Opportunities for Junior Scientists in Fusion Energy & Plasma Science

Presented by James W. Van Dam (DOE-FES) 30 October 2012









WWW.PHDCOMICS.COM

Acknowledge:

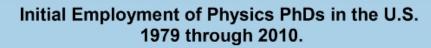
Dr. Sean Finnegan

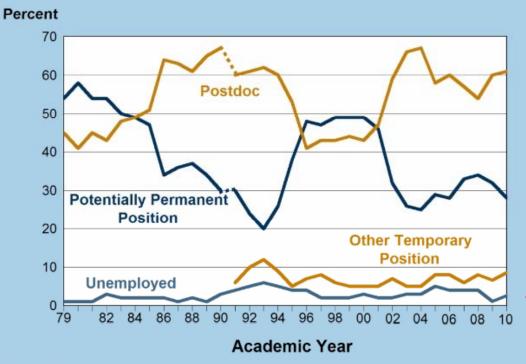
FES program manager for education & outreach





Physics Ph.D. employment





In 1991, the survey questionnaire was changed to measure "other temporary" employment as a separate category. Data only include U.S.-educated PhDs who remained in the U.S. after earning their degrees.

http://www.aip.org/statistics

Since 2002, initial employment for physics Ph.D.'s has been:

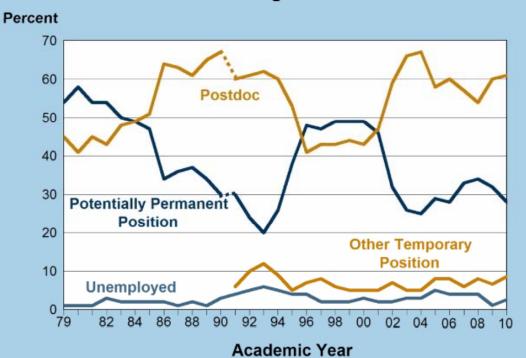
- 1. Postdocs (~60%)
- 2. Potentially permanent positions (~30%)

Unemployment for those with Ph.D.'s in physics has remained consistently low (< 5%)



Physics Ph.D. employment

Initial Employment of Physics PhDs in the U.S. 1979 through 2010.



In 1991, the survey questionnaire was changed to measure "other temporary" employment as a separate category. Data only include U.S.-educated PhDs who remained in the U.S. after earning their degrees.

http://www.aip.org/statistics

Types of Positions Accepted by Employment Sector, Classes of 2009 & 2010.

	Postdoc	Potentially Permanent	Other Temporary	Overall
	%	%	%	%
Academic*	73	23	82	58
Private sector	1	57	9	19
Government	22	16	6	19
Other	4	4	3	4
N	740	365	89	1,194

Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

*Includes university affiliated research institutes.

http://www.aip.org/statistics

Upon graduation: **58%** employed

by academic institutions

Of those at academic institutions:

73% postdoctoral appointments

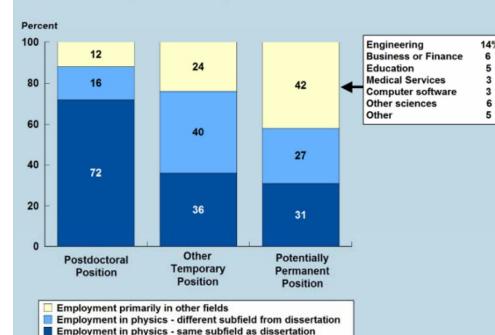
Of those in private sector:

57% potentially permanent positions



Physics Ph.D. employment

Initial Employment of Physics PhDs, Classes of 2009 & 2010.



Employment in physics means an individual's primary or secondary employment field was in physics or astronomy. Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

http://www.aip.org/statistics

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http://www.aip.org/statistics

The majority of Ph.D.'s initially work as postdocs at academic institutions in the same subfield as their dissertation

There are many opportunities for those interested in pursuing both traditional and non-traditional career paths in science.

You just have to know where to look ...



