Davidson College
Biology
Major
Handbook
2020-2021 edition
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**Mission Statement**

The Davidson College Department of Biology provides students with a strong foundation in biology, enabling them to think critically about biological topics, to learn technical skills for solving biological problems, and to communicate biological information in oral and written formats. By offering courses that span the spectrum of biological disciplines, Davidson’s Biology Department prepares students for advanced studies in a wide variety of fields. Finally, the Department’s curriculum prepares all students to take a leadership role in society by furnishing them with the tools to make informed decisions about scientific issues.

**Vision Statements**

Across its curriculum, the Biology Department will:

- Expose students to a broad range of scientific knowledge and to the many disciplines that comprise the biological sciences.
- Recognize evolution as the keystone for biological understanding.
- Stress a inquiry-based approach to learning that emphasizes critical thinking.
- Provide students with a range of technical skills, including the ability to:
  - Evaluate the benefits and limitations of different research designs, to analyze biological questions and issues, and to become proficient in interpreting and reporting quantitative data.
  - Use advanced research and information technologies.
- Help students develop abilities to convey biological information to both the scientific and lay communities in written and oral formats.

The Biology Department will encourage students to obtain relevant experiences in biology that immerse them in focused research environments both on and off campus.

**Learning Outcomes**

**Learning Outcome #1. Students will develop critical thinking skills and apply their understanding to novel situations by:**

- evaluating and analyzing relevant data to inform decisions and policies
- utilizing skill sets to solve novel problems
- developing creative solutions that draw from diverse areas of knowledge
- analyzing data to reach logical conclusions

**Learning Outcome #2. Students will demonstrate scientific literacy by:**

- generating testable hypotheses
- constructing well-controlled experiments
- collecting data with field-appropriate methodology and protocols

**Learning Outcome #3. Student will exercise quantitative skills by:**

- generating and interpreting graphs, tables, and other forms of data visualization
- using statistics appropriately to substantiate conclusions
Learning Outcome #4. Students will communicate science effectively through oral and written formats by:
   a. organizing information and presenting logical, coherent thoughts
   b. delivering scientific information to match the target audience
   c. producing deliverable information using appropriate digital media

Learning Outcome #5. Students will understand and analyze the historical, ethical, legal, and social context and implications of biological information by:
   a. employing ethical standards when designing experiments
   b. applying biological knowledge to inform personal decisions
   c. evaluating policies, news items, and society using data and logic
   d. interrogating the foundations of the discipline of biology, including the role it has played in racist, ableist, and sex-based discrimination and oppression
   e. critiquing the lack of diversity among biologists and the misuse of biological information and how they contribute to social inequities

Learning Outcome #6. The curriculum will enable students to cite specific examples of the following core concepts across all size scales of biological organization:
   a. information flow, exchange, and storage
   b. processes and mechanisms of evolution
   c. the relationships between structure and function
   d. homeostatic mechanisms that utilize and transform energy and matter
   e. biological systems produce emergent properties
### Biology Faculty Members

<table>
<thead>
<tr>
<th><strong>Dr. Mark Barsoum, Assistant Professor of Biology; Math &amp; Science Center Director</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Office:</strong> Wall 290</td>
</tr>
<tr>
<td><strong>Phone:</strong> x2796</td>
</tr>
<tr>
<td><strong>Email:</strong> <a href="mailto:mabarsoum@davidson.edu">mabarsoum@davidson.edu</a></td>
</tr>
</tbody>
</table>
| **Education:** BS (Physiology) University of California, Davis  
  PhD (Biomedical Sciences) University of California, San Diego |
| **Research:** Science education, neurodegenerative disease, cellular physiology |
| **Courses:** BIO 111 – Molecules, Genes, & Cells (+lab)  
  BIO 112 – Organisms, Evolution, & Ecosystems (+lab)  
  BIO 310 – Human Physiology |

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<thead>
<tr>
<th><strong>Dr. Karen Bernd, Professor of Biology</strong></th>
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<td><strong>Office:</strong> Wall 276</td>
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<tr>
<td><strong>Lab:</strong> Wall 215</td>
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<tr>
<td><strong>Phone:</strong> x2889</td>
</tr>
<tr>
<td><strong>Email:</strong> <a href="mailto:kabernd@davidson.edu">kabernd@davidson.edu</a></td>
</tr>
</tbody>
</table>
| **Education:** BS (Biology) Franklin & Marshall College  
  MA (Molecular Biology) Princeton University  
  PhD (Molecular Biology) Princeton University  
  Postdoc (Developmental, Cellular, & Molecular Biology) Duke University |
| **Research:** Cell biology, effects of pollutants on lung cells |
| **Courses:** BIO 111 – Molecules, Genes, & Cells (+lab)  
  BIO 208 – Cell Biology (+lab)  
  BIO 238 – Cell Biology & Signaling  
  BIO 267 – Cases in Environmental Health  
  BIO 357 – Biotoxicity of Hookah Tobacco Smoke |

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<thead>
<tr>
<th><strong>Dr. A. Malcolm Campbell ’84, Professor of Biology</strong></th>
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<td><strong>Office:</strong> Wall 327</td>
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<tr>
<td><strong>Lab:</strong> Wall 325</td>
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<tr>
<td><strong>Phone:</strong> x2692</td>
</tr>
<tr>
<td><strong>Email:</strong> <a href="mailto:macampbell@davidson.edu">macampbell@davidson.edu</a></td>
</tr>
</tbody>
</table>
| **Education:** BS (Biology) Davidson College  
  PhD (Biology) Johns Hopkins University  
  Postdoc (Cellular & Molecular Biology) Washington University  
  Postdoc (Molecular Genetics) Macalester College |
| **Research:** Synthetic biology, genomics, teaching & learning |
| **Courses:** BIO 105 – Biology for Life  
  BIO 113 – Integrated Concepts in Biology (+lab)  
  BIO 266 – Synthetic Biology Discoveries  
  BIO 309 – Genomics  
  BIO 343 – Laboratory Methods in Genomics  
  WRI 101 – Fake News, Real Science |
**Dr. Verna Miller Case, Adjunct Professor of Biology**

Email: [vecase@davidson.edu](mailto:vecase@davidson.edu)

Education:  
BS (Zoology) Pennsylvania State University  
PhD (Zoology) Pennsylvania State University

Courses: BIO 368 – Health Care Issues in Zambia

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**Dr. Rachid El Bejjani, Associate Professor of Biology**

Office: Wall 288  
Lab: Wall 248  
Phone: x2603  
Email: [raelbejjani@davidson.edu](mailto:raelbejjani@davidson.edu)

Education:  
BS (Zoology) Université Libanaise, Faculté des Sciences  
MS (Biology) American University of Beirut  
PhD (Molecular & Cellular Biology) University of Arizona  
Postdoc (Genetics) Yale University

Research: Molecular mechanisms of nervous system maintenance and axonal regeneration

Courses:  
BIO 113 – Integrated Concepts in Biology I (+lab)  
BIO 201 – Genetics (+lab)  
BIO 333 – Cellular & Molecular Neuroscience (+lab)  
BIO 393 – Advances in Genome Editing

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**Dr. Karen Hales, Professor of Biology** *(On sabbatical Fall ’20 and Spring ’21)*

Office: Wall 321  
Lab: Wall 323  
Phone: x2324  
Email: [kahales@davidson.edu](mailto:kahales@davidson.edu)

Education:  
BA (Biology) Swarthmore College  
PhD (Genetics, Cell Biology, & Developmental Biology) Stanford University  
Postdoc (Genetics & Cell Biology) University of North Carolina, Chapel Hill

Research: Molecular mechanisms of subcellular organization in fruit fly spermatogenesis

Courses:  
BIO 111 – Molecules, Genes, & Cells (+lab)  
BIO 201 – Genetics (+lab)  
BIO 352 – Genetics of Mitochondrial Shaping  
BIO 363 – Human Genetics

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**Prof. Linda McNally, Lecturer in Biology**

Office: Wall 388  
Phone: x2886  
Email: [limcnally@davidson.edu](mailto:limcnally@davidson.edu)

Education:  
BS (Biology) University of North Carolina, Charlotte  
MS (Biology) University of North Carolina, Charlotte

Courses: BIO 108 – Human Biology (+lab)
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<tr>
<th><strong>Dr. Barbara Lom, Professor of Biology</strong></th>
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<td><strong>Lab:</strong> Wall 217</td>
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<td><strong>Phone:</strong> x2338</td>
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<tr>
<td><strong>Email:</strong> <a href="mailto:balom@davidson.edu">balom@davidson.edu</a></td>
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<tr>
<td><strong>Education:</strong></td>
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<tr>
<td>BA (Biology) Lawrence University</td>
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<tr>
<td>PhD (Neuroscience) Northwestern University</td>
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<tr>
<td>Postdoc (Biology) University of California, San Diego</td>
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<tr>
<td>Postdoc (Neurobiology) University of California, Los Angeles</td>
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<tr>
<td><strong>Research:</strong> Development of the central nervous system, neuronal morphology, and axon guidance</td>
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<tr>
<td><strong>Courses:</strong></td>
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<tr>
<td>BIO 107 – Experimental Embryology</td>
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<td>BIO 251 – Light Microscopy</td>
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<td>BIO 261 – Neuroscience of Exercise</td>
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<tr>
<td>BIO 306 – Developmental Biology (+lab)</td>
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<td>BIO 336 – Animal Development</td>
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<th><strong>Dr. Janet Melonakos, Adjunct Assistant Professor of Biology</strong></th>
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<td><strong>Office:</strong> Wall 176</td>
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<tr>
<td><strong>Phone:</strong> x2604</td>
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<tr>
<td><strong>Email:</strong> <a href="mailto:jamelonakos@davidson.edu">jamelonakos@davidson.edu</a></td>
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<tr>
<td><strong>Education:</strong></td>
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<tr>
<td>BS (Microbiology) Brigham Young University</td>
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<td>PhD (Molecular Cancer Biology) Duke University</td>
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<tr>
<td><strong>Courses:</strong></td>
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<tr>
<td>BIO 111 – Molecules, Genes, &amp; Cells (+lab)</td>
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<tr>
<td>BIO 365 – Cancer Biology</td>
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<td>BIO 391 – Maternal and Fetal Health</td>
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<tr>
<th><strong>Dr. Christopher Paradise, Professor &amp; Chair of Biology</strong></th>
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<td><strong>Lab:</strong> Wall 146</td>
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<td><strong>Phone:</strong> x2890</td>
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<tr>
<td><strong>Email:</strong> <a href="mailto:chparadise@davidson.edu">chparadise@davidson.edu</a></td>
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<tr>
<td><strong>Education:</strong></td>
<td></td>
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<tr>
<td>BS (Biology) State University of New York, Albany</td>
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<tr>
<td>MA (Biology) State University of New York, Binghamton</td>
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<tr>
<td>PhD and Postdoc (Biology) The Pennsylvania State University</td>
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<tr>
<td><strong>Research:</strong> Community ecology of insects</td>
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<td><strong>Courses:</strong></td>
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<tr>
<td>BIO 114 – Integrated Concepts in Biology II (+lab)</td>
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<td>BIO 217 – Insects &amp; People</td>
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<tr>
<td>BIO 317 – Entomology (+lab)</td>
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<tr>
<td>BIO 321 – Ecology (+lab)</td>
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<td>BIO 366 – Renewable Natural Resources: Science &amp; Policy</td>
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<tr>
<th><strong>Dr. Rebecca Pollet, Visiting Assistant Professor of Biology</strong></th>
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<td><strong>Office:</strong> Wall 377</td>
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<td><strong>Phone:</strong> x2907</td>
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<tr>
<td><strong>Email:</strong> <a href="mailto:repollet@davidson.edu">repollet@davidson.edu</a></td>
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<tr>
<td><strong>Education:</strong></td>
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<tr>
<td>BS (Biochemistry) University of Tulsa</td>
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<tr>
<td>PhD (Biochemistry) University of North Carolina, Chapel Hill</td>
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<tr>
<td><strong>Research:</strong> Carbohydrate utilization by the human gut microbiome, especially outer membrane transport mechanisms in Bacteroides</td>
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<td><strong>Courses:</strong></td>
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<tr>
<td>BIO 113 – Integrated Concepts in BIO I</td>
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<tr>
<td>BIO 303 – Biochemistry</td>
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</table>
### Dr. Naima Starkloff, Visiting Assistant Professor of Biology

- **Office:** Wall 391  
- **Phone:** x3129  
- **Email:** nastarkloff@davidson.edu  
- **Education:**  
  - BA (Ecology & Evolution) Bennington College  
  - PhD (Ecology & Evolutionary Biology) State University of New York, Albany  
- **Research:** Ornithology, disease ecology, global change ecology  
- **Courses:**  
  - BIO 321 – Ecology (+lab)  
  - BIO 240 – Biostatistics for Life Scientists

### Dr. Sophia Sarafova, Associate Professor of Biology

- **Office:** Wall 242  
- **Lab:** Wall 240  
- **Phone:** x2899  
- **Email:** sosarafova@davidson.edu  
- **Education:**  
  - BA (Biochemistry) Swarthmore College  
  - MS (Cell, Molecular, & Biophysical Studies) Columbia University  
  - PhD (Immunology) Columbia University  
  - Postdoc (Immunology) National Institute of Health  
- **Research:** Lineage determination in the immune system  
- **Courses:**  
  - BIO 113 – Integrated Concepts in Biology (+lab)  
  - BIO 201 – Genetics (+lab)  
  - BIO 230 – The Host-Pathogen Interaction  
  - BIO 303 – Biochemistry (+lab)  
  - BIO 307 – Immunology (+lab)  
  - BIO 337 – Principles of Immunology  
  - BIO 364 – Immune System Dysfunction  
  - BIO 392 – Medical Biotechnology  
  - BIO 395 – Biochemistry Seminar

