

NSF Graduate
Research
Fellowship
(GRFP)

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What is the GRFP?

Goals:

1. Recognize & support early-career scientists with high potential for significant achievement.
2. Broaden participation in STEM fields.

What is the GRFP?

In a 5-yr period

- 3 years of full graduate support
\$159k (\$37k/yr stipend plus tuition+fees)
- Career-life balance support possible
- ~2200 awards; ~12,000 applicants/yr, ~18% funding rate

Eligibility

- US Citizen, national, or permanent resident
- Have not completed any grad degree by Aug 1 of the submission year unless (1) joint BS/MS program and no additional grad work; (2) At least 2 years off.
- **NO** MD/PhD, JD/PhD, Management, Social work;
NO support for clinical research, health services

When should I apply?

Senior undergraduates

Post-baccalaureates who have not started grad school

Must be prepared to enroll the fall after you receive the award

APPLY!

First year graduate students

APPLY!

Highly competitive = demonstrates high potential to make significant achievements in STEM

- Past achievements predict future success
- GPA, awards, research experience, letters, great essays, clear past broader impacts and plans for future broader impacts of your work.
- Publications, presentations definitely help

Deadlines are in November of each year

Components of Application

- Personal information, education, work experience
- Proposed field of study
- Transcripts
- Three letters of recommendation (VERY IMPORTANT!)
- **Essay 1: Personal Statement:** relevant personal background & future goals (3pg.)
- **Essay 2: Research Statement:** graduate research plan (2pg.)

NSF
Postdoctoral
Fellowships



NSF's Postdoctoral Opportunities

Goals:

1. Support independent postdoctoral research early in a scientist's career, enabling fellows to pursue innovative projects that broaden their perspectives and build leadership potential.
2. Facilitate professional development, including advanced training, interdisciplinary interactions, mentorship, and skill expansion beyond doctoral work.
3. Help establish fellows as future leaders in their fields by providing flexibility to choose environments (e.g., new institutions or collaborators) that maximize impact on their scientific growth.

NSF's Postdoctoral Opportunities

Programs:

1. Postdoctoral Research Fellowships in Biology (PRFB)
2. Mathematical Sciences Postdoctoral Research Fellowships (MSPRF)
3. Earth Sciences Postdoctoral Fellowships (EAR-PF)
4. Social, Behavioral, and Economic Sciences SBE Postdoctoral Research Fellowships (SPRF)
5. Engineering Postdoctoral Fellowship (eFellow)
6. Innovative Postdoctoral Entrepreneurial Research Fellowship
7. General NSF Postdoc Opportunities (e.g., Astronomy/Astrophysics, Atmospheric/Geospace, MPS-Ascend)

NSF postdoctoral funding page: <https://www.nsf.gov/funding/postdocs>

NSF's Postdoctoral Opportunities

Two-year fellowships

- 2 years of stipend + research allowance
\$220-\$340k (\$110-\$170k/yr) depending upon specific program.

Eligibility

- US Citizen, national, or permanent resident
- Must have earned (or will before fellowship start) a doctoral degree in relevant STEM field.
- Proposal must align with the program's disciplinary focus and goals.

Components of Application

- Project summary (1pg)
- **Project description** (6-10pg, depending on program)
- References cited
- Biographical sketch(es)
- Current and pending support
- Collaborators (COA)
- Data management and sharing plan
- Budget and justification
- Facilities, equipment, and other resources
- Letters from sponsoring scientists/mentors
- Letters of collaboration

NSF's Selection Criteria

What is the potential of the proposed activity to:

Advance knowledge and understanding within its own field or across different fields (**Intellectual Merit**)?

Benefit society or advance desired societal outcomes (**Broader Impacts**)?

Rating: [Excellent](#); [Very Good](#); Good; Fair; Poor

**MUST be strong under BOTH criteria;
Labelled Intellectual Merit and Broader Impact
statements must be in each essay/proposal**

Intellectual Merit

Definition: The potential to advance knowledge

Considers: Creativity, originality

Personal Statement: Evidence of prior achievement, personality, recognition

convince reviewers that you have intellectual merit

Research Statement: Importance and relevance of the proposed work

convince reviewers that your proposed research outcomes have intellectual merit

Broader Impacts

Definition: Potential to benefit society or advance desired societal outcomes

Personal Statement: Evidence of prior engagement or interest relevant to your proposed plan

show reviewers that you have experiences and qualifications that contribute to your ability to carry out your plan, and sincere commitment to its outcome

Research Statement: Detail your Broader Impacts plan in a way that naturally flows from some aspect of the research plan convince reviewers that you can and will carry out your BI plan, and that it will effectively accomplish something that meets the description of at least one of the major 5 types of broader impacts.

