U.S. AIR FORCE

USSF

AFRL

Air Force Office of Scientific Research Basic Research Opportunities and Space Interests

Dr. Julie Moses

AFRL/AFOSR Space Science Program Officer

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The Air Force Office of Scientific Research (AFOSR)
INVESTING IN DISCOVERY TODAY

TO COMPETE, DETER, AND WIN TOMORROW

FY22 Global Footprint

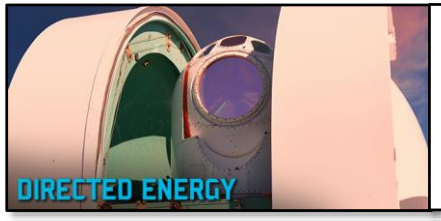
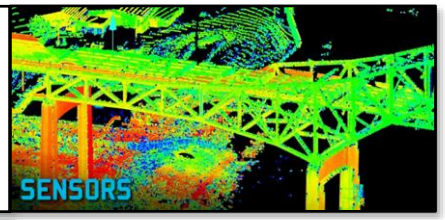
Mission is to discover, shape, and champion basic research for the Department of the Air Force (DAF)

60+ World-class subject matter experts search the globe for solutions to science challenges for future Defense capabilities

Awards 1,000+ grants each year to academic institutions worldwide and funds ~200 intramural research efforts

Cultivates and matures science, builds workforce pathways, and facilitates transition within AFRL and beyond

Air Force Research Laboratory At-a-Glance

AEROSPACE SYSTEMS	Aerospace Vehicles, Control, Power & Thermal Management, High Speed Systems, Rocket Propulsion, Turbine Engines			Laser Systems, Weapons Modeling, Simulation & Analysis, High Power Electromagnetics (HPEM), Directed Energy and Electro Optics for Space Superiority	**DIRECTED ENERGY**
HUMAN PERFORMANCE	Training, Adaptive Warfighter Interfaces, Bioeffects, Bioengineering, Aerospace & Operational Medicine			Advanced Space Resilience Technologies, Space Communication & Navigation Technologies, Space Awareness and Command & Control, Space Environment	**SPACE VEHICLES**
MATERIALS & MANUFACTURING	Structural Materials, Functional Materials, Manufacturing Technology, Support of Operations			Processing & Exploitation , Connectivity & Dissemination Autonomy, Command & Control and Decision Support, Cyber Science and Technology	**INFORMATION**
SENSORS	Radio Frequency (RF) Sensing, Electro Optical (EO) Sensing, Spectrum Warfare, Trusted & Resilient Mission Systems, Multi-domain Sensing Autonomy, Enabling Sensor Devices & Components			Munitions Airframe, Guidance, Navigation & Control, Terminal Seeker Sciences, Modeling & Simulation Evaluation Sciences Ordnance Sciences	**MUNITIONS**
EXPERIMENTATION	Capability & Technology Prototyping			Engineering & Information Sciences, Physical & Biological Sciences	**BASIC RESEARCH**

Investment Categories

6.1

Basic Research

Science Knowledge

Greater knowledge or understanding fundamental aspects

Observable facts

Without specific applications toward processes or products

New Science

6.2

Applied Research

Technologies

Applying knowledge or understanding to determine the means by which a recognized and specific need may be met

Science to Application

6.3

Advanced Technology Development

Capability Concepts

The development and integration of hardware for field experiments and tests

From Application to Capability

Non S&T

Other AF Funds Executed

Operational Development / Experimentation

- Research, Development, Test and Evaluation
- Strategic Development Planning Experimentation
- Small Business Innovation Research Program
- Air Force Surgeon General

Experimentation

How to work with AFOSR:

#AFRL #BasicResearch #AFOSRBoldResearch #HighRiskHighReward #AFOSRSpaceResearch #AFOSRPartnerships #AFOSRSTEM

#AFOSRYIP #AFOSRDURIP #AFOSRMURI #AFOSR_HBCU #PECASE #AFOSRTalent #AFOSRDATA #AFOSRPopSci

Funding Opportunities

TRADITIONAL GRANTS

- Extramural Grants
- International Grants
- Historically Black Colleges and University/Minority Institution Grants
- Young Investigator Grants
- Center of Excellence Grants