### Dr. Kevin G. Smith, Associate Professor of Biology

- **Office:** Wall 117  
- **Lab:** Wall 115  
- **Phone:** x3038  
- **Email:** kgsmith@davidson.edu  
- **Education:**  
  - BA (Biology) Colby College  
  - MS (Zoology) Auburn University  
  - PhD (Ecology & Evolutionary Biology) University of Tennessee  
- **Research:** Conservation ecology, especially understanding biodiversity change and extinction  
- **Courses:**  
  - BIO 114 – Integrated Concepts in Biology (+lab)  
  - BIO 227 – Conservation Biology & Biodiversity (+lab)  
  - BIO 240 – Biostatistics for Life Scientists  
  - BIO 356 – Extinction Analysis
<table>
<thead>
<tr>
<th><strong>Dr. Mark Stanback ‘84, Professor of Biology (On leave Spring ’21)</strong></th>
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<td><strong>Office:</strong></td>
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<td><strong>Lab:</strong></td>
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<td><strong>Phone:</strong></td>
<td>x2325</td>
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<tr>
<td><strong>Email:</strong></td>
<td><a href="mailto:mastanback@davidson.edu">mastanback@davidson.edu</a></td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td>BS (Biology) Davidson College</td>
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<tr>
<td></td>
<td>PhD (Zoology) University of California, Berkeley</td>
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<tr>
<td></td>
<td>Postdoc (Zoology) University of Washington</td>
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<tr>
<td><strong>Research:</strong></td>
<td>Avian behavioral ecology</td>
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<tr>
<td><strong>Courses:</strong></td>
<td>BIO 112 – Organisms, Ecosystems, &amp; Evolution (+lab)</td>
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<tr>
<td></td>
<td>BIO 222 – Vertebrate Zoology (+lab)</td>
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<td>BIO 223 – Animal Behavior (+lab)</td>
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<td>BIO 232 – Vertebrate Natural History</td>
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<tr>
<th><strong>Dr. Jeffery Sich ’77, Adjunct Professor of Biology</strong></th>
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<tr>
<td><strong>Office:</strong></td>
<td>Wall 189 (fall semester only)</td>
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<tr>
<td><strong>Phone:</strong></td>
<td>2640</td>
</tr>
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<td><strong>Email:</strong></td>
<td><a href="mailto:jesich@davidson.edu">jesich@davidson.edu</a></td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td>BS (Biology) Davidson College, Davidson</td>
</tr>
<tr>
<td></td>
<td>MS and PhD (Microbiology &amp; Molecular Genetics) University of Cincinnati (College of Medicine)</td>
</tr>
<tr>
<td><strong>Research:</strong></td>
<td>Career development and faculty engagement; U.S. biomedical research policy; global health.</td>
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<tr>
<td><strong>Courses:</strong></td>
<td>BIO 202 – Microbiology (+Lab)</td>
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<tr>
<th><strong>Dr. Bryan Thurtle-Schmidt, Assistant Professor of Biology (On leave Spring ’21)</strong></th>
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<td>Wall 344</td>
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<td><strong>Lab:</strong></td>
<td>Wall 346</td>
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<tr>
<td><strong>Phone:</strong></td>
<td>3124</td>
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<tr>
<td><strong>Email:</strong></td>
<td><a href="mailto:brhurtleschmidt@davidson.edu">brhurtleschmidt@davidson.edu</a></td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td>BS (Biochemistry) and BA (History) Indiana University, Bloomington</td>
</tr>
<tr>
<td></td>
<td>PhD (Molecular and Cell Biology) University of California, Berkeley</td>
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<tr>
<td></td>
<td>Postdoc (Biochemistry and Biophysics) Univ of California, San Francisco</td>
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<tr>
<td><strong>Research:</strong></td>
<td>Biochemical studies of membrane transport proteins</td>
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<tr>
<td><strong>Courses:</strong></td>
<td>BIO 113 – Integrated Concepts in Biology (+lab)</td>
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<td></td>
<td>BIO 303 – Biochemistry (+lab)</td>
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<td>BIO 394 - Molecular Machines</td>
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<thead>
<tr>
<th><strong>Dr. Debbie Thurtle-Schmidt, Assistant Professor of Biology (On leave fall 2020)</strong></th>
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<td><strong>Lab:</strong></td>
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<td><strong>Phone:</strong></td>
<td>x2640</td>
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<tr>
<td><strong>Email:</strong></td>
<td><a href="mailto:dethurtleschmidt@davidson.edu">dethurtleschmidt@davidson.edu</a></td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td>BS (Biology) Santa Clara University</td>
</tr>
<tr>
<td></td>
<td>PhD (Molecular and Cell Biology) University of California, Berkeley</td>
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<tr>
<td></td>
<td>Postdoc (Cellular Molecular Pharmacology) University of California, San Francisco</td>
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<tr>
<td><strong>Research:</strong></td>
<td>Integrating novel genomics data into teaching bioinformatics</td>
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<tr>
<td><strong>Courses:</strong></td>
<td>BIO 113 – Integrated Concepts in Biology I (+lab)</td>
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<tr>
<td></td>
<td>BIO/CSC 209 - Bioinformatics Programming</td>
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<td>BIO 240 – Biostatistics for Life Scientists</td>
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<td>BIO 309 – Genomics</td>
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<td>BIO 343 – Laboratory Methods in Genomics</td>
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<td><strong>Dr. Susana Wadgymar, Assistant Professor of Biology</strong></td>
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<td>Office: Wall 119</td>
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<td>Lab: Wall 121</td>
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<td>Phone: x2033</td>
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<tr>
<td>Email: <a href="mailto:suwadgymar@davidson.edu">suwadgymar@davidson.edu</a></td>
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</tr>
<tr>
<td>Education: BS (Ecology, Evolution, &amp; Behavior) University of Texas at Austin</td>
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<tr>
<td>PhD (Ecology and Evolutionary Biology) University of Toronto</td>
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<tr>
<td>Postdoc (Genetics/Ecology) University of Georgia</td>
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<tr>
<td>Research: theoretical predictions in ecology and evolutionary biology integrating field-based and greenhouse experiments with laboratory and analytical techniques</td>
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<tr>
<td>Courses: BIO 114 – Integrated Concepts in Biology (+lab)</td>
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<td>BIO 240 – Biostatistics for Life Scientists</td>
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<td>BIO 263 – Evolutionary Ecology</td>
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<th><strong>Dr. David Wessner, Professor of Biology and Chair of Health &amp; Human Values (On sabbatical Fall ’20 and Spring ’21)</strong></th>
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<td>Office: Wall 274</td>
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<td>Lab: Wall 225</td>
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<td>Phone: x2846</td>
<td></td>
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<tr>
<td>Email: <a href="mailto:dawessner@davidson.edu">dawessner@davidson.edu</a></td>
<td></td>
</tr>
<tr>
<td>Education: BS (Biology) Franklin &amp; Marshall College</td>
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<tr>
<td>PhD (Microbiology &amp; Molecular Genetics) Harvard University</td>
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<tr>
<td>Postdoc (Pathology) Uniformed Services University of Health Sciences</td>
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<tr>
<td>Research: viral infections: HIV/AIDS education and outreach materials</td>
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<tr>
<td>Courses: BIO 111 – Molecules, Genes, &amp; Cells (+lab)</td>
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<td>BIO 202 – Microbiology (+lab)</td>
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<td>BIO 263 – Images of HIV/AIDS</td>
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<td>BIO 361 – Biology of HIV/AIDS</td>
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<thead>
<tr>
<th><strong>Dr. Jeremy Whitson, Visiting Assistant Professor of Biology</strong></th>
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<tbody>
<tr>
<td>Office: Wall 389</td>
<td></td>
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<tr>
<td>Phone: 2329</td>
<td></td>
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<tr>
<td>Email: <a href="mailto:jewhitson@davidson.edu">jewhitson@davidson.edu</a></td>
<td></td>
</tr>
<tr>
<td>Education: BS (Biology &amp; Molecular Biology) Muskingum University, Concord, Ohio</td>
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<tr>
<td>PhD (Pathology) Case Western Reserve University, Cleveland, Ohio</td>
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<tr>
<td>Research: Molecular and cellular basis of aging, Aging-associated diseases and disorders</td>
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<tr>
<td>Courses: BIO 113 – Integrated Concepts in Biology</td>
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<td>BIO 201 – Genetics (+Lab)</td>
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<tr>
<td>BIO – Nutrition</td>
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## Biology Staff Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Location</th>
<th>Phone</th>
<th>Email</th>
<th>Duties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mr. James Denny</strong></td>
<td>Building Services Worker</td>
<td>Basement Wall</td>
<td>x2595</td>
<td><a href="mailto:jadenny@davidson.edu">jadenny@davidson.edu</a></td>
<td>Wall maintenance</td>
</tr>
<tr>
<td><strong>Mr. Keith Frye</strong></td>
<td>Instrumentation Specialist</td>
<td>Watson B127</td>
<td>x2490</td>
<td><a href="mailto:kefrey@davidson.edu">kefrey@davidson.edu</a></td>
<td>Ensuring performance of scientific instruments; developing custom devices</td>
</tr>
<tr>
<td><strong>Ms. Kimberly O’Brien</strong></td>
<td>Animal Care Technician</td>
<td>Wall B013</td>
<td>x2617</td>
<td><a href="mailto:kiobrien@davidson.edu">kiobrien@davidson.edu</a></td>
<td>Facilitate animal care needs for the sciences</td>
</tr>
<tr>
<td><strong>Mr. Mickey Hancock</strong></td>
<td>Building Services Worker</td>
<td>1st floor Wall</td>
<td>x2595</td>
<td><a href="mailto:mihancock@davidson.edu">mihancock@davidson.edu</a></td>
<td>Wall maintenance</td>
</tr>
<tr>
<td><strong>Ms. Martha Howland</strong></td>
<td>Building Services Worker</td>
<td>3rd floor Wall</td>
<td>x2595</td>
<td><a href="mailto:mahowland@davidson.edu">mahowland@davidson.edu</a></td>
<td>Wall maintenance</td>
</tr>
<tr>
<td><strong>Ms. Esther Lherisson</strong></td>
<td>FIRST Program Analyst</td>
<td>Wall 174</td>
<td>x2504</td>
<td><a href="mailto:eslherisson@davidson.edu">eslherisson@davidson.edu</a></td>
<td>Program analyst for FIRST</td>
</tr>
</tbody>
</table>
Ms. Peggy Maiorano, Lab Manager
Office: Wall 104
Prep Lab: Wall 104B
Phone: x2509
Email: pemaiorano@davidson.edu
Education: BS (Nursing) Clemson University
MS (Biology) University of North Carolina at Charlotte
Duties: Supports introductory biology lab courses

Ms. Gena Keeton, Departmental Coordinator
Office: Wall 282
Phone: x2385
Email: gekeeton@davidson.edu
Education: AAS (Business Office Systems and Support, Executive Assisting) Richland College
Duties: Supports BIO with programming and operations, managing budgets, event planning, publicity and outreach, and social media

Ms. Jessica Spillman, Lab Manager
Office: Wall 116A
Prep Lab: Wall ###
Phone: x3096
Email: jespillman@davidson.edu
Education: BA (Biology) University of North Carolina at Charlotte
MA (Environmental Studies) University of Illinois at Springfield
Duties: Supports environmental studies and biology non-majors and field labs

Ms. Nikki Steele, Building Services Worker
Location: Second floor Wall
Phone: 2595
Email: nisteele@davidson.edu
Duties: Wall maintenance

Mr. Matthew Wallace, Building Services Worker
Location: Wall
Phone: 2595
Email: mawallace@davidson.edu
Duties: Wall maintenance

Ms. Rebecca Vance, Lab Manager
Office: Wall 320A
Phone: x2731
Email: revance@davidson.edu
Education: BS (Biology) Montevallo
MS (Biology) University of Alabama at Birmingham
Duties: Support upper-level laboratory courses

Ms. Johanna Ziegler, Animal Care Coordinator
Office: Wall B013
Phone: x2759
Email: joziegler@davidson.edu
Education: AS Mitchell College, Registered Lab Animal Technologist
Duties: Facilitate animal care needs for the sciences
Biology Major Requirements

Required Courses:

The Biology major requires a total of eleven courses (three intro + eight upper level). Seven courses must be Davidson courses taught by Davidson College faculty members.

Three introductory courses (two biology, one chemistry):

BIO 111 or BIO 113 – Molecules, Genes, & Cells or Integrated Concepts in Biology I
BIO 112 or BIO 114 – Organisms, Ecosystems, & Evolution Integrated Concepts in Biol. II
CHE 115 – Principles of Chemistry

Eight biology courses numbered 200 or above

Of these eight, at least three from groups A and B, with at least one from each group:

Group A  201 – Genetics
202 – Microbiology
208 – Cell Biology
303 – Biochemistry
306 – Developmental Biology
307 – Immunology
333 – Cellular & Molecular Neuroscience
309 – Genomics + 343 – Methods in Genomics (both must be completed)

Group B  216 – Plants, Farms, & Forests
218 – Human Form & Function
222 – Vertebrate Field Zoology
223 – Animal Behavior
305 – Microanatomy of the Vertebrates (Histology)
311 – Comparative Anatomy
317 – Entomology
320 – Plant Adaptations
321 – Ecology
331 – Behavioral Neuroscience

Note – in the rare event when a group A or B course is taught without a lab, the course cannot count toward the group A/B requirement (but can count toward the major).

Recommended Courses:

CHE 250 – Introduction to Organic Chemistry
CHE 350 – Experimental Organic Chemistry
MAT 112 – Calculus I & Modeling
MAT 113 – Calculus II or MAT 110 - Finite Mathematics
PHY 120 – General Physics or PHY 130 - General Physics with Calculus
PHY 220 – General Physics or PHY 230- General Physics with Calculus

Notes: Most medical and veterinary schools require four chemistry, two physics, and two math courses. Most biology graduate programs strongly recommend two organic chemistry, two physics, and two math courses.

AP/IB Credit:

For Class of 2021 and earlier: The biology department grants AP/IB credit for Biology 107, which counts toward graduation requirements, but not toward biology major requirements.