Information resources: funding agencies







Office of Science







Funding Agencies

Provide support for students and postdocs in a variety of ways including:

- Research Grants, Cooperative
 Agreements, and Field Work Proposals
- Fellowships and Internships
- Funding of National Laboratories



Information resources: professional societies & orgs

Professional Societies & Organizations

Provide support for students and postdoc's in a variety of ways including:

- Fellowships and Internships
- Serve as an information resource



















Information resources: national laboratories

































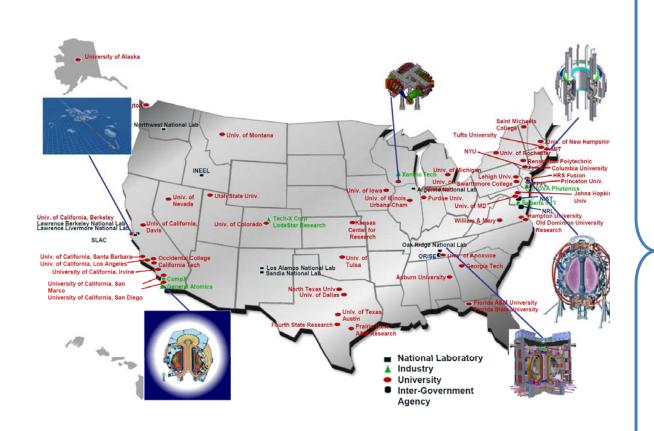
National Laboratories

Provide support for students, postdocs, and young scientists in a variety of ways including:

- Research through FWP's
- Fellowships and Internships



Information resources: universities



Universities

Provide support for students, postdocs, and young scientists in a variety of ways including:

- Research through Grants and Cooperative Agreements
- Fellowships and Internships



Information resources: industry R&D groups











Lodestar Research Corporation

Industry R&D Groups

Provide support for postdocs and young scientists in a variety of ways including:

- Research through Grants and Cooperative Agreements
- Fellowships



DOE domestic opportunities

Universities



Undergraduate Fellowships

SULI

NUF

Graduate Fellowships

SC graduate fellowship

Postdoctoral Fellowships

ORISE Fusion PD Fellowship

Early Career Awards

PPPL Off Site University Research Program

Visiting Faculty Program

National Labs



Undergraduate Fellowships

SULI

NUF *

Graduate Fellowships

SC graduate fellowship

Postdoctoral Fellowships *

ORISE Fusion PD Fellowship

Early Career Awards

Industry R&D



Government



Graduate Fellowships

Mass Media Fellowship Program

Postdoctoral Fellowships

AAAS Science & Tech Policy APS Congressional Science

IPAs & Detailees



DOE domestic opportunities

Universities



Prof. Troy Carter UCLA

Undergraduate Fellowships

SULI

NUF

Graduate Fellowships

SC graduate fellowship

Postdoctoral Fellowships

ORISE Fusion PD Fellowship

Early Career Awards

PPPL Off Site University Research Program

Visiting Faculty Program

National Labs



Undergraduate Fellowships

SULI

NUF *

Graduate Fellowships

SC graduate fellowship

Postdoctoral Fellowships *

ORISE Fusion PD Fellowship

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Industry R&D



Government



Graduate Fellowships

Mass Media Fellowship Program

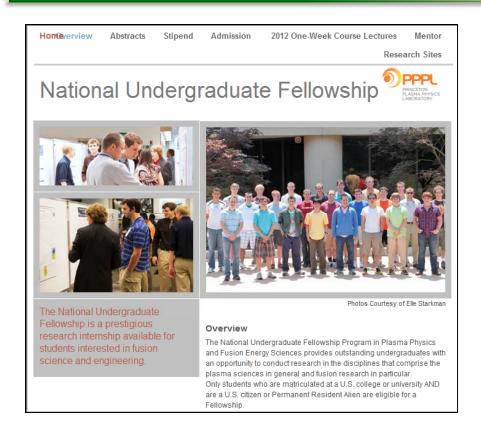
Postdoctoral Fellowships

AAAS Science & Technology Policy
APS Congressional Science

IPA's & Detailee's



National Undergraduate Fellowship



What the program is:

- Nine-week-long research projects performed at a participating universities or national laboratories
- One-week introductory course at the Princeton Plasma Physics Laboratory in the basic elements of plasma physics
- Research presented at the APS-DPP Annual Meeting

Who is eligible:

- Students in engineering, mathematics, computer science, physics, or other related fields
- U.S. citizens matriculated at a U.S. college or university
- Students should have taken at least one course in electricity and magnetism beyond introductory physics.