START

CAPACITY+ OPPORTUNITIES

- Multidisciplinary University Research Initiative Grants
- Instrumentation Grants
- Presidential Early Career Award for Scientists and Engineers
- MINERVA Research Initiative
- Summer Faculty Fellowships
- Windows on Science
- Defense Enterprise Science Initiative

GROW

WORKFORCE DEVELOPMENT

- Undergraduate Research Experiences
- Graduate Fellowships
- AFRL Internships
- AFRL Science and Technology Fellowships

SHARE

DURIP

DURIP is an Office of the Under Secretary of Defense, Research and Engineering (OUSDR&E) sponsored tri-service program designed to improve the capabilities of accredited United States (US) institutions of higher education to conduct research and to educate scientists and engineers in areas important to national defense by providing funds for the acquisition of research equipment or instrumentation.

Through DURIP we acquired additional equipment which was incredibly powerful and provided our lab with the capability to perform top-notch research that only larger institutions (e.g., Harvard, MIT, Northwestern) have and enabled us to start competing in the world rankings of Materials Science and Engineering programs – Dr. David Kisailus, University of California, Riverside (now UC Irvine)

Program Attributes

- 12-month awards for acquisition of equipment/instrumentation
- Capacity building in areas of vital importance to DoD – research and human capital
- Long-term investment via short grant
- No past, current, or future DoD funding required and no citizenship requirements

Budget

PEC: 61103F / SubBPAC: 5094U

FY18 (M)	FY19 (M)	FY20 (M)	FY21 (M)	FY22 (M)
$20.1	$20.0	$18.4	$20.1	$18.6

FY23 (M)	FY24 (M)	FY25 (M)	FY26 (M)
$?	$19.0	$12.5	$13.7

Young Investigator Program (YIP)

The YIP is awarded to outstanding early career S&Es who show innovative and ***"high risk"*** basic research directly related to AFOSR portfolios in promising and potential groundbreaking topics resulting in ***"high reward"***

- Program was established in 2007, over 640+ YIPs have been awarded
- Highly competitive award, 15-18% success rate

Eligibility Requirements

- US citizen or permanent resident
- Within seven years of receiving PhD
- Employed by US institution, for profit businesses, or non-profit research organizations

Budget

BPAC: 61102F

FY21 (M)	FY22 (M)	FY23 (M)	FY24 (M)	FY25 (M)
$15.8	$16.5	$16.3	$16.2	$16.2

One YIP per portfolio awarded

Recipient Attributes

- Foster creative basic research in S&E
- Enhance career development of early career researcher
- Address AF and DoD future research needs in critical technology areas

Three year research grant totals $450,000; not to exceed $150,000 annually

Science and Technology Fellowship Program (STFP)

The STFP offers 100 (84 AFOSR and 16 TD funded) postdoctoral and senior scientists and engineers opportunities to perform in residence research at sponsoring Air Force laboratory sites (AFRL, AFIT, and USAFA)

- Attract non-government, U.S. citizen, PhD S&Es (post-docs and senior researchers) of unusual promise and ability
- Allow researchers to solve problems largely of their own choice in alignment with current AF laboratory research interests
  - Over 300+ research opportunities listed on website

https://sites.nationalacademies.org/PGA/Fellowships/AFRL/index.htm

AFOSR Funded Positions

AF Organization	Allocations
Aeronautical Research Center	4
Aerospace Systems Directorate	14
Air Force Institute of Technology	2
Air Force Office of Scientific Research	2
Airman Systems Directorate	10
Directed Energy Directorate	6
Information Directorate	6
Materials & Manufacturing Directorate	14
Munitions Directorate	9
Sensors Directorate	6
Space Vehicles Directorate	11
TOTAL	**84**

Budget

BPAC: 61102F

FY21 (M)	FY22 (M)	FY23 (M)	FY24 (M)	FY25 (M)
$9.5	$9.5	$9.5	$9.5	$9.7
$0.68	$0.4	TBD	NA	NA

***: TD Funds**

USSF Opportunities

- Post research opportunities in hard to fill research positions
- Serve as research advisors to STFP fellows
- https://sites.nationalacademies.org/PGA/RAP/PGA_170152

Up to two year fellowship includes: $76,542 post-doc & $92,057 senior researcher salary, $4,000 travel budget, & healthcare insurance!