For Class of 2022: Credit for BIO 107 is awarded to students who scored a 4 or 5 on the AP Biology exam. Students who scored a 5 and plan to continue in the sciences, pre-med, and/or pre-health may receive credit for one of two introductory lab course requirements (BIO 111/113 or BIO 112/114) in place of the exploratory lab course (BIO 107) by consulting the Biology chair, Dr. Paradise.
Biology Courses

Descriptions of biology courses: http://www.davidson.edu/academics/biology/courses
Future course offerings: http://www.davidson.edu/academics/biology/courses/course-schedule--planning

Introductory Biology Courses (take one even and one odd: 111+112, 111+114; 113+112, or 113+114)
BIO 111 – Molecules, Genes, & Cells (+lab)
BIO 112 – Organisms, Evolution, & Ecosystems (+lab)
BIO 113 – Integrated Concepts in Biology I (+lab)
BIO 114 – Integrated Concepts in Biology II (+lab)

Group A Biology Upper-Level Lab Courses (take at least one A course & at least three in groups A&B)
BIO 201 – Genetics (+lab)
BIO 202 – Microbiology (+lab)
BIO 208 – Cell Biology (+lab)
BIO 303 – Biochemistry (+lab)
BIO 306 – Developmental Biology (+lab)
BIO 307 – Immunology (+lab)
BIO 333 – Cellular & Molecular Neuroscience (+lab)

Group B Biology Upper-Level Lab Courses (take at least one B course & at least three in groups A&B)
BIO 216 – Plants, Farms, & Forests (+lab)
BIO 218 – Human Form & Function (+lab)
BIO 222 – Vertebrate Zoology (+lab)
BIO 223 – Animal Behavior (+lab) (cross-listed as PSY 323)
BIO 227 – Conservation Biology & Biodiversity (+lab)
BIO 317 – Entomology (+lab)
BIO 320 – Plant Adaptations (+lab)
BIO 321 – Ecology (+lab)
BIO 331 – Behavioral Neuroscience (cross-listed as PSY 303) (+lab)

Upper-Level Biology Courses Without Labs
BIO 217 – Insects & People
BIO 237 – Biodiversity & Conservation
BIO 238 – Cell Biology & Signaling
BIO 230 – The Host-Pathogen Interaction
BIO 232 – Vertebrate Natural History
BIO 233 – Behavioral Ecology
BIO 299 – Various advanced biology courses transferred from other institutions
BIO 309 – Genomics
BIO 310 – Human Physiology
BIO 332 – Functional Neuroanatomy (cross-listed as PSY 324)
BIO 336 – Animal Development
BIO 337 – Principles of Immunology
BIO 342 – Evolutionary Biology

Biological Methods Courses
BIO 209 – Bioinformatics Programming (cross-listed as CSC 209)
BIO 240 – Biostatistics for Life Scientists
BIO 251 – Light Microscopy
BIO 252 – Avian Behavioral Ecology
BIO 256 – Applied Insect Ecology
BIO 257 – Tree Taxonomy & Identification: Dendrology
BIO 343 – Laboratory Methods in Genomics
BIO 352 – Genetics of Mitochondrial Shaping
BIO 356 – Diversity & Extinction Analysis
BIO 357 – Biotoxicity of Hookah Tobacco Smoke

**Biology Seminar Courses**
BIO 260 – Perspective on Darwinism
BIO 261 – Neuroscience of Exercise
BIO 262 – Forensic Serology
BIO 263 – Representations of HIV/AIDS (*cross-listed as ENG 285*)
BIO 263 – Evolutionary Ecology
BIO 266 – Synthetic Biology Discoveries
BIO 267 – Cases in Environmental Health
BIO 360 – Biology of HIV/AIDS
BIO 362 – Issues in Reproductive Medicine
BIO 363 – Human Genetics
BIO 364 – Immune System Dysfunction
BIO 365 – Biology of Cancer
BIO 366 – Renewable Natural Resources: Science & Policy (*cross-listed as ANT 382 & ENV 366*)
BIO 367 – Ecotoxicology (*cross-listed as ENV 367*)
BIO 391 – Maternal and Fetal Health
BIO 392 – Medical Biotechnology
BIO 393 – Advances in Genome Editing
BIO 394 – Molecular Machines
BIO 395 – Advanced Biochemistry Seminar (*cross-listed as CHE 430*)

**Off-Campus Study Courses**
BIO 368 – Health Care Issues in Zambia
BIO 381 – Environmental Field Studies (School for Field Studies)
BIO 382 – Environmental Field Studies (School for Field Studies)
BIO 383 – Environmental Field Studies (School for Field Studies)
BIO 385 – Techniques in Environmental Field Research (School for Field Studies)

**Independent Research Courses**
BIO 370 – Directed Reading in Biology
BIO 379 – Thesis in Biology

**Biology courses that do not count toward the biology major** (*a.k.a. non-major courses*)
BIO 102 – Special Topics in Biology
BIO 103 – Microbes & Disease
BIO 104 – Nutrition
BIO 105 – Biology for Life
BIO 106 – Microbes & Our Health (+lab)
*BIO 107 – Special Topics in Biology I (+lab) - awarded for AP or IB Biology
BIO 108 – Human Biology (+lab)
BIO 184 – Environmental Field Studies (School for Field Studies)
*BIO 199 – Various courses transferred from other institutions
Honors in Biology

The Biology Department Thesis Program is designed to promote, develop, and recognize individual excellence through directed independent research. Thesis students meeting additional requirements may be awarded Honors or High Honors in Biology. All thesis students are strongly encouraged to report the results of their research at scientific meetings and in peer-reviewed journals.

Please direct all general inquiries to the Thesis Coordinator: Dr. Bernd

Thesis Requirements:
- A written thesis proposal describing a specific research project in the biological sciences and candidate’s preparation for that work.
- Presentation of a short (~10 minute), public thesis preview presentation as part of a Biology Department seminar along with other thesis students. This group seminar will be scheduled by the faculty Thesis Coordinator as early as possible in the semester preceding the thesis defense.
- Completion of an original research project in the biological sciences
- A written thesis describing the completed research project and results
- A public seminar describing the research project and results
- A successful oral defense of the research with Biology Department faculty and up to one external faculty member as suggested by the Biology Department faculty immediately following the public seminar
- Completion of the Biology major course requirements including at least two semesters of independent research (BIO 371/372/373/374/379), or at least one semester of independent research plus a summer spent on the proposed research. (BIO379)
- Attendance at Biology Department seminars as follows:
  - At least three Biology Department seminars by outside speakers during the semester of the defense and/or the semester preceding that in which the defense is scheduled. Thesis students will have opportunities to interact with invited speakers.
  - All biology student thesis defenses during the semester in which the defense is scheduled.
    - Note: A Thesis Program candidate who performs at least four hours of biology-related community service activities during the senior year can substitute that service for attendance at one seminar, if approved by the Thesis Coordinator in advance. Any schedule conflicts should be discussed with the Thesis Coordinator as soon as possible.
- Submission of an electronic copy of the final thesis to the Biology Department & Library.

Additional Requirements to achieve Honors in Biology:
- One additional Biology course (numbered 200 or above) beyond those already fulfilling Biology major requirements.
- A final GPA at graduation of greater than or equal to 3.2.

Additional Requirements to achieve High Honors in Biology:
- Successful achievement of Honors
- A final GPA at graduation of greater than or equal to 3.6
- Nomination for high honors by mentor and vote by biology faculty
Thesis & Honors Guidelines

Thesis Learning Outcomes:
Students completing an Honors Thesis will be able to:

- Synthesize relevant literature
- Formulate testable hypotheses based in the prior knowledge of the field
- Design studies in the form of experiments, observational studies, or surveys to answer scientific questions
- Clearly and succinctly write a thesis proposal
- Analyze and interpret results in written thesis
- Synthesize results within the context of current knowledge in biology and in other disciplines
- Communicate clearly and succinctly for a general biology audience presentation
- Explain results and experimental design in response to questions

Timeline:
Sophomore and/or junior years:
- Begin planning a thesis proposal with a Biology Department faculty member who is willing to act as a research mentor.
- Engage in a group investigation course (BIO250s/350s), independent research course (BIO371-374), and/or summer research (as needed).

Semester before defense (junior or senior year):
- With your research mentor, identify and ask a second member of faculty to act as a second reader.
- Distribute electronic copies of thesis proposal to all Biology faculty members by Friday of the second full week of classes. Instructions for the thesis proposal are found below.
- Biology faculty members will then consider the proposal at their next scheduled meeting. The faculty Thesis Coordinator will communicate a synopsis of the discussion to the student within 72 hours of the meeting. The synopsis highlights strengths and/or weaknesses of the proposal. Revisions to the written document may be required before a decision can be made.
- Give short thesis preview presentation with other thesis students. Instructions for the preview presentation are found below.
- Conduct research with advice and guidance from mentor, second reader(s), etc.
- Begin writing thesis.

Semester of the thesis defense (junior or senior year):
- Continue writing thesis (enroll in BIO379).
- In the first month of the semester, arrange date, time, and location for defense in consultation with availability of research mentor, second reader(s), chair, and departmental schedule.
- A complete draft of thesis is due to second reader(s) at least two weeks before the scheduled defense (second readers can request an earlier deadline).
- An electronic copy of the complete thesis is due to all Biology faculty members at least 10 days before the scheduled defense.
- The oral thesis presentation and defense must be held no later than the last regular class day of the semester.
- Within 24 hours of the defense, the Thesis Coordinator will communicate a synopsis of the strengths and weaknesses of the presentation, defense, and written thesis to the student. Revisions and corrections may be required of the final written thesis and must be completed by the last optional day of the semester.
- When the final thesis has been approved by the Thesis Coordinator, the student submits both electronic and bound copies of the thesis to the Biology Department’s (& library) archives.
**Thesis Proposal Instructions**

**Due:** Friday of the second full week of classes of the semester during which student is beginning thesis work.

**Proposal components:** With your research mentor, develop a four-page proposal that includes the following four numbered sections:

1. **GOAL:** *What is the goal of your project? *What is the question/hypothesis/exploration that you plan on conducting?

2. **APPROACH:** *How will your project address each of the learning outcomes listed on page 19 above? (Some of the learning outcomes (LO) may be outside the scope of what is possible for a particular project. Determine which LO are appropriate for you in consultation with your research mentor. Your proposal should clearly convey your LOs and how they will be addressed.) *What specific methods do you plan on using for your project? If you do not already know these methods, what is your plan for acquiring those skills in time to do your analysis? *What courses have you taken that support those skills? *What work have you already completed? *What possible changes could be made in your plans if we are required to adapt to changes caused by the current pandemic?

3. **FORM:** What form will your final product take?

4. **TIMELINE & BUDGET:** *What is your preliminary timeline for the fall and spring semesters? The fall timeline may serve as part of your fall Independent research course’s syllabus. *What facilities and resources will you require access to in order to complete your work (might include locations, data bases, computer/internet)? *What materials/costs will be required?

**EMAIL your completed proposal** to Dr. Karen Bernd (Biology Thesis Coordinator) by Friday. Dr. Bernd will distribute the proposal to biology faculty who will provide ideas and input to help you achieve your goals and meet the learning outcomes.

**Thesis preview presentation:**

**Scheduled** during February/March or October/November of the first semester of thesis research

**Description:** A <10min oral presentation delivered by Zoom that:

a) Introduces the thesis project,

b) describes background information that situates the project within the field and discusses why it is a relevant direction of exploration, and

c) presents the projects goals and expected outcome.

d) Provides an opportunity to practice science communication.

Approximately one week before the presentations, Dr. Bernd will meet with all researchers as a group to check in, make sure everyone is comfortable with the technology, and provide a chance for group discussion and questions.

**Thesis & Honors Guidelines**

**Thesis Guidelines**

- The thesis will be written in the form that the department faculty approved as part of your thesis proposal.
- Electronic copies of the thesis must be distributed to all Biology faculty members no later than 10 days before the defense.
- An addendum to the thesis should list all Biology department seminars attended during the current and previous semester. Each entry on the list should include the speaker’s name, title of talk, date, and a paragraph describing the major findings presented. The addendum should also describe any community service activities that led to an exemption from one Biology seminar.
Presentation Guidelines

• To culminate the project, the researcher orally presents and discusses the thesis research with the public and the Biology Department. Dr. Bernd assists in scheduling and identifies a tertiary reader. The presentation must be scheduled at a time when the student, research advisor, Thesis Coordinator, second reader(s), and designated tertiary readers (who are at least two faculty members designated by the Thesis Coordinator, one who teaches BIO 111/113 and/or Group A courses and one who teaches BIO 112/114 and/or Group B/C courses) are all available.
• The oral presentation of the thesis research must be advertised and open to the community.
• Throughout the presentation the researcher is expected to demonstrate a thorough understanding of their research question, methods, results, analysis, related literature, etc. and be able to discuss multiple aspects of the research, including problems encountered in the research process.
• Immediately following the oral presentation and general question and answer period, the researcher, their faculty mentor, designated faculty members external to the Biology Department (if research mentors are not Biology faculty), and other Biology Faculty members will engage in a conversation about the research. No other guests are permitted at this time.
• After the preceding conversation the student and any non-Biology faculty will be excused from the room. The faculty mentor comments briefly on the student’s work and is then excused while the remaining Biology faculty members meet in executive session to discuss the researcher’s presentation and thesis in comparison with the stated learning outcomes. Within 24 hours of the discussion, the Thesis Coordinator will email feedback regarding strengths and weaknesses of the presentation and written thesis. Honors may be contingent upon satisfactory revisions to the written thesis or the decision to award honors may be delayed until receipt of the revised thesis.

Awarding of Honors

• A thesis student is awarded honors if:
  - all Biology Department honors requirements are met
  - all Davidson College honors requirements are met, including GPA ≥3.2 at graduation
  - a simple majority of Biology faculty members vote in favor of the honors designation.

• The decision to award honors includes, but is not limited to:
  - the scholarly quality of the thesis
  - the student’s imagination and creativity in conducting and communicating the research
  - the time and energy the student invested in the research
  - the student’s ability to think clearly, discuss, and answer questions about the research as demonstrated in the execution of the research, written thesis, and final presentation.

Awarding of High Honors

• Candidates awarded honors are considered for high honors if they are awarded honors and a written recommendation by the faculty mentor is submitted to Biology faculty after the defense and before the last regular class day of the student’s final semester.
Recommendations for high honors are based, in part, on the following:
  - Overall GPA ≥3.6
  - Thesis research judged meritorious and truly exceptional, using criteria such as, but not limited to: success in obtaining extramural funding for research, presentation of research at regional or national scientific meetings, and potential for publication of research in a peer-reviewed journal.

The Thesis Coordinator will call for a vote of Biology faculty (tenured and tenure track, excluding the primary faculty mentor), no later than 48 hours after the written recommendation for high honors is circulated.

The vote is conducted electronically unless any departmental member requests a meeting to discuss the recommendation. The candidate is awarded high honors if a simple majority of the voting faculty members favor awarding high honors.
School for Field Studies (SFS)

http://www.davidson.edu/academics/biology/the-school-for-field-studies

Davidson College is an affiliate school of the School for Field Studies (SFS). SFS offers both semester and summer programs concentrating on international environmental issues. These studies target environmental issues that are pertinent to the area surrounding the SFS center. Course work and directed research projects at each center are integrated with the courses taken by students. See SFS catalogue (www.fieldstudies.org) and the Davidson at SFS website (http://www.davidson.edu/academics/biology/the-school-for-field-studies) for more information on the SFS program centers. Dr. Kevin Smith the SFS Affiliate Representative for Davidson College and can be reached at kgsmith@davidson.edu.

Davidson’s affiliation with SFS allows Davidson students to:

• Receive priority acceptance to the various SFS semester and summer programs.