(intended primarily for students completing their junior year majoring in physics or engineering)

How to Apply:

Applications must be completed online and official transcripts must be mailed to: NUF, PPPL, PO Box 451, Princeton, NJ 08543 or NUF, 100 Stellarator Road, Science Education, Princeton, NJ 08543 (Fed-Ex or UPS)

Who to contact:

For further information please email Deedee Ortiz at mortiz@pppl.gov. http://science-education.pppl.gov/NUF/Overview.html



Some NUF posters at this meeting

JP8 16-Testing the Validity of the Neoclassical Toroidal Viscosity Model of Torque due to 3D Non-Resonant Magnetic Fields

A. J. McCubbin (Hope College), O. Meneghini (ORISE), et al.

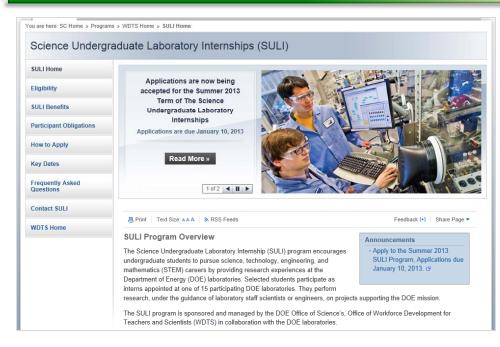
JP8 17—Investigating the Validity of the "Magnetic Flutter" Model of Tokamak
Transport in the Presence of 3D External Magnetic Fields

P. Raum (Virginia Tech), O. Meneghini (ORISE), et al.

Tools to evaluate neoclassical toroidal viscosity (NTV) and heat transport due to magnetic flutter in the presence of non-axisymmetric fields have been developed by NUF summer students Andrew McCubbin and Peter Raum. These tools may use the magnetic fields calculated by the two-fluid code M3D-C1 as input, in order to take into account the important effects of plasma response on the non-axisymmetric fields. Preliminary calculations show NTV torques in good agreement with experimental measurements in a QH-mode discharge. Flutter transport calculations show that plasma response near the top of the pedestal leads to significant heat transport there, and calculated thermal diffusivities are in rough agreement with experimental measurements. An interface for running these tools and visualizing their output has been implemented in OMFIT.



Science Undergraduate Laboratory Internships (SULI)



How to Apply: Applications due January 10, 2013.

All Applications must be completed online.

The Application requirements include:

- 1. Required fields in the applications, including:
 - Contact and Education Information Citizenship Status Laboratory choice and research interests Essays
- 2. Undergraduate transcripts, submitted online
- 3. Two letters of Recommendation, submitted online

What the program is:

- Research experiences under the guidance of laboratory staff scientists or engineers at one of 15 participating Department of Energy (DOE) laboratories.
- Research projects supporting the DOE mission.
- Each DOE laboratory offers different research opportunities (not all DOE laboratories offer internships during the Fall and Spring Terms)

Who is eligible:

- Must be currently enrolled as a full-time undergraduate student at an accredited institution,
- Completed at least one year as a matriculating undergraduate student at the time of applying
- Must have an cumulative minimum Grade Point Average (GPA) of 3.0 on a 4.0 scale
- Must be 18 years or older at the time the internship begins.
- Must be a United States Citizen or Permanent Resident Alien at the time of applying.

Who to contact: http://science.energy.gov/wdts/suli/contact/



Office of Science Graduate Fellowship



What the program is:

Three-year award for full-time graduate study and thesis/dissertation research at a U.S. academic institution, providing partial:

- Tuition support (up to \$10,500 per yr.)
- Annual stipend for living expenses (\$35,000 per yr.)
- Research allowance (\$5,000 per yr.)

