



## Undergraduate Research

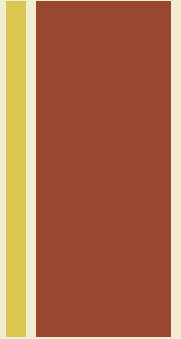
February 2015

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Indiana University Department of Biology

*\*Graduate Assistant/Seminar Co-instructor for Women in STIM LLC*


+ *the* skills needed for a successful career are **diverse**



Personal skills	Transferrable skills	Specific skills
<ul style="list-style-type: none"><li>• Initiative</li><li>• Flexibility</li><li>• Punctuality</li><li>• Adaptability</li></ul>	<ul style="list-style-type: none"><li>• Time management</li><li>• Organization</li><li>• Project planning</li><li>• Problem solving</li><li>• Communication</li><li>• Writing/Presentations</li><li>• Leadership skills</li></ul>	<ul style="list-style-type: none"><li>• Computer programming</li><li>• Aseptic technique</li><li>• Titration</li></ul>

# + What is research?

## re·search

*/ˈrē,sərCH,rēˈsərCH/* 

*noun*

1. the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions.  
"we are fighting meningitis by raising money for medical research"  
*synonyms:* investigation, experimentation, testing, analysis, fact-finding, fieldwork, examination, scrutiny [More](#)

*verb*

1. investigate systematically.  
"she has spent the last five years researching her people's history"  
*synonyms:* investigate, study, inquire into, look into, probe, explore, analyze, examine, scrutinize, review [More](#)



```
graph TD; A[Identify a problem] --> B[Develop questions]; B --> C[Gather data]; C --> D[Analyze and interpret];
```

Identify a problem

Develop questions

Gather data

Analyze and interpret





# types of RESEARCH OPPORTUNITIES

## ■ During **ACADEMIC YEAR @ IU:**

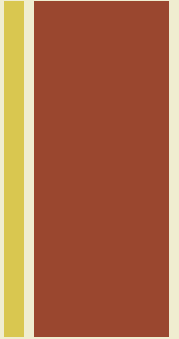
- Unpaid, volunteer research: you might have to start off volunteering just to get your foot in the door.
- You will want to commit ~8-10 hours/week (different labs have different requirements. Bottom line, there is a good bit of training involved so you need to be in the lab long enough to make it worth everyone's time)
- Research for credit (e.g., L490)
- Honor's Thesis – this is a really great way to learn about research from start to finish (i.e., designing and carrying out experiments to analyzing results and writing up the paper).

## ■ During **SUMMER:**

- Research Experiences for Undergraduates ([REU](#)) – one of the best options as an undergrad. They PAY FOR YOUR TRAVELS costs, plus a stipend.
- Summer Undergraduate Research Fellowship ([SURF](#))
- [Other internships](#) (websites: ecolog, Texas A & M University Wildlife and Fisheries, Bird Jobs - <http://www.birdingonthe.net/maillinglists/BJOB.html>)



# so... how do I get into a research lab in my first year?



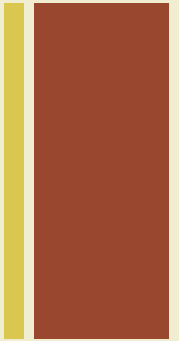
## 1. Investigate current research

- Positions often are not advertised
- Biology
- Chemistry
- Neuroscience
- Physics
- Geology
- Medical Sciences

# + so... how do I get into a research lab in my first year?

1. Investigate current research
2. Craft resume specific to position
3. Contact potential advisor with a short and informative email – attach your CV (not sure what a CV is ? Look it up! )

Example email:



## + Example email to send:

Dear Professor McGonagall,

Hi, my name is Hermione Grainger and I am wondering if you have any open positions (volunteer or paid) in your lab. I am currently a freshman obtaining a biology degree with a chemistry minor. I am **especially interested in your research on ovarian cancer and breast cancer (something to specific to show that you have looked over their research – often found in “research” tab on their webpage)**. Moreover, I am interested in how these cancers respond to endocrine therapies.