• Receive four Davidson biology course credits (BIO 184, 381, 382, 383) for attending a semester program and one Davidson biology course credit (BIO 385) for attending a summer program. Biology 381-383 and Biology 385 count as credit toward a major in Biology. Biology 184 does not count toward the major.

• Fulfill the cultural diversity core requirement (BIO 184), if the student attends semester programs in Kenya, Baja, Turks & Caicos, or Costa Rica.

Application process:
The SFS program is open to all Davidson students regardless of major. Seniors can also participate in an SFS semester at any time during their senior year. All SFS students are technically considered “on campus” students and apply directly to SFS for acceptance. In general, apply as early as possible after making a decision to attend a specific program. Students applying for semester programs during the following academic year should get their applications to SFS early in the New Year, or before the winter holiday break for Fall Semester programs.

Requirements:

• Complete one full semester of college and one college-level biology course

• Other SFS specific requirements may apply and may vary by center

Registration for courses:
Once accepted to an SFS semester program, students are required to complete an Off-Campus Study Terms and Conditions Form. Students do not need to complete a course preference tree for their SFS Semester.

Students attending SFS should leave their course preferences for the following semester with their advisor although they can generally register via the web while at SFS centers

Summer program: Upon acceptance by SFS, students should meet with Dr. Smith and complete an Off-Campus Study Agreement form (available at http://www.bio.davidson.edu/sfs).
Other Off Campus Study Opportunities

Biology students are encouraged to study off-campus as part of their undergraduate education. Advanced planning is particularly helpful. Consult Dr. Smith and Davidson’s Study Abroad Office for program suggestions and considerations. A few of the many off-campus study programs a Davidson Biology student might consider include:

- **Davidson College Study Abroad** – Germany, France, India, Peru, Classics Trip
  [http://www.davidson.edu/about/distinctly-davidson/study-abroad](http://www.davidson.edu/about/distinctly-davidson/study-abroad)

- **Organization for Tropical Studies** – Costa Rica and South Africa
  [http://www.ots.ac.cr/](http://www.ots.ac.cr/)
  An increasing number of Davidson students are studying abroad with the OTS, a program conducted by Duke University. OTS runs both semester and summer programs in Costa Rica (Tropical Biology; Tropical Medicine and public Health) and South Africa (African Ecology and Conservation). These courses are research-intensive with a combination of regular and visiting faculty. Participants receive Duke University course credit. For more information, contact Dr. Stanback

- **Oak Ridge Science Semester** - Oak Ridge, Tennessee
  [www.acm.edu/programs/15/oakridge/index.html](http://www.acm.edu/programs/15/oakridge/index.html)

- **Marine Biological Labs Semester in Environmental Science** - Woods Hole, MA
  [http://ecosystems.mbl.edu/ses/](http://ecosystems.mbl.edu/ses/)

- **School for International Training** – Africa, Asia, Europe, Latin America, Caribbean, Middle East
  [www.sit.edu/studyabroad/](http://www.sit.edu/studyabroad/)

- **Sea Education Association** - Woods Hole, MA
  [www.sea.edu/home/index.aspx](http://www.sea.edu/home/index.aspx)

- **Danish Institute for Study Abroad** - Copenhagen, Denmark
  [www.dis.dk/](http://www.dis.dk/)

- **Institute for Study Abroad** – Australia, Argentina, Chile, China, Costa Rica, Egypt, UK, India, Mexico, New Zealand, Peru

- **Council on International Educational Exchange** – Africa, Middle East, Asia, Australia, Europe, Latin America
  [https://www.ciee.org/](https://www.ciee.org/)

- **Center for Education Abroad** – Australia, China, England, France, Greece, India, Ireland, Italy, New Zealand, Scotland, South Africa, Spain, Tanzania, Wales
  [www.arcadia.edu/abroad/](http://www.arcadia.edu/abroad/)

- **Semester at Sea**
  [www.semesteratsea.org/](http://www.semesteratsea.org/)
Summer Research at Davidson – DRI & Other Options

Davidson Research Initiative (DRI)
http://www.davidson.edu/about/distinctly-davidson/research/davidson-research-initiative/application-directions

Students interested in applying for the DRI Summer Research Program should begin consulting with a potential faculty mentor early in the fall semester and submit research proposals and other application materials (form, transcript, and letters) to the DRI program director. Proposal writing workshops will be held in the fall semester. Examples of successful proposals from past years are also available at P:\Academic Affairs\Davidson Research Initiative (authentication required).

Application Deadlines
The online DRI Proposal Application (authentication required) is typically due in mid/late January. Email prompts will automatically be sent to your mentor and faculty recommenders when the online Proposal Application has been completed. Your mentor will be asked to write a letter of recommendation and the faculty recommenders will be asked to fill in a recommendation form. All mentor letters and faculty recommendation forms must be submitted online by late January. Completed applications are typically reviewed by the Student Study and Research Committee with awards announced in February. More information can be found at http://www.davidson.edu/about/distinctly-davidson/research/davidson-research-initiative. Fellowship awards are typically announced before Spring Break.

Proposals
Detailed proposals must be submitted in order to be considered. Proposals must include:
- research plan (a detailed project description)
- timetable for completing the project
- justification (the unique and original nature of the research)
- description of the interactions between you and your mentor throughout the research
- description of previous experiences that prepare the student for the project
- budget (required materials and estimated costs)
- how results of the research might be shared (posters, presentations, professional publications)

Additional Application Materials
In addition to your proposal, the following materials must be submitted to be considered:
- letter of support from the faculty mentor, assuring that proposal was written by the student
- copy of the student’s transcript
- two letters of recommendation from persons other than your faculty mentor

Students from Historically Black Colleges and Universities (HBCUs)
Davidson invites students from local HBCU campuses to apply for DRI research positions with Davidson faculty. Five HBCU students can participate in the DRI Summer Research Program. HBCU students or faculty members who would like to recommend a student for the program should indicate their interest to the DRI program director, Verna Case. HBCU students who are accepted will be invited to participate under the same conditions as Davidson student participants.

Other Options
Some Davidson faculty members have their own research grants from the College, federal agencies (NSF, NIH, etc.), and/or private agencies. If you are interested in the research of a faculty member, just ask what opportunities might be available to you.
The Duke-Davidson Immunology Summer Program invites outstanding Davidson students to apply for a 10-week research internship in an immunology laboratory at Duke University. The program offers training in cutting edge immunology research. In addition, the selected students will be immersed in research laboratory culture and, with undergraduate fellows from other Duke summer research programs, participate in weekly research seminars and social hours, a workshop about how to apply successfully to graduate school, and a closing poster symposium.

The application is on a web site used by all summer programs at Duke http://gradschool.duke.edu/gsa/srop/ click on 'Apply' from the right-side menu.

When completing the application make sure to indicate the following:

• Why do you wish to participate? (max. 250 word)
• Career goals (max. 300 words)
• Under current interest specify you are interested in research in a Duke Immunology Department laboratory (this and your letters route the application to the correct people)

*The online application is a common form. The "past research" paragraph found in the common application is optional for DDIP applicants and will not be taken into consideration when making the decision.*

In addition to completing the information on the above website, please arrange for three letters of recommendation to be mailed to:

Dr. Yuan Zhuang, Department of Immunology
Box 3010
Duke University Medical Center
Durham, NC 27710

Dr. Sarafova is the Davidson link for this program. Please contact sosarafova@davidson.edu with questions.
Summer Research Programs at Other Institutions

In addition to summer research opportunities at Davidson, undergraduates can obtain paying positions in research labs at universities and institutions across the country (including a few international opportunities). Competition for these positions is usually very tight, so students are encouraged to apply for multiple summer research opportunities. Application deadlines generally vary from December to March.

NSF REU programs
http://www.nsf.gov/crssprgm/reu/reu_search.cfm
A list of institutions who have National Science Foundation funding—an excellent resource to begin your search for a summer research opportunity

Specific Summer Research Programs:

Merck Science Initiative - Undergraduate Science Research Scholarship Awards
https://scholarships.uncf.org/Program/Details/76950245-bca2-42e2-b13a-4aee87e44285
This award is intended to help African American undergraduate students who are interested in science careers. This award provides tuition support and opportunities for research experience at a Merck research facility during the summer.

HHMI Janelia Undergraduate Scholars
http://www.hhmi.org/programs/janelia-undergraduate-scholars
Cold Spring Harbor Undergraduate Research Program
http://www.cshl.edu/URP/

The Kathleen S. Anderson Award and Manomet Bird Observatory
https://www.manomet.org/job-opportunities/kathleen-s-anderson-award-promising-biologists
Grant for avian research, especially research furthering bird conservation. Proposed research must take place in the Americas.

Examples:
In recent years, Davidson Biology majors have completed summer research programs at many prestigious research institutions such as:

- Duke University
- Vanderbilt University
- Rockefeller University
- HHMI's Janelia Farm
- Wake Forest University
- Mayo Clinic
- Caltech
Opportunities to Present Research

On Campus

Davidson Summer Research Symposium
- An annual event held the second week of fall semester featuring research conducted by DRI and other summer research programs at Davidson College.

The Verna Miller Case Research and Creative Works Symposium
- An annual symposium featuring research conducted by students across campus; held on the Wednesday prior to reading day of the Spring semester

Off Campus

Association of Southeastern Biologists (ASB)
http://www.sebiologists.org/

Posters on the Hill
http://www.cur.org/conferences_and_events/student_events/posters_on_the_hill/

National Conferences on Undergraduate Research (NCUR)
http://www.ncur.org/theconference.htm

State of North Carolina Undergraduate Research & Creativity Symposium (SNCURCS)
http://www.sncurcs.org/

North Carolina Academy of Science (NCAS) Annual Meeting
http://www.ncacadsci.org/

Symposium for Young Neuroscientists & Professors of the SouthEast (SYNAPSE)
http://synapse.cofc.edu/

Mid-Atlantic Regional Conference of Undergraduate Scholarship (MARCUS)
http://sbc.edu/marcus/

Undergraduate Research Symposium in the Chemical & Biological Sciences
http://cnmssymposium.umbc.edu/

Sigma Xi Student Research Conference
https://sigmaxi.org/meetings-events/international-research-conference
Grants for Undergraduate Research

The David C. Grant Travel Award
http://www.davidson.edu/academics/biology/grant-travel-awards

Provides funding (up to $500) for Davidson students to offset the costs of travel to present research at regional or national scientific meetings. Applicants must be Davidson students who are authors on the presentation - preferably first author. All types of biological research are acceptable, though special consideration will be given to field ecology. In addition to providing travel funds, the Grant Awards may also be used to offset publication costs in peer-reviewed journals. The committee expects all applicants to have applied for the $400 grants available from the VPAA’s office (research advisors can provide details). Applications should be submitted to Dr. Rachid El Bejjani and include:

- A cover letter stating the title of the research and details the need (dates, place, and name of conference and/or name of journal and acceptance date of manuscript, list of authors, etc.). This cover letter should also include a short paragraph outlining the main results and its significance.
- A more-detailed presentation of the work in the form of an extended abstract (~1 page) including an outline of the methods (including statistical treatments), the main results, and an explanation of its significance.
- A detailed budget and explanation of any other funding sources that will be used. If the grant is used for publication costs, a copy of the accepted manuscript should be submitted.

North Carolina Independent Colleges and Universities Undergraduate Research Stipend
http://www.ncicu.org

NCICU will award stipends to students performing undergraduate research at NCICU’s 36-member colleges and universities in the science, technology, engineering and mathematics (STEM) fields of study. Stipends are funded through the undergraduate research endowment established by the North Carolina GlaxoSmithKline Foundation. Stipends are awarded competitively, and recipients are requested to participate in the annual “State of North Carolina Undergraduate Research and Creativity Symposium” (SNCURCS), which is jointly sponsored through a collaborative partnership, between NCICU and the University of North Carolina. All students interested in applying for a stipend must have a faculty mentor - who also is willing to mentor the student’s participation in the Symposium. Stipends are awarded in either $2,000 or $1,000 increments. Students wishing to perform research, advised by a faculty mentor, during summer and fall 2015 may apply for $2,000 stipends. Students wishing to commence their research upon returning to campus in fall 2015 may apply for $1,000 stipends.

Yarbrough Research Grants (Collegiate Academy of the NC Academy of Sciences CANCAS)
https://sites.google.com/a/ncsu.edu/ncas/grants-awards/yarbrough-grant

Supports undergraduate research by providing grants to students who submit grant proposals judged meritorious of support. In recent years, grants have ranged from $30 to $500+.

Sigma Xi Grants-in-Aid of Research (GIAR)
https://www.sigmaxi.org/programs/ethics-and-research

Grants up to $1,000 to students from all areas of the sciences and engineering. Designated funds from the National Academy of Sciences allow for grants of up $2,500 for vision related research. Students use the funding to pay for travel expenses to and from a research site, or for purchase of non-standard laboratory equipment necessary to complete a specific research project.
Beta Beta Beta National Biological Honor Society

http://www.tri-beta.org/

The Tau Omega Chapter of Beta Beta Beta was installed at Davidson College on April 28, 1995. TriBeta is an honor and professional society for students of the biological sciences, particularly undergraduates. It seeks to encourage scholarly attainment, to cultivate intellectual interest in the life sciences, and to promote a better appreciation of the value of biological study. It encourages undergraduate research and "emphasizes a three-fold program: stimulation of scholarship; dissemination of scientific knowledge; and promotion of biological research." TriBeta members receive Bios, a journal of scientific reports by members of the society. Members can submit original research articles to this journal for publication and can present papers at district and national conventions of the organization. Members and chapters are also eligible to compete for various awards given by the national organization.

The Tau Omega Chapter invites students to become regular members during their sophomore, junior, or senior year of study. The requirements for membership are:

- declaration of Biology as a major
- completion of at least three courses in biology
- a 3.2 GPA in the major

The initiation fee for regular members is $50.00 (life membership). Any biology major with a GPA of at least 3.0 is eligible to become an associate member. Associate member dues are $40.00. Associate members may become regular members if they meet the requirements of regular membership and pay an additional $10.00. Membership invitations are sent to eligible students each spring semester, and the initiation ceremony for new members occurs during the same semester.

TriBeta and the BioSociety function jointly in sponsoring events throughout the school year. Currently, the officers of both organizations are the same.

Local chapters, such as Tau Omega, hold business meetings, sponsor presentations of scientific research by students or outside speakers, and undertake various projects. The outreach project with Davidson Elementary School is an example of one project of the Tau Omega chapter and the BioSociety.