Who is eligible:

- Applicants must be U.S. Citizens and
- A first or second year graduate student, or
- An undergraduate senior at the time of applying
- Must be pursuing or plan to pursue graduate study
- Research in areas relevant to the science programs supported by the DOE Office of Science.

How to Apply:

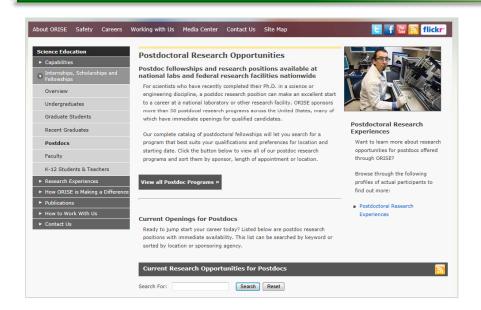
All applications must be submitted online . A complete application includes:

- Three essays
- Academic transcripts
- General Record Examination (GRE) scores for the General Test and a Subject Test
- Three letters of recommendation

Who to contact: SCGFInfo@science.doe.gov; http://scgf.orau.gov/index.html



ORISE Postdoctoral Fellowship



Benefits: \$67,000 annual stipend; limited reimbursement for health and medical insurance costs; inbound travel and moving expenses

How to Apply:

Application materials available at http://www.orau.gov/fusion.

Who to contact:

Program Manager Tom Richmond tom.richmond@orau.org (865) 576-2194

What the program is:

Offers recent doctoral degree recipients the opportunity to conduct research in DOE fusion energy research and development programs. Participants acquire training in areas of fusion energy, interact with outstanding scientists and engineers, and have access to advanced equipment and facilities.

Discipline(s): physical sciences; engineering; mathematics; related scientific disciplines

Eligibility:

U.S. Citizens and Legal Permanent Residents.

Recent (within three years of desired start date) doctoral degree recipients or those expected to complete all doctoral degree requirements prior to desired start date;

Location(s):

Various locations across U. S. Laboratories and contractor sites supported by the U.S. Department of Energy's Office of Fusion Energy Sciences

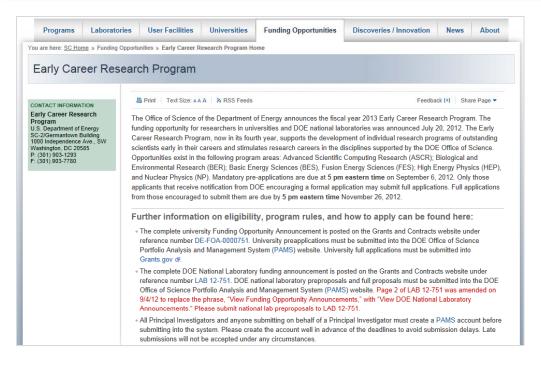
Duration:

One year; normally renewable for a second year

Deadline(s): March 1, 2013



Office of Science Early Career Award



How to apply:

The complete university and DOE National Laboratory Funding Opportunity Announcements are posted on the Grants and Contracts website

Who to contact: http://science.energy.gov/early-career/

What the program is:

Funding opportunity for researchers in universities and DOE national laboratories

Who is eligible:

The Principal Investigator must be

- Staff scientist at a DOE Laboratory, or
- **Untenured** Assistant Professor or Associate Professor on the tenure track at a U.S. academic institution as of the deadline for the application.
- No more than ten (10) years can have passed between the year the Principal Investigator's Ph.D. was awarded and the year of the deadline for the application.
- Each Principal Investigator may only submit one Office of Science Early Career Research
- Program application per annual competition.
 Additionally,
- A Principal Investigator may not participate in more than three Office of Science Early Career Research Program competitions.



Recent Early Career Awardees



Daniel Sinars of Sandia National Laboratories wins the Presidential Early Career Award for Science and Engineering (PECASE)

"For developing innovative techniques to study the properties of instabilities in magnetized-high-energy-density plasma, enabling quantifiable comparison between experiment and simulation needed for validating cutting-edge radiation-hydrodynamics codes, and for demonstrating substantial leadership qualities in high-energy-density-laboratory-plasma (HEDLP) physics."

