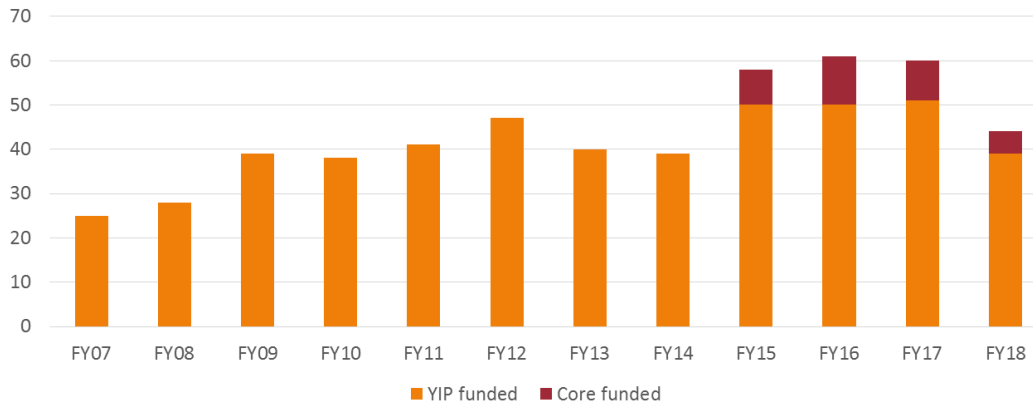


Young Investigator Program (YIP)



- Enhance early career development of outstanding young investigator by fostering creative basic research in science and engineering via AF research projects
 - Received PhD in the last five years or
 - Received PhD in the last seven years if served as 2 years as research associate/post-doc or tenure track faculty
- 525 awards since FY07
- \$150K per year for 3 years (additional 2 years option)
- FY18, 44 new YIPs awarded totaling \$19.1M
- FY19 YIP BAA projected to open mid Mar 18 (posted on www.grants.gov)

YIP Historical Data



S&E FORCE RENEWAL	PROGRAMS		POSITIONS	
	Palace Acquire Program (PAQ)	SMART Program	Pathways	Entry Level
PROGRAM DESCRIPTION	<ul style="list-style-type: none">• 2 or 3-year program:1 year to earn a Master’s degree. The 1st and 3rd years - work experience, the 2nd year is for paid graduate studies, while maintaining full salary.• Benefits: student loan repayment (up to \$20K), possible recruiting bonus (25% of salary)	<ul style="list-style-type: none">• SMART is a national program recruiting new talent for the DoD.• Benefits include scholarship, stipend (\$25K to \$38K, depending on level/degree), health insurance reimbursement and internship.	<ul style="list-style-type: none">• This program provides an opportunity for current students to get part-time engineering experience.	<ul style="list-style-type: none">• Full-time employment
ELIGIBILITY REQUIREMENTS	<ul style="list-style-type: none">• U.S. Citizenship• Obtain & maintain Clearance• Signed Mobility Agreement• Accept a service commitment	<ul style="list-style-type: none">• U.S. Citizenship• Accept a service commitment with the DoD, 1 year for every year in the program (1:1) upon graduation.	<ul style="list-style-type: none">• U.S. Citizenship• Meet OPM qualification requirements for Competitive Service	<ul style="list-style-type: none">• U.S. Citizenship• Obtain & maintain Security Clearance
EDUCATION	<ul style="list-style-type: none">• B.S. degree from ABET-accredited university• >2.95 cumulative GPA• Graduate studies must be in science or engineering degree	<ul style="list-style-type: none">• Pursuing undergraduate or graduate degree in an approved Science, Technology, Engineering and Mathematics (STEM) discipline• >3.0 cumulative GPA	<ul style="list-style-type: none">• Enrolled in ABET accredited university; science or engineering degree• Enrolled at least half-time during Fall & Spring• >2.95 cumulative GPA	<ul style="list-style-type: none">• B.S. in Science or Engineering (ABET-accredited)
POSITION/ GRADES	<ul style="list-style-type: none">• Starting at GS-07• At the end of the development period PAQs will be promoted to journeyman-level (GS-12)	<ul style="list-style-type: none">• GS-07 for undergraduate• GS-09 for master’s• GS-11 for PhD’s	<ul style="list-style-type: none">• Starting at GS-04	<ul style="list-style-type: none">• Starting at GS-07
APPLICATIONS	<ul style="list-style-type: none">• Accepted year-round• Apply at a recruiting event• Positions applied for on USAJobs	<ul style="list-style-type: none">• Accepted August 1 through December 15• Submit online at www.asee.org/smart	<ul style="list-style-type: none">• Accepted year round• Must be submitted to installation	<ul style="list-style-type: none">• Accepted year round• Positions can be applied for on USAJobs



Contact Information and More



- AFOSR Home Page: <http://www.afosr.af.mil>

- POC at AFOSR:

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Questions