The charter, coat of arms and key of the Tau Omega Chapter of Beta Beta Beta are located in the Biology Department office.
**Davidson Biology Awards**

**Tom Daggy Biology Award**
The Tom Daggy Biology Award was established in honor of Dr. Tom Daggy, who taught in the Department of Biology from 1947 to 1981. This award recognizes outstanding academic achievement, leadership and service, and a love of exploring the secrets of life. Award winners are selected during the spring semester from among senior majors by the biology department faculty. The selection is based on the student's academic achievements while at Davidson and his/her contribution to the Biology Department. Contributions may include a variety of activities, including but not limited to research, active involvement in BioSociety/TriBeta or other departmental activities, service to the community or the department (e.g. serving as a teaching assistant, tutoring, etc.). The Tom Daggy Award is presented at Spring Convocation. The recipient receives a monetary award and a certificate, and their name is recorded on a plaque.

Recent Daggy awardees (last 10 years):
- 2020 – Lydia Soifer
- 2019 – Hartlee Johnson
- 2018 – Kyhl Austin
- 2017 – Annalee Tutterow
- 2016 – Elizabeth Brunner
- 2015 – Devon Harris
- 2014 – Justin Strickland
- 2013 – Elene Clemens
- 2012 – Alexis Valauri-Orton
- 2011 – Evan Eskew

**Dr. Jeremiah L. Putnam Endowed Biology Fund**
Established by former students and friends of Dr. Jeremiah L. Putnam to honor his 46 years of dedication and service to Davidson College, this fund supports students with strong academic potential and a proven interest in the biological sciences. Awarded at the discretion of the Biology Department, this funding will assist students seeking to further their education through international internships and/or research. Preference is given to students with demonstrated financial need.

**Sigma Xi's Undergraduate Research Award**
The Charlotte chapter of Sigma Xi, Scientific Research Society, honors top undergraduate research scientists from regional colleges and universities. At Davidson, biology faculty nominates individual students for this award and the entire department selects student(s) to represent the department at the Celebration of Undergraduate Research. The student researchers and their faculty mentors are honored at the Celebration. Each student receives an award certificate and the department represented by the student receives a plaque for display.

Recent Sigma Xi awardees (last 10 years):
- 2020 – Caroline Phan & Caroline Miller
- 2019 – Sebastian Flores
- 2018 – Ryan Almeida
- 2017 – Annalee Tutterow
- 2016 – Hannah Itell & Morgan Shannon
- 2015 – Hannah McMillan
- 2014 – Eric Sawyer
- 2013 – Max Kern
- 2012 – Daniel Cook
- 2011 – Pallavi Penumetcha
Davidson Biology Events & Resources

BioLunch
All biology students and faculty are invited to BioLunch, an informal event held almost every Friday at 12:30 in Commons. Look for the table with the Biology sign. The Biology Department pays for lunches of students who do not have a Commons meal plan.

Biology Newsletter
The Biology Newsletter is a weekly electronic newsletter sent to biology majors and students currently or recently enrolled in a biology course. It distributes information on events, seminars, scholarships, research opportunities, & accomplishments of Davidson biologists. To add announcements or subscribe to this newsletter please contact Gena Keeton (gekeeton@davidson.edu).

Facebook and Twitter
Keep up with Biology events by liking the Biology Department Facebook Page, (Davidson College Biology Department) Instagram, (davidsonbio), and on Twitter (@DavidsonBiology)

Biology Seminars
www.davidson.edu/academics/biology/activities-and-events/seminar-series
The Biology Department Seminar Series hosts guest speakers from universities and research institutions around the country to share their research results. Seminars are typically held in the late afternoon. Contact Dr. Wessner, the Seminar Series Coordinator, with speaker suggestions and questions.

Darwin’s Birthday Celebration
Since 2002, the Davidson Biology Department has been celebrating Darwin Day, an international event usually held on or around Darwin’s birthday, February 12th. The celebration at Davidson includes dinner, birthday cake, scientific door prizes (including a coveted Chlamy hat knit by Dr. Peroni), and a special appearance by Charles Darwin. Contact Dr. Sarafova (BioSociety & BBB advisor) for more information.

Biology Banquet
Near the end of each spring semester, senior biology majors are invited to a banquet to celebrate the year and announce the Sigma Xi and Tom Daggy award winners.

BBB Induction Ceremony
New members of Beta Beta Beta (BBB), the biology honor society, are inducted during a short ceremony. Watch for an invitation sent to all eligible declared biology majors in the spring semester. Contact Dr. Sarafova (BBB advisor) for more information.
Planning Your Future

Like it or not, the process of leaving Davidson College begins the moment you accept a place as a first year student. The purpose of a college education is to prepare you for a career, which may involve further training in graduate or professional school. As an entering first year student, some of you may have a clear plan for your future. Others may have very few plans when walking across the stage at graduation. Hopefully most of you will be exploring different career options throughout your four years at Davidson. Some will decide to attend graduate or professional school immediately after graduating; others will decide to look for employment until making a decision about graduate or professional school. Still others will move immediately into a career-track position and choose not to go onto graduate or professional school. Regardless of the path you pursue, at some point you will decide whether you want a career in a biologically related area.

How do you decide on a career as a biologist? Here is some advice from the Biology department:

• Determine what you like to do, what interests you the most, what you do well.

• Determine careers that will incorporate your interests and strengths as you define them.

• Do some research on careers that interest you:
  - Interview professionals in those fields - take them to lunch or coffee. Ask her/him how they got their current jobs? What courses or graduate programs would s/he recommend as preparation for a career in their field?
  - Gather information from various sources, surf the web, and ask everyone you know (family members, friends, the Career Services, your advisor, Davidson alumni, etc.). Learn as much as possible about the daily lives/responsibilities of individuals in various careers that interest you. Can you see yourself in that role? What additional training, if any, will you need to enter that career?
  - Get some experience: internships, summer employment, volunteering etc., in areas of your interest(s).
  - Obtain skills (writing, computer applications, and using research equipment) that are appropriate to the field you hope to pursue.

• Determine if your career interest requires graduate or professional school.
Career Ideas for Biology Majors

So you like biology and you are good at biology, but what can you do with a degree in biology?

Career choices available for an individual with training in the biological sciences are as diverse as the discipline of biology itself. A degree in biology opens a lot of doors, some of which are more obvious than others. Similarly, some of these careers are highly specialized, while others are not. Jobs for the biologist are found in the private sector, with federal agencies and with nonprofit organizations.

Helpful websites include: http://www.aibs.org/careers/
http://www.nationalacademies.org/careerguides/
http://www.si.edu/encyclopedia_si/nmnh/careers.htm
http://www.nap.edu/openbook.php?record_id=5129

Corporate positions
- Salesperson for medical, pharmaceutical or biomedical products
- Research scientist/technician
- Consultant - Environmental impact assessments, agricultural consulting in developing countries
- Occupational safety
- Hazardous waste management specialist
- Toxicologists/risk assessment specialist
- Industrial hygienist

Animal and human medicine
- Physician
- Veterinarian
- Dentist
- Nurse
- Physical therapist
- Optometrist
- Chiropractor
- Pharmacist
- Genetic counselor
- Osteopathic physician
- Food scientist/nutritionist
- Hospital administrator
- Veterinary or animal technician
- Animal psychologist

Education/Research
- College/University professor
- K-12 teacher

Federal agencies
- Soil conservationist/scientist
- Wildlife biologist
- Microbiologist
- Fishery biologist
- Environmental engineer/scientist
- Natural resource specialist
- Park Ranger
- Forester
- Outdoor recreation planner
- Hydrologist
- Ecologist
- Botanist
- Geographic information systems (GIS) specialist
- Economic botanist
- Horticulturist
- Plant pathologist

Nonprofit organizations
- Administrator
- Scientific staff
- Educational staff
- Public relations
- Fund-raiser
- Environmental Law
- Journalist/writer
- Animal breeder
- Biostatistician
- Medical/scientific illustrator
- Entrepreneur/ecopreneur
- Ecotourism specialist

Other
- Environmental Law
- Journalist/writer
- Animal breeder
- Biostatistician
- Medical/scientific illustrator
- Entrepreneur/ecopreneur
- Ecotourism specialist
Finding a Job

One option for your life immediately after Davidson is to find employment. Some biology graduates may work for a year or several years before attending a graduate school or professional school. Others may immediately move into career-track employment and forego further schooling.

So how do you find a job that will reassure your parents that you won’t be depending on them forever and that your Davidson tuition was well spent?

1. Think about your career goals (see above) and approach your job search with those goals in mind.
2. Talk with biology faculty and any other individuals who may have information on jobs that fit your interests. Hone your networking skills early!!
3. You may want to target a geographical area or look for job opportunities at a graduate of professional school that you may be applying to at a later date.
4. Visit the Center for Career Development and listen to their voice mail messages (REALLY!). The biology department will also send occasional voice mail messages to seniors regarding job opportunities.
5. Identify Davidson alums working in an area you want to pursue. Ask them for aid in finding a position or contacts they may have that would be useful to you.
6. Develop your resume (see Center for Career Development for workshops, etc.) and send it to potential employers.
7. Sharpen your interviewing skills. Again, ask the Center for Career Development for help in this area or ask some biology faculty members if they would be willing to give you a practice interview.

Center for Career Development at Davidson
"The Center for Career Development at Davidson provides students with the means to explore career interests and prepare for life after Davidson." This includes graduate school, career-related employment, etc. The Center for Career Development is located in the College Union and has a good deal of information on biology-related internships, job opportunities and graduate schools. It will benefit students majoring in biology or considering a biology major to visit this office. The initial visit will give you an overview of the resources available in this office. When you are seeking internships, jobs, etc., you will know what information is available and how to obtain that information. The list below highlights some of the services provided by the Center for Career Development:

- Career counseling
- Internship and summer job information
- Alumni contacts for internships and jobs
- Career resources library
- Graduate school information and guidance
- Testing - GRE preparation, GRE testing information
- Seminars and workshops: Resume writing, interviewing techniques, job-hunting tips, exploring graduate and professional schools and fellowships, etc.
- Mock interviews
- Campus corporate recruiting
Support for Post-Bac Study Abroad

Watson Fellowship
http://watson.foundation/fellowships/tj
Focused year of travel and learning on a topic of the student’s choosing. Students may NOT go to a country they have visited before, nor to a country on the State Department’s travel advisory list. Fellows are NOT allowed to enroll or attend a school. The Fellowship experience is intended to provide Fellows an opportunity to immerse themselves in cultures other than their own for an entire year. Citizenship and GPA are not crucial for winning a Fellowship. See Dean of Students Office. Campus nominations are made in the Fall Semester with written proposal due about October 1. First on-campus interview about mid-October. Only eligible as a senior.

Fulbright Grants
http://www.cies.org/
Allows students to do research or advanced study for one year in a foreign country. Students can also teach English through the Fulbright, but host country language proficiency required. No age limit.

Rhodes Scholarship
http://www.rhodesscholar.org/
Awarded for two or three years of study at Oxford University. Highly competitive but worth considering if GPA ≥3.8.

Luce Foundation Fellowships
http://www.hluce.org/lsprogram.aspx
Provides one year of living and working in an Asian culture. Biological work/study opportunities available. Cannot have prior Asia experience. This program is highly competitive program but worth considering if GPA ≥3.7.

Marshall Scholars Program
http://www.marshallscholarship.org/
Marshall Scholarships finance young Americans of high ability to study for a degree in the United Kingdom. This highly competitive program is worth considering for students with GPAs ≥3.8.

Davidson’s Graduate Fellowships Committee & Office
www.davidson.edu/offices/fellowships-office/fellowships-committee
The Graduate Fellowships Committee is a standing appointive committee of the College. Its members advise students on their fellowship and scholarship applications, help students plan their studies after Davidson, administer nominations for some graduate fellowships and scholarship competitions, hold mock interviews, read and respond to draft application essays and generally lend a hand during the often trying and always challenging application process for items like Rhodes Scholarships, Marshall Scholarships, Mellon Fellowships, National Science Foundation Grants, Fulbright Grants, Luce Scholarships, Goldwater Scholarships, Mitchell Fellowships, and the Davidson College Smith Scholarship, among others. The committee seeks to identify early in their Davidson careers, students who are likely candidates for graduate fellowships and scholarships and holds occasional information sessions for these students. The VPAA’s office and Graduate Fellowships Committee members offer some specific information on several Graduate Fellowships and Scholarships of interest to Davidson students (e.g. Marshall, Rhodes, Gates Trust, Luce, Watson, Smith). This list includes some pre-graduate fellowships (e.g. Goldwater, Beinecke, Truman). There is no age limit for this committee to help Davidson alumni. See https://www.davidson.edu/after-davidson/fellowships for more information.
Graduate & Professional Schools

Biology Majors post-graduation:

BIOLOGY MAJOR ALUMS IN THE CLASSES 1984-2014 (data compiled in 2014)

<table>
<thead>
<tr>
<th>School Type</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Medical school</td>
<td>32.9%</td>
</tr>
<tr>
<td>Graduate school</td>
<td>31.1%</td>
</tr>
<tr>
<td>Veterinary school</td>
<td>3.1%</td>
</tr>
<tr>
<td>Dental school</td>
<td>2.2%</td>
</tr>
<tr>
<td>Law school</td>
<td>2.4%</td>
</tr>
<tr>
<td>Nursing</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

Some of the Many Graduate Schools Attended by Biology Major Alumni:
Appalachian State University, Auburn University, Baylor University, Boston University, Cambridge University Columbia University, Duke University, East Carolina University, Emory University, Georgia State University, Harvard University, Howard University, Johns Hopkins University, Medical University of South Carolina, NC State University, Northwestern University, Oregon State University, Princeton University, Purdue University, Scripps Institute, Stanford University, SUNY Albany, Syracuse University, Texas Tech University, Tufts University, Thomas Jefferson University, Tufts University, University of Arizona, University of California at Berkeley, University of California Davis, University of California San Diego, University of Colorado, University of Florida, University of Georgia, University of Guelph, University of Kansas, University of Kentucky, University of Maryland, University of Miami, University of Michigan, University of Notre Dame, UNC - Chapel Hill, UNC - Wilmington, University of Rhode Island, University of Rochester, University of South Carolina, University of South Florida, University of Salamanca (Spain), South Carolina, University of South Florida, University of Salamanca (Spain), University of Kansas, University of Kentucky, University of Pennsylvania University of Tennessee, University of Washington, Western Reserve University, University of Wisconsin, Wright State University

Some of the Many Professional Schools Attended by Biology Major Alumni:
Albany Medical College, Auburn University, Baylor University, Boston University, Bowman Gray School of Medicine, Columbia University, Drexel University, Duke University, East Carolina University, East Carolina University, East Tennessee State, Eastern Virginia University, Emory, Johns Hopkins University, Louisiana State University, Medical College of Georgia, Medical College of Virginia, Medical University of South Carolina, Meharry Medical College, Milwaukee College, New Jersey Medical School, NC State, Northwestern University, Ohio State University, St. Louis University, Southwestern University, St. Louis University, SUNY - Buffalo, Tulane University, University of Alabama, University of Arkansas, University of Colorado, University of Chicago – Pritzker School of Medicine, University of Connecticut, University of Florida, University of Georgia, University of Illinois, University of Iowa, University of Kentucky, University of Louisville, University of Maryland, University of Michigan, University of Minnesota, University of New Mexico, University of North Carolina at Chapel Hill, University of Oklahoma, University of Pennsylvania, University of Pittsburgh, University of South Florida, University of Tennessee, University of Texas, University of Virginia, University of West Virginia, Vanderbilt University, Virginia Commonwealth University, Wake Forest University, Washington University.