National Defense Science and Engineering Graduate Fellowship Program (NDSEG)

This congressionally mandated program under the direction of the Office of the Under Secretary of Defense for Research and Engineering, OUSD (R&E), is a tri-service fellowship program sponsored by the Air Force Research Laboratory (AFRL), the Army Research Office (ARO), and the Office of Naval Research (ONR) designed to increase the number of US citizens receiving doctorates in research discipline areas of military importance at US institutions

AFOSR serves as the DoD Program Manager

www.ndseg.org

NDSEG Mentor Program

- Establish a one on one relationship with fellows and DoD S&Es
  - Host quarterly meetings
  - Advise fellows on career development
  - Promote DoD internships and research opportunities
- Serves as pipeline for DoD workforce development of future S&Es

Budget

BPAC: 61103F

FY21 (M)	FY22 (M)	FY23 (M)	FY24 (M)	FY25 (M)
$45.0	$45.0	$45.0	$45.0	$45.0

150-180 awards annually

***: OSD Funds**

NDSEG Conference

- Establish a relationship with fellows to increase DoD engagement
- Build networking community
- Connect fellows with sponsoring agency S&Es
- Provide valuable perspective on related research conducted across the defense community

Three year fellowship includes: full tuition/fees, $3,400 monthly stipend, $5,000 travel budget, & $1,400 healthcare insurance!

Science, Technology, Engineering and Mathematics (STEM)

AFRL

The technological superiority of the Department of the Air Force depends on the availability of experienced, well-trained scientists, engineers and a STEM literate public.

STEM Pre-K-16

Education and outreach activities that promote foundational knowledge building, experiential learning and workforce development
STEM FOA, DURIP-LL FOA, DAF K12 National Office

Awards to Stimulate and Support Undergraduate Research Experiences

Undergraduate research support for projects relevant to DOD areas of interest
Component of the National Science Foundation's Research Experiences for Undergraduates Program

Summer Faculty Fellowship Program

Technical directorates provide professional development opportunities to faculty and graduate students
Alumni self-report finding value in the program and several participants have returned for continued research opportunities

AFRL Scholars

Provides project-based summer internship experience for HS – Postdoc & professional educators
AFOSR supports RD-managed program in partnership with TDs

Photo Credit: National Human Genome Research Institute

Frontiers of Engineering

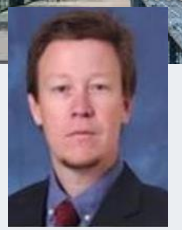
Multi-day symposium providing networking opportunities for early career professionals
Attendees must be nominated and selected by National Academies of Science and Engineering panelists

AFOSR Core Space Team

Tony Kim

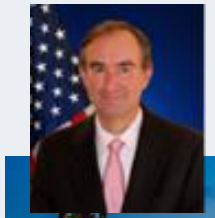
Brad Barrett

Geoffrey Andersen



AFOSR Core Space Group

Scott Dudley



Grant Thomas

Barrett Flake

Stacie Williams

Julie Moses

Michael Yakes

Basic Research Project Provides Gold Standard Ionosphere Weather Model

AFRL

** Blue highlight indicates transition customer*

The technology:

Global Assimilation of Ionospheric Measurements (GAIM)

Full physics model that ingests ground and space data to forecast on a spatial grid a continuous reconstruction of the three-dimensional electron density distribution from 90 km to geosynchronous altitude (35,000 km) to predict ionosphere disturbances.