FY 2010	FY 2011	FY 2012
Stanislav Boldyrev, U Wisc.	Kai Germaschewski, UNH	Felix Parra Diaz, MIT
Tobin Munsat, U Colorado	Christoph Niemann, UCLA	Jaime Marian, LLNL
Jean Paul Allain, Purdue Univ.	Francesco Volpe, U Wisc.	Nicholas Commaux, ORNL
Luisa Chiesa, Tufts University	Anne White, MIT	Andreas Kemp, LLNL
Jong-Kyu Park, PPPL	Daniel Sinars, SNL	
Vlad Soukhanovskii, LLNL	Ezekial Unterberg, ORNL	



R&D 100 Award to Early Career Awardee

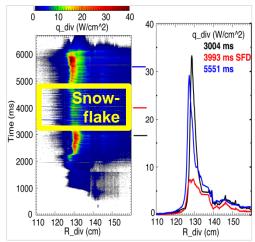


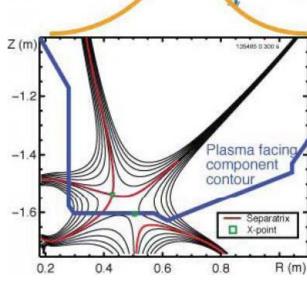




The Snowflake Divertor:

- Initial results: peak heat loads reduced from 4-7 to 0.5-1 MW/m²
- Creates poloidal magnetic field lines with a snowflake shape.
- Creates a large zone flaring the plasma flow, dramatically decreasing heat fluxes.
- Promising first step: compatibility with attractive core plasmas is a future research topic





Dmitri Ryutov (LLNL)
Joon-Wook Ahn (ORNL)
Stefano Coda (EPFL)
Ronald H Cohen (LLNL)
Basil Duval (EPFL)
Egemen Kolemen (PPPL)

Jonathan Menard (PPPL)
Jean-Marc Moret (EPFL)
Francesco Piras (EPFL)
Thomas Rognlien (LLNL)
Vsevolod Soukhanovskii (LLNL)
Maxim V. Umansky (LLNL)



PPPL Off-Site University Research Program

What the program is:

The PPPL Off Site University Research (OSUR) Program provides "scientific outreach" to a broad range of US colleges and universities in various areas of plasma and fusion science. These areas include:

- plasma theory and simulation,
- plasma experiments,
- plasma diagnostics,
- undergraduate plasma education,
- engineering support, and safety.

This support is provided to approximately 25 University groups by approximately 25-30 PPPL personnel, with a level of effort of ~5-15% of an FTE per University group.

Who to contact:

If you are interested in the PPPL OSUR program, contact:

Dr. Philip C. Efthimion

pefthimi@pppl.gov Office: 609-243-3212



Jeremiah Williams at Wittenberg University, has utilized the PPPL off-site program to build an experimental research program in dusty plasma physics. The assistance from PPPL included vacuum hardware and was critical in his receiving an NSF Career Award in 2010.





Visiting Faculty Program



How to Apply:

All Applications to the VFP program must be completed online. **The Faculty Application requirements include**:

- 1. Completion of all required fields in the applications
- 2. Current Curriculum Vitae (CV)
- 3. Two letters of Recommendation
- **4.** A research project proposal co-developed with the research staff located at the host DOE laboratory
- **5.** Applicants seeking NSF supported appointments must also submit a supplemental funding proposal to NSF through their home institution PI

What the program is:

- The Visiting Faculty Program (VFP) seeks to increase the research competitiveness of faculty members and their students at institutions historically underrepresented in the research community
- •Selected university/college faculty members collaborate with DOE laboratory research staff on a research project of mutual interest.
- Faculty member participants may invite up to two students (one of which may be a graduate student) to participate in the research project.
- Applications for the VFP are solicited annually for appointments to the Summer Term (May through August), which is 10 weeks in duration.

Who is eligible:

- Must be a United States Citizen or Permanent Resident Alien at the time of applying.
- Must be a full-time faculty member at an accredited U.S. degree granting, post-secondary, institution of higher education *historically underrepresented in the U.S. research community*.