Fatal Flaws (Advice from a Panelist)

Panelists advised to weight Intellectual Merit and Broader Impacts *equally*

- Weak *history* of Broader Impacts (in Personal Statement)
- Weak *future* plan for Broader Impacts related to proposed research (in Research Statement)
- Vague Broader Impacts—need both specific history (not laundry list, but a story) and specific future plan
- Mundane Broader Impacts
- Too much overly personal information or too negative in Personal Statement
- Weak Intellectual Merit in Research Statement

Ideas for Broader Impacts

Finding Fluorescence

Illuminate the unseen

English

HOME ABOUT BIOFLUORESCENCE GET STARTED VIEW MAP UPLOAD DATA CONTACT



Photograph by Teresa Zgoda and Teresa Kugler

Finding Fluorescence:

Illuminate the unseen world around you

ABOUT GET STARTED VIEW MAP UPLOAD DATA

Help scientists make new discoveries in your own backyard! All you need is a black light and enthusiasm. Perfect for a class activity or to add a little extra exploration to your camping trip.

Many organisms are biofluorescent; they are able to absorb light and re-emit it at a longer wavelength, and new discoveries of biofluorescent organisms are made everyday. We need your help to expand our knowledge of which organisms fluoresce.

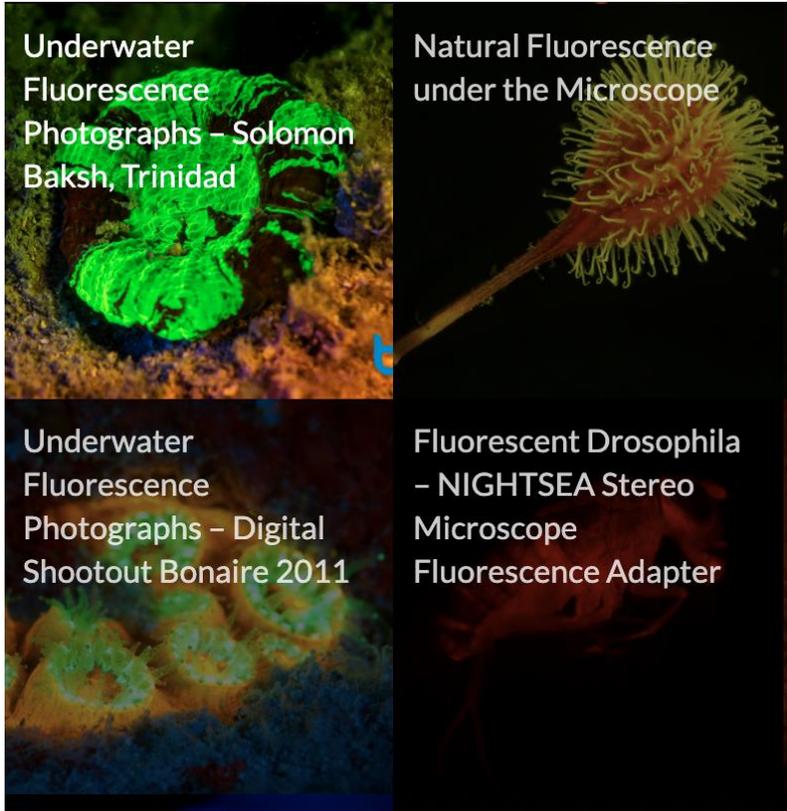
Finding Fluorescence is a resource to teach about biofluorescence, get people involved in and excited about making discoveries, and to document the presence or absence of biofluorescence in the vast number of species across the world, in a format accessible to scientists of all fields.

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Follow me
@FluoroFrogs

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Broader Impacts: Finding Fluorescence website by Courtney Witcher



Finding Fluorescence

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English

HOME ABOUT BIOFLUORESCENCE GET STARTED VIEW MAP UPLOAD DATA CONTACT

What is biofluorescence?

Biofluorescence is a trait of an organism (any living thing) where light that hits the organism is re-emitted at a longer wavelength. When you stand under a blacklight at a bowling alley or in a haunted house and your white shirt and shoe laces glow bright, that is fluorescence. When you see this in an animal, it is called biofluorescence. To understand biofluorescence, we must understand the difference between biofluorescence and bioluminescence.