AFRL/AFOSR-funded grants/exchanges:

- ***1998: OSD Multidisciplinary University Research Initiative (MURI) collaboration between AFOSR and Office of Naval Research***

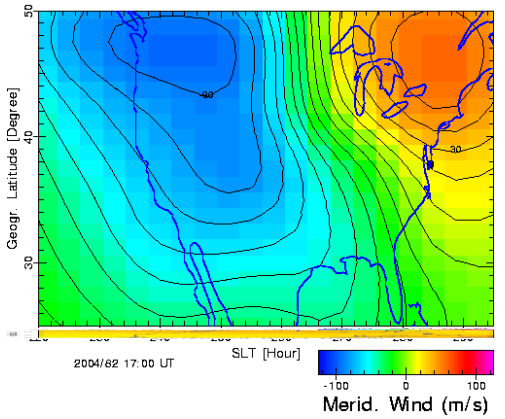
6.1 Basic Research Investment from FY98-03 $5M

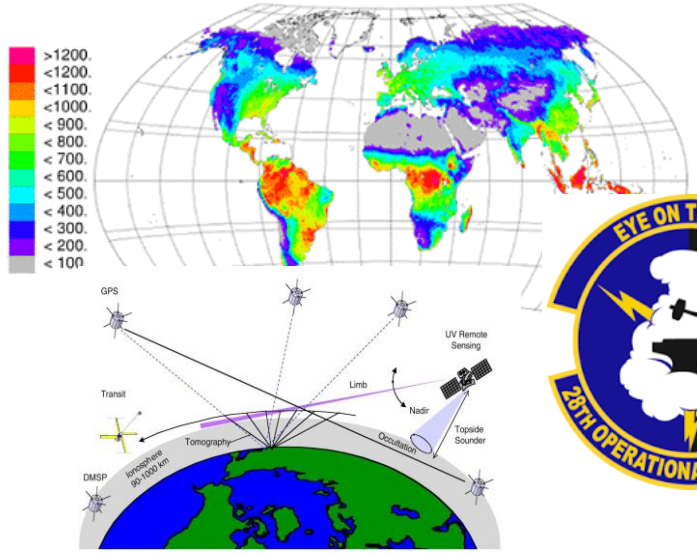
PI: Dr. Robert Schunk, Utah State University

2018 transition to 557th Weather Wing

- 2006- initial GAIM version transitioned to Air Force Weather Agency and 2018 full physics model was transitioned to the 557th Weather Wing supporting environmental situational awareness worldwide to the Air Force, Army, joint warfighters, Unified Combatant Commands, the national intelligence community, and the Secretary of Defense.
- The research began as a collaborative Multidisciplinary University Research Initiative between the Office of Naval Research and AFOSR in 1998 and is used extensively in the space weather community including NASA and NOAA.

- Incorporates experimental measurements to forecast the ionosphere whose disturbances can significantly impact both military and civilian systems.
- Provides global distributions for the ionospheric drivers such as neutral winds and densities, magnetospheric and equatorial electric fields, and electron precipitation patterns that may affect military and civilian systems.
- Model is a gold standard in the space weather community and is used by NASA, NOAA, and many others.





EYE ON THE SKY
26TH OPERATIONAL WEATHER SQ

New Funding Opportunities: USSF Space Strategic Technology Institutes

Objectives

- Create a rich ecosystem of university partners, including UPP, international, other world-class research institutions, and research within the Department of Air Force.
- Engage with academia to perform USSF-specific applied research and transition early-stage technology into transformational capability development
- Augment the workforce development parts of UPP by providing research opportunities for Guardians pursuing advanced degrees

Way Ahead

Five SSTIs focused on Technology Breakthroughs in Key Areas:

- XGEO and Space Domain Awareness
- Advanced Space Power and Propulsion
- In-space Servicing and Manufacturing
- Advanced Remote Sensing Technologies and Operating Concepts
- Cyber Mission Assurance and Data Trust for Space Based Military Missions

Space Strategic Technology Institutes (SSTIs)

Addresses Science and Technology (S&T) challenges via multi-party institutes:

- Each SSTI will comprise a network of universities and industry collaborating with government laboratories to address space research, development and demonstration needs
- S&T that also includes strategy, doctrine, CONOPS, law, logistics, supply chain and advancing research in other relevant areas
- Facilitates advancement of capabilities into integrated systems
- Opportunity for international/allied S&T collaboration

SSTIs leverage Other Transaction Authority (OTA) for Research and Prototypes