Emerging global opportunities

Europe



Asia

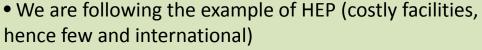




emerging global opportunities

Euro

Fusion is International



- We now bring people to facilities, not vice versa.
- How much should a scientist spend on site (to become a colleague) versus at home (so as not to become a stranger)
- We might become shift workers (2 am—10 am).
- Televideo communication will become integral.
- We need to forge a path for how to do international collaborations on a large scale.
- Similar to State Dept foreign service.
- Institutions have to prepare their scientists: language training (can be done at US universities), cultural awareness







International fellowships





Monaco Postdoctoral Fellows at ITER

Postdoctoral Research Fellowships which will allow recent PhD graduates to join the ITER Organization for a period up to two years

Applicants are requested to apply through the ITER job site: http://www.iter.org/jobs





Japan Society for the Promotion of Science

JSPS offers three postdoctoral fellowship programs, each with different eligibility requirements.

Postdoctoral Fellowships for Foreign Researchers (Standard)

Postdoctoral Fellowships for Foreign Researchers (Short-term) (for researchers from North America and Europe)

JSPS Summer Program

(for young researchers from North America and Europe)



ENERGY Atoms For Peace

International Atomic Energy Agency

IAEA Expert opportunities (Brookhaven):

Cost-Free Expert Positions (CFE) Junior Professional Officer (JPO)

http://www.bnl.gov/ispo/expert opportunities.asp

IAEA fellowships (Argonne)

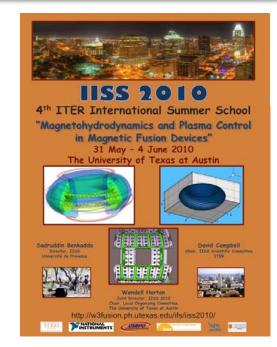
http://international.anl.gov/fellowships.html



ITER International School scholarships

U.S. Burning Plasma Organization provides scholarships for US participants

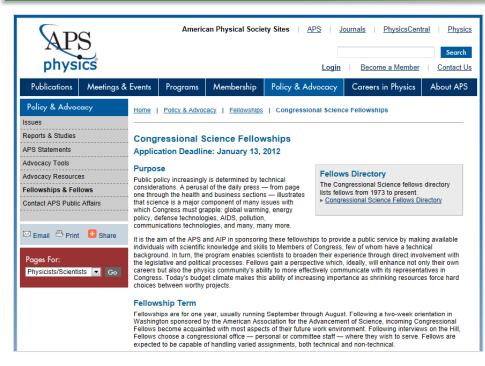
- 4th ITER School (May 2010) was held in the US
 - "MHD and Plasma Control"
- 5th ITER School (June 2011) held in France
 - "Energetic Particles"
- 6th ITER School (Dec 2012) to be held in India
 - "RF Heating and Current Drive"







APS Congressional Fellowship



Application Deadline: January 13, 2013

To apply, candidates should submit on-line the materials requested below.

- Cover Sheet
- Letter of Intent
- Resume
- Three Letters of Reference

Who to contact:

http://www.aps.org/policy/fellowships/congressional.cfm

What the program is:

Fellowships are for one year, usually running September through August.

A two-week orientation in Washington

Following interviews on the Hill, Fellows choose a congressional office, personal or committee staff.

Fellows are expected to be capable of handling varied assignments, both technical and non-technical.

A stipend is offered in addition to an allowance for relocation, professional travel, and health insurance premiums.

Following their year on the Hill, APS Congressional Fellows are invited to serve a one-year term on the Physics Planning Committee (PPC) and the Panel on Public Affairs (POPA).

Qualifications include:

- A PhD in physics or a closely related field,
- A strong interest in science and technology policy,
- Preferably, some experience in applying scientific knowledge toward the solution of societal problems.
- APS membership is required to receive an APS fellowship.



AIP State Dept Fellowship

Are you interested in the interface between science and technology and international affairs?