Applying to Professional Schools – Resources at Davidson
Dr. Naila Mamoon, Premedical and Preveterinary Advisor

Medical school and allied health
https://www.davidson.edu/academic-departments/premedicine-and-allied-health-professions

Veterinary medicine
https://www.davidson.edu/academic-departments/preveterinary-medicine

Law school
https://www.davidson.edu/academic-departments/prelaw
Applying to Graduate School

Most graduate programs in biology are designed to produce research scientists. The number of PhDs produced by graduate schools in recent years exceeds the number of available research positions. Consequently, there are a large number of underemployed PhDs. The decision to go to graduate school, therefore, is one that should be made only after a great deal of personal introspection and exploration of fields of study. Prior to deciding to attend graduate school, you should:

- Evaluate your strengths and weaknesses (academic and personal). Strong motivation and persistence are very important. Intelligence, initiative, self-motivation, and self-discipline are attributes that are critical to a successful graduate school experience.
- Determine what you enjoy doing and why you enjoy it. Do you like paying attention to detail? Do you like exploring new ideas? Are you curious? What disciplines of biology did you enjoy studying the most in college? Do you like to interact with others to try to solve a problem?
- Evaluate your career objectives. Do you want to be a research scientist in industry? Do you have some idea of what life in this position would be like? How can you find out? Do you want to teach at a college or university? What are the differences between a position at a college and at a university? Do you think you’d like teaching? Do you want a career associated with making policy decisions for a federal agency? A conservation organization? What have you experienced that will help make this decision? What do you still need to experience to help you make this decision?
- Determine if a master’s degree or a Ph.D. is necessary for your career objectives. A Ph.D. requires a longer time commitment initially, and frequently leads to teaching and/or research career. A Master’s degree allows exploration of research interests with less time commitment than a Ph.D. While pursuing a Master’s, you may decide that you like the field and want to continue. You may also decide to try another avenue of research or terminate your schooling at the Master’s level.
- If you do not want to proceed directly from your undergraduate studies to graduate school, consider working in a biology-related field to gain experience that will help you ‘trial run’ career options. Note: It is advisable to take the GREs during your senior year or shortly after graduation if you think you may apply to graduate school at some time in the future.

When you have made your decision to apply to graduate school, you need to decide to which schools and programs you will apply. How do you choose graduate schools?

- Talk to professors in the department, particularly individuals teaching in areas that interest you. Ask these professors about their graduate school and others they would recommend in their field.
- The library and web have sources that rank graduate programs in different disciplines.
- Read the primary literature in the discipline of your interest. Find papers that interest you the most. The principal investigators for those papers may be individuals you want to contact regarding their graduate programs. See which institutions are represented most often in the papers.
- Contact professors with whom you would like to work. Explain your interest in their research program. Offer to volunteer or become an intern in their laboratory.
- Attend biology department seminars and talk to the individuals presenting the seminar about their graduate school. Volunteer to be in the student group that takes this individual out to lunch.
- Surf the web. Many graduate schools have detailed information on their programs and faculty members have pages explaining their research interests.
- Visit potential grad schools, talk with grad students, and talk with possible thesis advisors.

When you have narrowed your list of potential graduate schools and determined the application procedures for each department and school, you should write to potential faculty advisors. In each email:

- express your interest in pursuing graduate work with him/her;
- explain how you developed your interest in this area, including brief descriptions of your undergraduate research;
- describe your current research interests as it pertains to obtaining a graduate degree;
- discuss your overall career goals (research and teaching at a university, working for industry, etc.);
- ask whether he/she would consider serving as your major professor.
• Include a curriculum vitae (C.V.; the academic version of a resume) with your letter. This should include your educational background, publications or presentations at conferences, research projects, and academic awards. Ask a Biology faculty member to review the letter and C.V.

Graduate Record Examination (GRE) info:
Most graduate school programs require you to take the GRE general exam and a subject exam (e.g. biology). In highly competitive graduate programs, the GRE scores may be used to limit the number of candidates in the pool during the first phase of applicant screening. For better or worse, these scores are an easy, objective means of culling applicants. Hence, doing well on these exams is crucial for entrance to most graduate schools. Excellent grades and/or an outstanding research project may counteract modest GRE scores, but you will have to be much more aggressive in proving your worth to the graduate program if the GRE scores are not competitive with other applicants. Consider taking the general exam during the spring of your junior year and the subject exam no later than December of your senior year. You can retake either portion of the exam.

• Information and registration are available via Davidson’s Career Services Office.
• In preparing for the GRE, take practice exams available from the testing service. The bookstore sells GRE preparation manuals. In addition, Kaplan offers GRE preparation courses. Another useful tool for studying for the subject exam is your introductory biology text.

The graduate school application process:
• Most graduate school application deadlines fall in December or early January. Begin work on your applications no later than early November.
• Your application should be tailored to the specific program to which you are applying. Your statement of purpose should be clearly written and as specific as possible. Address your academic strengths and personal qualities. Remember that you are "selling" yourself and need to give the reviewers reasons to select you above other highly qualified candidates. You should generally discuss all research experiences you have had, including independent research, group investigations, summer research, etc. Detailed descriptions of research related to your proposed field of study will be most useful to the individual professors in the department to which you apply.
• An official transcript will be required for each program to which you apply. In addition, if you decide to apply to schools not listed by you when you took the exam, you need to arrange with the Educational Testing Service to send your scores to these additional schools.
• Letters of recommendation from Davidson faculty and others will be critical to your application. Choose your references wisely. Don’t be afraid to ask if the referee can write you a strong letter of recommendation. Ask for letters of reference at least one month prior to the application deadline.
• How many schools should you apply? A general rule is to apply to two or three programs that match your area of interest. Aim for the schools rated best for your area of interest, but also apply to 1-3 schools not rated as highly, in the event you are not accepted into your top choice schools.
• If your application receives a favorable review, you may be invited to visit the university. The graduate program will usually provide your plane fare and accommodations during the visit. If you will be given an interview during your visit, prepare before you leave Davidson by doing mock interviews with biology faculty or through Career Services. Give well-thought, sincere reasons for wanting to attend that graduate school. Be enthusiastic! You should also take advantage of this opportunity to do your own "interviewing" of administrators, faculty and students in the program.

Questions for the director of graduate studies/chair of the department:
What are course requirements? How are graduate students funded? How long does it take for most students to complete their degree? How many years of funding are guaranteed to students who make suitable progress? What are the responsibilities and time commitment associated with teaching assistantships? How much turnover is there within the faculty?

Questions for your potential major professor(s):
What are potential research projects for your thesis? What are other students in the lab doing? What type of positions do former graduate students now hold? How are current students funded? How long does it take for students to complete their degrees? How does s/he feel about alternative careers (e.g. teaching rather than research)?

Questions for graduate students:
Ask the above questions and: Are you happy working and living here? How much time does your
major professor spend with you? What are his/her expectations of you as a graduate student? How do you feel about your interactions with faculty, postdocs, and grad students? How is your research progressing? Are you satisfied? What opportunities do you have as a graduate student (attending scientific meetings, etc.)? What is the working environment? Do you have the financial and instrumental support that you need for your work?

Questions for other faculty in the program:
Ask same questions that you asked of the director of the program and potential major professors. Other questions you might pose: Is there cooperation among faculty members and graduate students within the program? Are you available to help graduate students working with other faculty members?

- You are trying to determine if you will have a rewarding experience as a graduate student in that program. Look for enthusiastic responses and for indications of mutual respect and cooperation.

Accepting a graduate school offer
- If you are fortunate enough to be admitted to more than one program, you will have to decide which one you will attend. This will be a very critical decision and should be approached with considerable thought. You should be comfortable with the individuals with whom you will be working, particularly your major professor. You should have financial support that allows you to pursue your research without needing to resort to part-time or summer jobs. You will want a challenging program and you will want to be surrounded by enthusiastic and highly motivated individuals.
- If you are only admitted to one program, decide if that program will meet your needs. If you are not convinced, don't accept the offer. You can spend a year or two gaining work experience and then apply to schools you think will be more appropriate for your interests. Another option to consider is to enroll in a Master's degree program before applying as a Ph.D. candidate at the schools of your choice. The job market for Ph.D.'s in science is tight, so you will want to pursue your studies at one of the best possible schools. Look for programs that will expose you to the leaders in your chosen field.

Financing Graduate School:
Generally speaking, graduate students in the sciences are supported by the institution via teaching or research assistantships. These positions pay for tuition, as well as provide a salary. In addition to institutional support, graduate fellowships are available from a number of agencies and foundations. Information on many fellowship opportunities is available in the Career Services Center. Some of these are very prestigious and biology students who are planning to attend graduate school should apply. There are also grad school fellowships specific to an institution.
- National Science Foundation (NSF) Graduate Research Fellowships (www.nsf.gov)
- National Consortium for Graduate Degrees for Minorities in Engineering & Science (GEM) www.gemfellowship.org
- UNCF/Merck Graduate Science Research Dissertation Fellowships (http://umsi.uncf.org/sif)
Plagiarism is representing another’s ideas or words as one’s own. Plagiarism, as a form of cheating, is a violation of Davidson’s Honor Code.

The statements above may seem straightforward, but plagiarism can take many forms, some of which constitute a gray area in people’s understanding of the issue. Furthermore, there are variations among different academic fields concerning citation styles and expectations. The purpose of this document is to clarify **WHEN** and **HOW** to cite your sources when writing for a biology class. Note that **self-plagiarism**, or the use of your own previous work in another class, is also an Honor Code violation unless re-use of your work is expressly allowed by the professor. Your biology professors expect original work to be submitted in their classes.

**WHEN to cite your sources** *(Click [here](http://bio.davidson.edu/dept/plagiarism.html) for HOW.)*

**Direct quotations**

Let’s start with the obvious. If you repeat someone else’s words verbatim, you must enclose those words in quotation marks and provide a citation. For the citation to be complete, there MUST be a properly formatted in-text citation at the end of the sentence and a corresponding entry in your list of references (see below on how to cite sources). It is not sufficient simply to name the source within the sentence. Omitting quotation marks and/or a complete citation is a citation error and a corresponding entry in your list of references (see below on how to cite sources). It is not sufficient simply to name the source within the sentence. Omitting quotation marks and/or a complete citation is considered plagiarism. Keep in mind that direct quotations are not commonly used in scientific writings such as lab reports or grant proposals but can be appropriate in biology essays and term papers. Make sure that direct quotations flow smoothly within your own thought progression in the assignment; your task is to **synthesize** the relevant literature, not copy and paste direct quotes from each source or provide a summary sentence for each.

**Paraphrasing**

Paraphrasing is restating someone else’s ideas while not copying verbatim. There are acceptable and unacceptable ways to paraphrase, and it is crucial that you understand the difference. **Unacceptable** paraphrasing includes any of the following: 1) using phrases from the original source without enclosing them in quotation marks; 2) emulating sentence structure even when using different wording; 3) emulating paragraph organization even when using different wording or sentence structure. See examples below. Unacceptable paraphrasing—even with correct citation—is considered plagiarism. When you do paraphrase in an acceptable manner, a proper citation is always required. Omitting a citation is considered plagiarism.

<table>
<thead>
<tr>
<th>Original text</th>
<th>Unacceptable paraphrasing: copying phrases without using quotation marks</th>
<th>Unacceptable paraphrasing: emulating sentence structure (here, paragraph structure is also emulated)</th>
<th>Unacceptable paraphrasing: emulating paragraph structure (even though sentence structure is original)</th>
<th>Acceptable paraphrasing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few laboratory creatures have had such a spectacularly successful and productive history as Drosophila. It first entered laboratories about 1900, revealed its talent for experimental genetics to Thomas Hunt Morgan and his students at Columbia University in the early 1910s, and after some ups and downs in status is still going strong almost a century later. <em>(from Kohler, R.E. 1994. The Lords of the Fly. The University of Chicago Press, 321 pages.)</em></td>
<td>Despite some ups and downs in status, nearly a century after the fly revealed its talent to Thomas Hunt Morgan and his students, Drosophila genetics research continues its spectacularly successful history <em>(Kohler, 1994).</em> <em>(Can you spot the copied phrases? The author of the paraphrasing could avoid trouble by using quotation marks, though it would be much better to write in more original language.)</em></td>
<td>No model organism has been so amazingly useful and effective as the fruit fly. The fly came on the scene as an experimental tool at the beginning of the 20th century, was adopted by Thomas Hunt Morgan and his Columbia pupils at Columbia University around 1910, and (despite some fluctuations in attention paid to it) is still a widely used experimental system <em>(Kohler 1994).</em> <em>(Within each sentence, can you trace the structural similarities?)</em></td>
<td>Drosophila is model organism with a rich and useful legacy. Upon arriving on the scene at the turn of the century, the fruit fly soon became the organism of choice for Thomas Hunt Morgan and his Columbia University pupils. Despite fluctuations in status, fly research is still central to the progress of genetics <em>(Kohler, 1994).</em> <em>(Trace how the ideas flow in a manner identical to the original.)</em></td>
<td>Thomas Hunt Morgan and colleagues at Columbia University were among the first to use the fruit fly Drosophila as a model organism, adopting it as an experimental system around 1910. Since then, the popularity of the fly has waxed and waned somewhat, but the breadth and depth of current research indicates that Drosophila continues its legacy as an incredibly important research tool <em>(Kohler, 1994).</em></td>
</tr>
</tbody>
</table>
Describing scientific findings that are not your own

In many forms of scientific writing, you are expected to compile and summarize experimental results from other researchers. Using in-text citations, you must give credit for every mentioned scientific fact that you did not discover yourself, with the exception of facts that are common knowledge, such as "all cells come from pre-existing cells." (If you are not sure what is common knowledge, play it safe and provide a citation; however, if a fact is treated as common knowledge in your source, then you can generally do the same.) Technically, you should provide a citation for each distinct idea, and that sometimes means including one citation in the middle of a sentence and then another citation at the end. However, if a series of sentences clearly go together, with all of them describing findings from a single source, it is acceptable to cite the source only once (instead of after every sentence).