Currently, I am enrolled in the following relevant classes: Bio – L211, Chem – C341, and Bio – L113. Additionally, in high school I shadowed a physician at XX hospital. Last summer, I volunteered on a project investigating communication between mandrakes and carnivorous trees in the enchanted forest. Our research suggested possible links between root length and the tempo of mandrake screams.

I am available to work ~10 hours a week if possible. I have attached my CV and a tentative schedule.

Thanks for your time and consideration. I hope that we can schedule a meeting soon at your convenience to discuss this possibility.

With best regards,

Hermione



# + How to find current research at IU that you might be interested in ?

## ■ Google: IU Biology Departmental

- -> Faculty = Principle Investigators (PI)
- -> Description
- -> Click a name that interests you and find the link from there that goes to their specific website. Look over their current research topics

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







Home » Research Strengths

**FACULTY & RESEARCH**

Research in the Department of Biology

The Indiana University Department of Biology prides itself in the breadth and depth of its research. Unlike most large universities, we have not divided Biology into multiple smaller departments, believing that scientific breakthroughs come most often when a diversity of thought and approaches are brought to bear on a question. For example, faculty and students studying animal behavior benefit immensely by interacting with colleagues with expertise in neurobiology, molecular biology, molecular genetics, and evolution. Similarly, faculty and students studying epigenetic regulation of gene expression in animals benefit by close interactions with those studying similar processes in plants, and vice versa. The diversity of expertise and scientific approach represented in our 61 faculty, combined with an exceptionally collegial culture, is what makes IU Biology stand out, and has made IU a premiere place for performing cutting edge research. Below are links to in-depth descriptions of many of IU Biology's research strengths. We invite you to explore these pages, click on the faculty links, and get a flavor of the exciting research currently underway in IU Biology.

- Browse all faculty
- Behavior
- Chromatin, Chromosomes, and Genome Integrity
- Developmental Mechanisms and Regulation in Eukaryotic Systems
- Ecology
- Eukaryotic Cell Biology, Cytoskeleton and Signaling
- Evolution
- Genomics and Bioinformatics
- Microbial Cell Biology and Environmental Responses
- Microbial Interactions and Pathogenesis

Faculty Member	Contact	Description
 Stephen Bell Professor Microbiology	stedbell@indiana.edu 812 856 2331 405A Simon Hall	Molecular Biology of the Archaea
 Yves Brun-Clyde Culbertson Professor of Biology Microbiology	ybrun@indiana.edu 812-855-8860/5-7239(lab) JH 447G / JH 447F (lab)	Mechanism, regulation, and evolution of bacterial shape, differentiation, and formation.
 Patricia Foster Professor of Biology Microbiology	pifoster@indiana.edu 812-855-4084/5-4054(lab) JH 447E / JH 447A(lab)	Mutagenesis, DNA repair, replication recombination.
 Clay Fuqua Professor and Chair of Biology Microbiology	cfuqua@indiana.edu 812-856-6005/6-5186(lab) JH 425E / JH 425 (lab)	Attachment, biofilm formation, multicellular and disease ecology of Agrobacterium tumefaciens
 Ka Hu Professor of Biology Genome, Cell & Developmental Biology	kehu@indiana.edu 812-855-0166/5-0311(lab) MY 216A / MY 230 (lab)	The Cytoskeletal Biogenesis of Apicomplexan Parasites
 Daniel Kearns Associate Professor of Biology Microbiology	dkearns@indiana.edu 812-856-2523/6-2559(lab) JH 469/JH 432 (lab)	Bacterial motility and multicellular behavior
 David Kehoe Professor of Biology Microbiology	dkehoe@indiana.edu 812-856-4715 JH A413A	Environmental regulation of gene expression in bacteria.
 Jay T. Lennon Associate Professor Evolution, Ecology & Behavior	lennonj@indiana.edu 812-856-0962 JH 261B / JH 261 (lab)	Microbial Ecology and Evolution
 Michael Milnych	milynch@indiana.edu	Evolution; population genetics and genomics

## Faculty Profile

### Jay T. Lennon

ASSOCIATE PROFESSOR

IU AFFILIATIONS  
CENTER FOR RESEARCH IN  
ENVIRONMENTAL SCIENCES

#### Program

Evolution, Ecology & Behavior

#### Research Areas

- Ecology
- Evolution
- Genomics and Bioinformatics
- Microbial Cell Biology and Environmental Responses
- Microbial Interactions and Pathogenesis

#### Education

Ph.D., Dartmouth College

Postdoctoral Research Associate, Brown University

#### Research Description

Microorganisms are the most abundant and diverse life forms on Earth. They attain high population densities, have fast reproductive rates, and evolve rapidly to changes in their environment. Moreover, microbes carry out important functions, including nutrient cycling, trace gas flux, and carbon sequestration, which are important for the stability of natural and managed ecosystems.