- Issues involving S&T are an important part of the U.S.'s diplomatic portfolio, making it essential for the U.S. Department of State to have knowledgeable scientific input. Through its State Department Science Fellowship program (run under the auspices of the American Association for the Advancement of Science's Science and Technology Policy Fellowships), the American Institute of Physics offers an opportunity for scientists to make a unique and substantial contribution to the foreign policy process by spending a year working at the U.S. State Department.
- Qualified scientists at any stage of their career are encouraged to apply. Applicants must be U.S. citizens, have a PhD in physics or a closely related field, be members of one or more of AIP's ten Member Societies and be eligible to receive an appropriate security clearance prior to starting the Fellowship. Final interviews will take place early in 2013 and the 12- month Fellowship term will begin in September 2013.
- Application components include a letter of intent, resume and three letters of recommendation.
 Developing a clear, comprehensive and competitive application takes significant time. Start early and contact your references as soon as possible. All application materials must be received by the November 1 deadline.
- Please see our website or contact Jennifer Greenamoyer (<u>jgreenamoyer@aip.org</u> 301-209- 3104)

What do AIP Fellows work on during their terms at the State Department?

 AIP Fellows have worked on topics as varied as critical infrastructure protection, export controls, use of remote sensing imagery, biotechnology and the safety of agricultural products, emerging S&T issues, European and Russian science policy, and the World Summit on Sustainable Development



AAAS Fellowship



2012-20134 AAAS Fellows

Application Deadline: December 5, 2012

To apply, candidates should submit on-line the materials requested below.

- Cover Sheet
- Letter of Intent
- Resume
- Three Letters of Reference

Who to contact: http://fellowships.aaas.org/

AAAS Welcomes its 40th Class of Fellows

September 1, 2012 marked a major milestone in Fellowship history when it welcomed the 40th class of Fellows. In 2012-13, 279 Fellows will spend a year in more than 15 executive branch agencies and several congressional offices; they are sponsored by 34 scientific and engineering societies. The first class began in 1973 with 7 Fellows sponsored by 4 scientific and engineering societies.

Online Application is Now Open

The online application is open for the 2013-14 Fellowship Year. Visit our application website at https://fellowshipapp.aaas.org for more information...

Qualifications include:

- A PhD in physics/biology/earth science, social science, medical science, mathematics/computational science, or engineering disciplines
- A strong interest in science and technology policy,
- Strong communication skills, problem-solving ability, commitment to serve society, leadership, judgment.
- U.S. Citizenship
- •Not Federal employee (for Science & Tech Fellowships)



IPAs and Detailees

From presentation delivered by Dr. Edmund Synakowski for the University Fusion Associates Evening Session at the annual APS-DPP meeting on November 14th, 2011 in Salt Lake City, UT.

Please consider contributing to your program's success as an IPA

- IPA = Intergovernmental Personnel Act
- We are considering creating an IPA slot to help craft our international research endeavors, including with working with the Research Division Director to develop programs that optimize leverage with the domestic program along scientific, topical lines. Developing an approaches for university engagement with labs in such a program will be critical.
- Program support funding for an IPA is presently frozen, given federal budget uncertainties, but when there is some thawing we may pursue this
- Examples of recent IPA successes: Mark Koepke (WVU), and Hutch Neilson (PPPL)



Career opportunities at DOE-FES

"For me, the most significant benefit in working for the Federal government is the opportunity to serve my country in a capacity that utilizes my strengths and skills..."

Dr. Sean Finnegan



What do you think is the "coolest" thing about your job?

The "coolest" thing about my job, hands down, is getting to know the genuinely brilliant researchers and students whose work is critical not only to addressing the scientific questions underpinning fusion as a viable long-term energy solution and to strengthening our national security, but is also vital in continuing to expand the boundaries of human knowledge.

What would you say to a potential candidate that would convince her/him to join your organization or the Federal government?

If you are not just looking for a job, but a career, that will challenge you in ways you likely never imagined, then you can't do better than this. I can promise you that no two days will be the same and that you will have the opportunity to have a real and significant impact on your country and perhaps the world.

Contact:

James W. Van Dam 301-903-4095 james.vandam@science.doe.gov