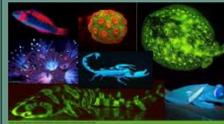
The Science of Biofluorescence

Biofluorescence is a great example of how all three main sciences interact. This makes biofluorescence an ideal tool for teaching and learning about science. Let's examine the biological, chemical, and physical properties of biofluorescence.

Biology

Biofluorescence has been examined in a range of species including insects, plants, fish, reptiles, and amphibians. Fluorescence has been found to act in sexual attraction (bees and flowers, birds, spiders), intraspecies recognition (copepods), camouflage (reef fishes), and signals of condition (leaves, fruits, mammals).

Here are a few organisms that fluoresce; watch the image below to see the reveal of their biofluorescence.

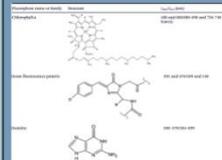


What do you notice about the differences in how each organism "glows"? Why might these differences exist?

Chemistry

Biofluorescence is the result of natural fluorophores (chemicals that fluoresce). There are many natural fluorophores, all organic chemicals with their own fluorescent emission wavelength.

Here are a few examples of some of the chemicals underlying the fluorescence we see in living organisms.

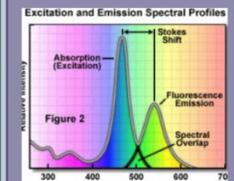


What similarities and differences exist between the structures of the fluorophores?

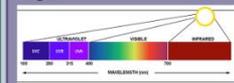
Do you recognize any of the names? Where have you heard them before?

Physics

Biofluorescence is the result of absorbed light being re-emitted at a longer wavelength due to fluorophores. The wavelength of light determines if we can see it and what color it appears as. Fluorescence shifts this wavelength to a new color.



Here the wavelengths of light visible to humans are labeled. Some organisms can also see wavelengths in the ultraviolet range.



Which aspect of biofluorescence is your favorite? The interaction of biology, chemistry, and physics is necessary for biofluorescence to occur. This characteristic and its widespread nature make it relevant to a large number of researchers and allows for collaboration across scientific fields. Because biofluorescence is often invisible to human eyes without special equipment, many organisms have yet to be tested for fluorescence. Visit the Get Started tab for ways YOU can help scientists make discoveries of biofluorescence and ways to utilize biofluorescence as a tool for teaching science in your classroom.

Broader Impacts: *Finding Fluorescence*

K-12 Activities

Lab Activities for Classrooms

Biofluorescence provides a unique opportunity to teach and learn about the three main topics of science (biology, chemistry, and physics) in one lesson. Find downloadable worksheets linked below. These can be used in the classroom or at home. Check back often as new modules are continually added and being expanded upon to provide resources for students of all ages.

Use the language menu at the top of the page to visit the Spanish version of the site and download the worksheets below in Spanish.



Classroom Resources

MODULES:

- [Biology of Biofluorescence Worksheet](#)
- [Chemistry of Biofluorescence Worksheet](#)
- [Physics of Biofluorescence Worksheet](#)
- [Finding Fluorescence Lab](#)

FINDING FLUORESCENCE LAB

Intro

Definitions:
Biofluorescence
Bioluminescence

Before you go out:

What questions do you have?
How will you know if you are seeing fluorescence?
What things do you think will have fluorescence?
What color do you think will glow under your light?

After you go out:

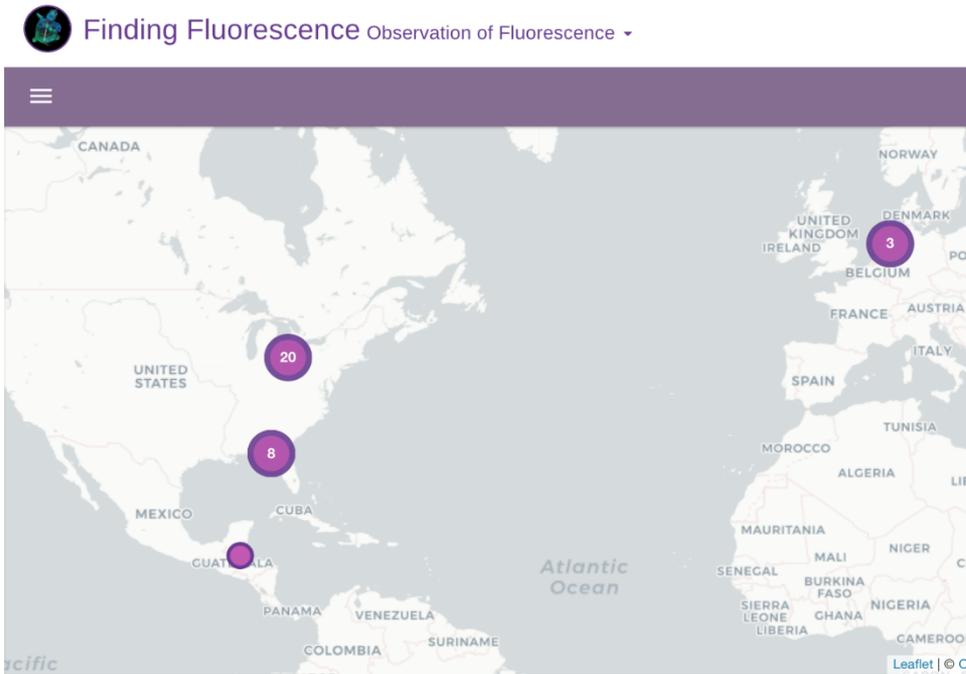
What non-living objects did you find that are fluorescent?
Why do you think they might be fluorescent?
What organisms did you find that are fluorescent?
Why do you think they might be fluorescent?