We study the ecology and evolution of microbial communities. We are interested in the biotic and abiotic factors that generate and maintain microbial biodiversity. In turn, we seek to understand the implications of microbial diversity for ecosystem functioning. We conduct research in terrestrial and aquatic habitats, and use a variety of tools including molecular biology, simulation modeling, laboratory experiments, field surveys, and whole ecosystem manipulations in natural and managed ecosystems.

#### Select Publications

[Lennon JT](#), Aanderud ZA, Lehmkuhl BK, Schoolmaster DR (2012) Mapping the niche space of soil microorganisms using taxonomy and traits. *Ecology* 93: 1867–1879 [\[article\]](#)

[Lennon JT](#), Aanderud ZA, Lehmkuhl BK, Schoolmaster DR (2012) Mapping the niche space of soil microorganisms using taxonomy and traits. *Ecology*. [\[article\]](#)

Lau JA, [Lennon JT](#) (2012) Rapid responses of soil microorganisms improve plant fitness in novel environments. *Proceedings of the National Academy of Sciences of the United States of America* 109: 14058–14062 [\[article\]](#)

#### CONTACT INFORMATION

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FAX 812-855-6082

JH 261B / JH 261 (lab)

[Lab website](#)

[Lab wiki](#)



Lennon Lab  
Microbial Ecology

Home Research People Publications Teaching Opportunities



**Environmental variability:** Soil core from the KBS Long Term Ecological Research (LTER) site. Soil microbes experience fluctuation in environmental conditions (e.g., moisture and resource availability), which influence biotic interactions and ecosystem processes, including the flux of greenhouse gasses.

#### Microbial Biodiversity: From Evolution To Ecosystems

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Visit the Lab Wiki for news and additional information  
Follow the Lennon Lab on Twitter

#### Contact

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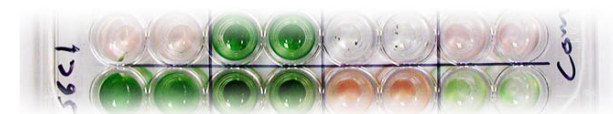
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Site design by Nick Friedenberg. Last updated 1/15/2013

Lennon Lab  
Microbial Ecology

Home Research People Publications Teaching Opportunities

#### Publications



[Lennon JT](#), Denev VJ (In Review) Evolutionary ecology of microorganisms: from the tamed to the wild.

Rocca JD, Hall EK, [Lennon JT](#), Evans SE, Waldrop MP, Cotner JB, Nemerugut DR, Graham EB, Wallenstein MD (In review). Relationships between protein-encoding gene abundance and corresponding process are commonly assumed yet rarely observed.

Aanderud ZT, Jones SE, Fierer N, [Lennon JT](#) (In Review) Resuscitation of the rare biosphere contributes to pulses of ecosystem activity.

Muscarella ME, Bird KC, Larsen ML, Placella SA, [Lennon JT](#) (In Review) Phosphorus resource heterogeneity in microbial food webs.

Vert JC, Harker AR, Breakwell DP, [Lennon JT](#), Aanderud ZA (In Review) Hypersaline environments constrains bacterial dormancy in lakes.

Weitz JS, Stock CA, Wilhelm SW, Bourouiba L, Buchan A, Coleman ML, Follows MJ, Fuhrman JA, Jover LF, [Lennon JT](#), Middelboe M, Sonderegger DL, Suttle CA, Taylor BP, Thingstad TF, Wilson WH, Wommack EK (In Review) A multitrophic model to quantify the effects of marine viruses on microbial food webs and ecosystem processes