Proposing an idea that is not your own

If you propose a bit of analysis or interpretation that originated in someone else's brain, you must provide a citation.

Using images from the WWW or print sources

In your papers and web page assignments, the use of an image (whether photocopied, scanned, or downloaded) that you did not create is the equivalent of a direct quotation. You must include both an in-text citation next to the image and a corresponding entry in your list of references. If you are designing a web page that will be available publically, you must seek permission to use any borrowed images.

HOW to cite your sources (Click here for WHEN.)

Biologists expect in-text citations and then a list of references at the end of the work. There are two main approaches: AUTHOR-DATE and NUMERICAL. The author-date method is most common. Here is a quick overview of these two formats.

<table>
<thead>
<tr>
<th>General approach</th>
<th>AUTHOR-DATE</th>
<th>NUMERICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples of in-text citations</td>
<td>Sometimes, depending on the particular mutation, the same gene can be involved in dominant or recessive deafness (Kelsell et al., 1997). Several genes involved in syndromic and nonsyndromic deafness have already been identified and are reviewed in Kalatzis and Petit (1998). (adapted from Kubisch et al., Cell 96: 437-446)</td>
<td>Kuru was the first human prion disease shown to be transmissible, by inoculation of chimpanzees with autopsy-derived brain tissue (1). It is hypothesized that kuru originated from consumption of an individual with sporadic CJD (2), a disease with a remarkably uniform worldwide incidence of around 1 per million and a lifetime risk of around 1 in 50,000. (adapted from Mead et al., Science 300: 640-643)</td>
</tr>
</tbody>
</table>

Rules and variations for in-text citations:

A. For the author-date type of in-text citation, if the source has two authors, list both last names, as in (Roberts and Gonzalez, 1998); if the source has three or more authors, use the format with et al. as in (Jackson et al., 1998). The abbreviation et al. should be italicized, with a period after the al.
B. If you have already mentioned the authors' names in the sentence, your in-text citation can consist of just a date: Jones and Smith (1992) demonstrated that the D1S80 marker is not linked to chocolophilia.

C. The in-text citation can be placed in the middle of a sentence to indicate that only part of the information in the sentence is taken from the source. Example: The cho gene product metabolizes aromatic amino acids (Tobler et al., 1994) and physically associates with the van gene product (Breyer et al., 1997).

D. If you cite multiple papers for a single idea, include all in-text citations within one set of parentheses and separate each citation with semi-colon, as in (Tong et al., 1997; Gallagher et al., 1998).

E. Do not indicate the source page number in your in-text citation.

F. If you cite a source, you are implying that the idea in question originated in that source. If your source actually cites someone else for the same idea, you should track down and cite the original. Only sources that you have examined directly should be included in your reference list. If it is not possible to obtain the original source, you can do the following: (Robertson et al., 1992, as cited in Burgess and Leonard, 2001). Sometimes it is useful to cite a review paper, if there is an appropriate one available—then you don’t need to cite as many individual sources. Your in-text citation would read something like (reviewed in Smith and Jones, 2001). If you don’t know how to distinguish a review paper from an original research paper, ask your instructor. A good indicator of an original research paper is a section (often called Materials and Methods, or just Methods) describing specific experimental techniques. Some journals, however, include descriptions of methods in odd places (e.g. embedded in the references, as in Science), so the absence of a Methods section per se is not a sure sign that the paper you’re looking at is a review paper.

G. If you use the numerical approach, the numbers themselves can be enclosed in either parentheses or brackets, or they can be superscripted. Just be consistent throughout the paper.

Rules and variations for reference lists:
A. Citing journal articles:
Biologists (unlike members of some other fields) have not agreed on a standard way for formatting references. For a given assignment, check the course syllabus and other handouts for guidance on what reference format to use. If you do not find specific instructions, you will be safe if you follow the following common format (which is also illustrated in the examples in the table above):
Primary Author's Last Name, Initials, Other Author's Initials, Last Name. Year. Title of article (only capitalize first word). Journal and volume number: page numbers.

In different journals you will see that each publisher seems to have a different style for formatting entries in reference lists. Aspects that vary among different journals include:
--whether initials come before or after an author's last name
--whether the date comes before or after the paper title
--whether the title is included (journals like Science and Nature leave it out as a space-saving device)
--whether the date is enclosed in parentheses
--whether the journal name is italicized
--whether the volume number is italicized or in bold face
--whether there is a colon or comma after the journal volume number
--whether the issue number (in addition to the volume number) is included
--whether the whole page range or just the first page number is listed
--whether different components (e.g. authors, title, journal, etc.) are in boldface.
Whatever format you are expected to use, you should be completely consistent in how you format your list of references.
B. Citing books:
Use the following format to cite a whole book:
Author Last Name, Initials. Date. Title. Publisher, number of pages.
Use this format for citing book chapters:
Author Last Name, Initials. Date. Title of chapter. In: Title of book (editors). Publisher, number of pages.

C. Citing web sites:
If you obtain from the WWW a journal article originally published in a print journal, cite the article exactly as you would for a print source.
If you obtain a peer-reviewed article from one of the growing number of online-only journals, cite the article as for a print source, but also append <URL>. Accession Date.
Most other web sites are not peer-reviewed, and so their reliability is highly variable. It is rare to use such non-peer-reviewed web sites as sources for scientific writing. For any given assignment, check your course syllabus or assignment handout to see if you are permitted to use such sources. If so, then it is still up to you to evaluate the reliability of a web site; consider the credentials of the author, the purpose of the web page, and the date of the last revision, among other things. For more guidance on evaluating web pages, see the Evaluating Web Sites Tutorial from the Ohio State Libraries.

To cite a web site, use the following reference format:
Author Last Name, Initials. Date page created or revised. Title of page. Title of larger work if applicable. <URL>. Accession date.

See links at bottom right for more information and examples for citing different types of sources in biology assignments.

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<th>Davidson sites on plagiarism:</th>
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<td>Dr. Epes’s address to the incoming class, 2002</td>
</tr>
<tr>
<td>Department of History statement on Plagiarism</td>
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<tr>
<td>Plagiarism views from elsewhere:</td>
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<tr>
<td>Indiana University</td>
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<td>Georgetown University</td>
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<td>UC Davis</td>
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<td>Northwestern University</td>
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<td>Princeton University</td>
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<td>Dartmouth University</td>
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<td>Purdue University</td>
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<th>Other sites on citing sources for a biology assignment:</th>
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<tbody>
<tr>
<td>Lewis and Clark Biology Dept Writing Guidelines</td>
</tr>
<tr>
<td>Earlham College Biology Dept How to Cite Sources ONLINE! Instructi</td>
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</tbody>
</table>
Safety

https://www.davidson.edu/academic-departments/biology/facilities/lab-safety

All students enrolled in biology courses at Davidson College are trained in laboratory safety. The course instructor will conduct this training during the first laboratory meeting. Students must sign a form after this training indicating they have completed the exercise.

All laboratories are equipped with eyewashes and showers. Consult the Davidson College Chemical Hygiene Plan in the lab spaces (or on Public/Physical Plant/Safety/Policy Documents/Chemical Hygiene Plan) for information on chemical and emergency procedures. A departmental policy on the use of human body fluids is in effect for all teaching laboratories and research protocols.

SMOKING IS NOT PERMITTED IN WALL, their balconies or patios, or within 20 feet of a window or door. **Sanctions:** All students, faculty and staff are expected to adhere to this policy. Students violating this policy will incur a $25 fine for the first offense and possible Code of Responsibility charges and/or eviction from the residence halls for repeated offenses. Laboratories and other facilities in Wall are closed to students between 12:00 midnight and 6:00 am. At least one other person must accompany students working in the building from 6:00 pm to 12:00 midnight or on weekend days.
Our ability to train students to become successful in the life science fields frequently depends on providing learning experiences involving the use of live animals. Although we attempt to minimize the use of live animals for teaching purposes whenever possible, certain instructional benefits can only be achieved through their use. These benefits include learning skills necessary for handling and working with animals as well as developing and conducting meaningful research projects that contribute to scientific knowledge.

We know that with the decision to use live animals for teaching purposes comes a responsibility to humanely care for them and minimize pain and discomfort whenever possible. Finally, whenever possible and appropriate, we design experiments which use animals of “lower” phylogenetic positions (e.g., invertebrates).

Animal-based research projects require clearly stated educational goals. These projects must be relevant to the course, should be taught by a competent individual who will supervise all activities and follow all government guidelines for the use of animals in research. In addition, all courses offering animals based-projects shall notify the students of all class activities at the beginning of the course, allowing students to have the option to participate in those activities.

The Institutional Animal Care and Use Committee (IACUC) must approve all use of living vertebrates at Davidson College. This includes animal use in research, in classroom laboratories, and in the field. All faculty, staff and students responsible for the care of vertebrate animals must attend the training program on animal care and use. The training program is organized and taught by Johanna Ziegler, Animal Care Coordinator.

For information on government regulations, institutional policies and how to submit an animal use request, relevant information can be found at www.davidson.edu/offices/animal-care-and-use or contact Johanna Ziegler, Animal Care Coordinator.
Field Work

Students participating in field trips or on independent or group field projects are trained in general field safety and are given specific safety information for the environment in which they are working. Mobile phones are available to take in the field for use in emergency situations.

**Release forms:** Waivers and release forms are important in documenting that students are aware of the risks and consequences of their research. All students doing field work in classes or in conjunction with a research project need to read and sign a release form.

**Vehicles:** The use of seat belts and other safe driving practices is mandatory. For field trips associated with departmental courses (other than independent research or group investigations), college-owned vehicles are used to transport students.

Students participating in independent research requiring travel to a field site are usually required to use their personal vehicles, unless using the department field truck. *Students are NOT covered by Davidson College insurance while they are in their own or each others’ cars,* even if they are “on College business.” If the parents own a student’s vehicle, they are required to sign a release form as well. In order to be allowed to drive Biology’s field truck students are required to pass a safety record check, attend vehicle training with Davidson College Public Safety, receive approval and permission by faculty mentor, and follow all Field Vehicle Guidelines for Use. *Students are not covered by Davidson College for any accident that occurs while they are in a vehicle other than a college-owned vehicle, even if they are on College business.* Students will be asked to sign a form confirming that the insurance policy holder(s) and owner(s) of the vehicle which they will be driving have been informed of these facts.

**Buddy System:** Whenever possible, have students work with another student in the field. This is especially important when students are working at remote sites without much foot traffic. A faculty member, research tech, or student researcher should always accompany students.

**Cell Phones:** Every student or group of students working in the field should have a cell phone with them at all times.

**First Aid Kits:** Every field group must have a first aid kit in their vehicle at all times.

**Duty Rosters:** If at all possible, students’ daily schedules should be posted on a duty roster for the mentor and other students to see. This is especially critical if students will be working alone. If schedules vary unpredictably, students should leave a voice mail message with the mentor of work localities and changes of plan.

**Miscellaneous Risk Concerns:** If any students are known to be allergic to bee stings, they should keep their epi kit (available by prescription only) with them at all times. A Lyme disease vaccine is now available (though it is only 80% effective) for interested students and faculty. Student researchers, especially females, should always be aware of their surroundings (listening to music on iPods, mp3 players, etc. is forbidden during field work). If anything or anyone looks suspicious, the student should leave. Common sense is an important risk management tool.

**Landowner Relations:** Fieldwork on private property requires permission from landowners (or company representatives) before taking classes or conducting research at those sites.
**Equipment Policies**

All equipment purchased with biology departmental funds (regular budget or grants to the department...including HHMI, NSF, etc.) is available for use by any departmental faculty member.

Departmental faculty and staff are responsible for the maintenance and use of departmental equipment. The instrumentation specialist will make most of the arrangements for routine maintenance or special service for the departmental equipment.

An inventory of all departmental equipment that was purchased for ~$500 or more will be conducted yearly.

The IT department will maintain and inventory computer equipment in all laboratories.

Individuals who have primary responsibility for equipment are to coordinate the use of that equipment and ensure the equipment is working properly. Primary responsibility for equipment will be delegated as follows:

- Research labs: Equipment primarily used by one faculty member and located in his/her research lab will be that faculty member’s responsibility.

- Teaching labs: Faculty who teach in each lab and the Laboratory Managers will be responsible for the equipment in these labs. Any faculty member who needs to remove a piece of equipment from any lab, for use in another location, must return the equipment after use to its original location. The equipment must be clean and in working order when returned.

- Prep rooms and special equipment rooms: Common equipment in these areas will be the responsibility of the instrumentation specialist, staff, and faculty members who use the equipment on a regular basis. Faculty members are responsible for insuring that the equipment is clean and in working order after each use. If a problem arises, the faculty member must immediately inform the instrumentation specialist and other faculty members who often use that equipment. If “common” equipment is taken from its original location for use at any time, the faculty member taking the equipment must sign the equipment out and indicate the date the equipment is taken, where he/she is taking the equipment, and when he/she expects to return the equipment to its original location. When returned, the equipment must be clean and in working order.

All departmental equipment is available for use by biology students under the direct supervision of a departmental faculty member. The supervising faculty member is responsible for:

- insuring that the student knows how to use the equipment
- cleaning and returning equipment (in good working order) to its appropriate location after use.

The use of departmental equipment for teaching will have priority over the use of that equipment for faculty or student research.
Biology Equipment

Centrifuges – Ultracentrifuge, standard centrifuges, refrigerated centrifuge, microcentrifuges, etc.

Ultralow freezers and many standard refrigerators

Incubators (varied and numerous) and growth chambers

Incubator shakers, shaking waterbaths, refrigerated waterbaths, microprocessor shakers, etc.