Design an Experiment

After your initial observations, design an experiment to test a question inspired by what you observed. Think through how you will test this question and what insights the answers might provide.

Question:
Hypothesis:
Materials and Methods:
Possible Outcomes and Implications:

Broader Impacts: *Finding Fluorescence* Citizen Science Outreach



Finding Fluorescence Observation of Fluorescence ☰

Total: 32

Finding Fluorescence

illuminate the unseen

English ▼

HOME ABOUT BIOFLUORESCENCE GET STARTED VIEW MAP UPLOAD DATA CONTACT

Explore the data that people around the world just like you have uploaded. There are list and map forms of entry display. Below is the list form of the data. You can use the filter function to view entries by title and location. Click the three lines at the top right corner and select "MAP" to switch to a map view of the entries. Take note of areas near you not yet surveyed and help us grow our reach!

If you wish to use any of the data, please cite the Finding Fluorescence database as below.
Finding Fluorescence. (2019). Finding Fluorescence: Observation of Fluorescence. Retrieved from <https://findingfluorescence.wixsite.com>

Finding Fluorescence Observation of Fluorescence ☰

Total: 32, 1/1 < >

Filter by title FROM: 28 OCT, 19 TO: 03 NOV, 20 NEWEST X

View	Title	Created At	Date	Time	Location
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	4e91b710-1de9-11eb-...	3rd Nov, 2020	08/15/2020	09:10	30.202929, -84.229791
	Mediterranean gecko ...	22nd Sep, 2020	09/22/2020	21:24	30.474975, -84.31105
	Caterpillar	21st Sep, 2020	09/20/2020	21:30	53.211112, 6.582987
	Lichen?	21st Sep, 2020	09/20/2020	21:15	53.211124, 6.582886
	Moth	15th Sep, 2020	09/15/2020	17:40	53.211078, 6.575441

Bonus Material

To assess Intellectual Merit and Broader Impacts, Panelists are instructed to consider:

To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?

Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale?

Does the plan incorporate a **mechanism** to assess success?

How well qualified is the individual, team, or organization to conduct the proposed activities?

Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader Impacts

Advance discovery and understanding while promoting teaching, training, and learning, for example, by training graduate students, mentoring postdoctoral researchers and junior faculty, involving undergraduates in research experiences, and participating in the recruitment, training, and professional development of K-12 mathematics and science teachers.

Broaden participation of under-represented groups, for example, by establishing collaborations with students and faculty from institutions and organizations serving women, minorities, and other groups under-represented in the mathematical sciences.

Enhance infrastructure for research and education, for example, by establishing collaborations with researchers in industry and government laboratories, developing partnerships with international academic institutions and organizations, and building networks of U.S. colleges and universities.

Broaden dissemination to enhance scientific and technological understanding, for example, by presenting results of research and education projects in formats useful to students, scientists and engineers, members of Congress, teachers, and the general public.

Benefits to society may occur, for example, when results of research and education projects are applied to other fields of science and technology to create startup companies, to improve commercial technology, to inform public policy, and to enhance national security.

Encouragement

Awardees are not composed of only Ivy League superstars!

Diversity is an asset: students from rural areas, underrepresented groups, disabled, economically-disadvantaged, first generation college or graduate student, financial challenges

Talk about these things in your GRFP personal statement!

Applicants who have overcome major challenges and persevered are likely to succeed—write about your experience in the GRFP application