Metler microbalance and many other balances

Spectrophotometers (varied and numerous)

Autoclave units

Column chromatography refrigerator units

Vibratome sectioning system

Protein and nucleic acid electrophoresis equipment

Microplate readers

DNA microarray reader system

DNA microarray printing robot

DNA and RNA hybridization systems

Immunoblot apparati

Gel and blot imaging system

Quantitative RT-PCR equipment

Field Vehicles

PCR equipment

Optical Tweezers

Cell Culture incubators and laminar flow hoods

Computational genomics lab with stereographic viewing (3-D) capabilities

Laser-scanning confocal microscope

Epifluorescence microscopes with an image analysis system

Inverted and phase contrast microscopes

Matic Dual Head Stereoscopes with fiberoptic illuminators and digital cameras

Picospritzer, micromanipulators and pipette puller

Microinjection setup for constructing transgenic flies

CCD cameras with microscopes

Ecological sampling equipment

Global positioning system

Geographical information systems

Telemetry equipment

Digital camcorders and cameras

Other standard camera equipment

Glass washers and RO units
Math & Science Center

The Math & Science Center (MSC) is an academic support resource located in the Center for Teaching & Learning (CTL) on the first floor of the College Library. The MSC offers free assistance to students in all areas of math and science, with a focus on the introductory courses.

Trained and highly qualified peers hold one-on-one and small-group tutoring sessions on a drop-in basis or by appointment, as well as timely recap sessions ahead of scheduled reviews. Assistance is also offered for lab reports, presentations, research, and other math and science projects, in concert with the Speaking Center, Writing Center, and College Library. Emphasis is placed on thinking critically, understanding concepts, making connections, and communicating effectively, not just getting correct answers.

In addition, students can start or join a study group and use the MSC as a group or individual study space. Computers loaded with course-specific software and other instructional tools are available for student use.

Drop-in hours are Sunday through Thursday, 8-11 PM, and Sunday, Tuesday, Thursday, 4-6 PM, starting in week two of each semester. Appointments are available at other times. For more information, visit, http://sites.davidson.edu/ctl/students/tutoring/math-science-economics-center/ or contact Dr. Mark Barsoum (mabarsoum@davidson.edu or ext. 2796).
External Grants in Biology

Davidson College Biology faculty members have been very successful obtaining research and education grants from public and private agencies. Most research grants are designed so that undergraduate students can participate in the research questions as collaborators. Since 2000 Biology faculty members have been principal investigators (PIs) on grants that have totaled more than $29,000,000. Specific external grants over the past 10 years to Davidson Biology faculty members include:

**2019 Two awards to two faculty members totaling $353,327**
- 2019 $7,050 Research Experience for Undergraduates (REU) Supplement for NSF CAREER grant – Smith

**2018 Two awards to two faculty members totaling $1,064,030**
- 2018 $1,050,000 (HHMI): FIRST: Fostering Inclusivity and Respect in Science Together – Lom
- 2018 $14,030 Supplement to (NSF) Programmed Evolution for Metabolic Engineering – Campbell & Heyer

**2017 Two awards to two faculty members totaling $790,248**
- 2017 $3,030 (Promega) Training Support Program Grant Biototoxicity course support – Bernd

**2016 Five awards to three faculty members totaling $1,143,280**
- 2016 $616,012 (NSF) Programmed Evolution for Metabolic Engineering – Campbell & Heyer
- 2016 $447,000 (NIH) Waterpipe configuration and alveolar cell health – Bernd & Hauser
- 2016 $5,000 (CADISIL) Summer Research Fellowship – El Bejjani
- 2016 $4,500 (ASCB) Promoting Active Learning & Mentoring (PALM) Network – Bernd
- 2016 $70,768 Institutional Development Grant, NC Biotechnology Center. Isothermal Titration Calorimetry for Davidson College Biology and Chemistry – Myers, Snyder & Campbell

**2015 Nine awards to four faculty members totaling $233,089**
- 2015 $104,000 (Beckman) Beckman Scholars Program at Davidson College – Lom & Hauser
- 2015 $56,416 (US Fish & Wildlife) Eastern Diamondback Rattlesnakes in ACE Basin
- 2015 $5,000 (SCDNR) State Wildlife Grants
- 2015 $4,220 (Riverbanks Zoo) Conservation Support Fund
- 2015 $4,000 (USFWS) Telemetry of bog turtles at Friday Bog
- 2015 $1,500 (Kiawah Island Conservancy) Reproductive Output of Diamondback Terrapins
- 2015 $1,480 (Knoxville Zoo) Bern W. Tryon Bog Fund
- 2015 $1,000 (Idea Wild) Conservation Grant – Stanback

**2014 Fifteen awards to three biology faculty members totaling $251,453**
- 2014 $80,025 (DOD) Estimating Densities and Detection Probabilities of Secretive Reptiles
- 2014 $56,416 (USFWS) Inventory of Eastern Diamondback Rattlesnakes
- 2014 $19,295 (USGS) Risk Analysis for Diamondback Terrapins
- 2014 $15,500 (Virginia Tech) NSF ROA – Stanback
- 2014 $14,456 (USFWS) Inventory of Diamondback Terrapins
- 2014 $12,000 (ACS) Faculty Development: Strengthening Teaching & Learning Communities – Lom
- 2014 $12,000 (National Geographic Society) Indian Cavity Nesters Vulnerable to Tree Loss – Stanback
- 2014 $10,000 (ACS) Sustainability Blended Learning Library: Biodiversity/Ecosystem
- 2014 $9,981 (NCWRC) Environmental DNA for Bog Turtle Presence – Campbell, & Harden
- 2014 $5,300 (Duke Energy) Davidson College Herpetology Outreach Program
- 2014 $5,252 (Cornelius, NC) - Temporary Translocation of Semi-aquatic Turtles – Harden
<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
<th>Description</th>
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<tbody>
<tr>
<td>2014</td>
<td>$2,228</td>
<td>Greenville Zoo Can Nest Boxes Accelerate Colonization By Nuthatches? – Stanback</td>
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<td>2014</td>
<td>$5,000</td>
<td>Columbus Zoo Cavity Nesters Most Vulnerable to the Loss of Large Trees – Stanback</td>
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<td>2014</td>
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<td>John Ball Zoo Identifying Cavity Nesters Vulnerable to Loss of Trees – Stanback</td>
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<td>2014</td>
<td>$2,000</td>
<td>Sacramento Zoo S. African Cavity Vulnerable to Large Tree Loss – Stanback</td>
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**2013** Thirteen awards to six biology faculty members totaling $1,674,152

<table>
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<th>Year</th>
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<tr>
<td>2013</td>
<td>$584,913</td>
<td>NSF Using Synthetic Biology for Multidisciplinary Research – Campbell</td>
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<td>2013</td>
<td>$408,230</td>
<td>NIH Regulation of Cd4 Expression – Sarafova</td>
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<td>2013</td>
<td>$398,055</td>
<td>NSF Tissue-Specific ATP Synthase Subunits in Mitochondrial Shaping – Hales</td>
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<tr>
<td>2013</td>
<td>$320,832</td>
<td>NSF AAA ATPases Linking Mitochondria with Microtubule Processing – Hales</td>
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<tr>
<td>2013</td>
<td>$199,930</td>
<td>NSF Breathe, Eat, Touch (BET) Project – Bernd</td>
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<tr>
<td>2013</td>
<td>$186,000</td>
<td>Dupont Underrepresented Students and RISE Program – Case</td>
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<tr>
<td>2013</td>
<td>$100,000</td>
<td>Breakthrough Prize in Life Sciences Innovations in Teaching Biology – Campbell</td>
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<tr>
<td>2013</td>
<td>$98,954</td>
<td>Williams-Transco Monitoring Endangered Population of Bog Turtles – Campbell</td>
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<td>2013</td>
<td>$82,247</td>
<td>NC Biotechnology Center Blueberry Genomics – Campbell</td>
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<tr>
<td>2013</td>
<td>$7,876</td>
<td>NC Biotechnology Center Education Enhancement – Campbell</td>
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<td>2013</td>
<td>$6,560</td>
<td>NSF Supplemental – Campbell</td>
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<tr>
<td>2013</td>
<td>$5,000</td>
<td>NSF Undergraduate Biotechnology Research Fellowship Director – Sarafova</td>
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<td>2013</td>
<td>$4,250</td>
<td>NSF Informal Science Education – Sarafova</td>
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<td>2013</td>
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<td>NSF Environmental Impact Study – Sarafova</td>
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<td>NSF Immunoology Annual Meeting – Sarafova</td>
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<td>2013</td>
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<td>NSF Carolina Herp Atlas – Sarafova</td>
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<td>2013</td>
<td>$1,000</td>
<td>NSF Product Development GSH/GSSG-Glo Kit – Bernd</td>
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**2012** Eleven awards to six biology faculty members totaling $966,008

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<th>Amount</th>
<th>Description</th>
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<tr>
<td>2012</td>
<td>$398,055</td>
<td>NSF Tissue-Specific ATP Synthase Subunits in Mitochondrial Shaping – Hales</td>
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<tr>
<td>2012</td>
<td>$320,832</td>
<td>NSF AAA ATPases Linking Mitochondria with Microtubule Processing – Hales</td>
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<td>2012</td>
<td>$199,930</td>
<td>NSF Breathe, Eat, Touch (BET) Project – Bernd</td>
</tr>
<tr>
<td>2012</td>
<td>$186,000</td>
<td>Dupont Underrepresented Students and RISE Program – Case</td>
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<tr>
<td>2012</td>
<td>$100,000</td>
<td>Breakthrough Prize in Life Sciences Innovations in Teaching Biology – Campbell</td>
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<tr>
<td>2012</td>
<td>$99,999</td>
<td>NSF Second Generation Bacterial Computers – Campbell &amp; Heyer</td>
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<td>2012</td>
<td>$9,255</td>
<td>NSF Enhancing the Benefits of the ACS Teaching &amp; Learning Workshop – Lom</td>
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<tr>
<td>2012</td>
<td>$7,876</td>
<td>NC Biotechnology Center Education Enhancement – Campbell</td>
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<td>2012</td>
<td>$6,560</td>
<td>NSF Supplemental – Campbell</td>
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<td>2012</td>
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<td>NSF Undergraduate Biotechnology Research Fellowship – Sarafova</td>
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<tr>
<td>2012</td>
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<td>NSF Informal Science Education – Sarafova</td>
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<td>2012</td>
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<td>NSF Bog Turtle Research – Sarafova</td>
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<td>2012</td>
<td>$2,500</td>
<td>NSF American Association of Immunologist Meeting – Sarafova</td>
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**2011** Thirteen awards to six biology faculty members totaling $1,239,293

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<th>Year</th>
<th>Amount</th>
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<tr>
<td>2011</td>
<td>$429,000</td>
<td>NSF Elucidating Roles of Slitrks in the Developing Zebrafish CNS – Lom &amp; Round</td>
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<tr>
<td>2011</td>
<td>$320,832</td>
<td>NSF Workshop: Synthetic Biology Workshops – Campbell &amp; Heyer</td>
</tr>
<tr>
<td>2011</td>
<td>$199,999</td>
<td>NSF Second Generation Bacterial Computers – Campbell &amp; Heyer</td>
</tr>
<tr>
<td>2011</td>
<td>$100,000</td>
<td>Teagle Foundation Influential Interventions – Case &amp; Scott</td>
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<tr>
<td>2011</td>
<td>$80,000</td>
<td>Williams-Transco Status of Bog Turtles in Gaston County</td>
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<td>2011</td>
<td>$60,000</td>
<td>NSF Biochemistry-Related Projects – Bernd</td>
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<tr>
<td>2011</td>
<td>$42,344</td>
<td>NSF Duke Energy SNSWP Amphibian Study</td>
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<tr>
<td>2011</td>
<td>$40,000</td>
<td>NSF Environmental Impact Study</td>
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<td>2011</td>
<td>$8,000</td>
<td>NSF Strategic Planning to Improve the ACS Teaching &amp; Learning Workshop – Lom</td>
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<td>2011</td>
<td>$5,000</td>
<td>NSF Undergraduate Biotechnology Research Fellowship – Sarafova</td>
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<td>2011</td>
<td>$2,250</td>
<td>AAI Immunology Annual Meeting – Sarafova</td>
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<tr>
<td>2011</td>
<td>$2,000</td>
<td>UNC Greensboro Carolina Herp Atlas</td>
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<tr>
<td>2011</td>
<td>$1,000</td>
<td>NSF Product Development GSH/GSSG-Glo Kit – Bernd</td>
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</table>

**2010** Five awards to four biology faculty members totaling $417,892

<table>
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<th>Year</th>
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<tbody>
<tr>
<td>2010</td>
<td>$212,901</td>
<td>NIH 1, 2, 3 – Triazole Nucleobases in Nucleoside Analogs – Wessner &amp; Stevens</td>
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<td>2010</td>
<td>$149,091</td>
<td>Broad River Trust Amphibians &amp; reptiles as Indicators of Disturbance</td>
</tr>
<tr>
<td>2010</td>
<td>$43,000</td>
<td>NC Biotechnology Center Education Enhancement Grant – Sarafova</td>
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2010 $7,900 (NNAS) Nest Site Competition – Stanback
2010 $5,000 (Duke Energy) Hellbender

**2009 Nine awards to three biology faculty members totaling $144,922**

<table>
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<tr>
<th>Year</th>
<th>Amount (Grantor)</th>
<th>Description</th>
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<tr>
<td>2009</td>
<td>$59,950 (NFWF)</td>
<td>Golf Courses as Turtle Habitat in Urbanized Area</td>
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<tr>
<td>2009</td>
<td>$27,413 (Duke Energy)</td>
<td>Herpetological Surveys of the W.S. Lee III Nuclear Station</td>
</tr>
<tr>
<td>2009</td>
<td>$26,413 (Duke Energy)</td>
<td>Herpetological Surveys of the Proposed Railroad Site</td>
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<tr>
<td>2009</td>
<td>$10,000 (ACS)</td>
<td>Educational Practices Informed by Cognitive Sciences – Lom</td>
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<tr>
<td>2009</td>
<td>$8,000 (NFWF)</td>
<td>Brown-Headed Nuthatch Conservation – Stanback</td>
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<tr>
<td>2009</td>
<td>$7,000 (NSF)</td>
<td>Effects of Urbanization on Amphibian and Reptiles (supplement)</td>
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<td>2009</td>
<td>$4,886 (NCWC)</td>
<td>Carolina Herp Atlas</td>
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<td>2009</td>
<td>$800 (Carolina Bird Club)</td>
<td>Birds of the Carolinas Student Research – Stanback</td>
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<tr>
<td>2009</td>
<td>$460 (Carolina Bird Club)</td>
<td>Birds of the Carolinas Student Research – Stanback</td>
</tr>
</tbody>
</table>
Scientific Publications by Davidson Biologists

Davidson College Biology faculty members have been very successful publishing peer-reviewed research and education outcomes in a wide variety of scientific publications. Many students have contributed to these publications as co-authors. Since 2010 Biology faculty members at Davidson College have published more than 115 journal articles, books, and book chapters that included more than 160 undergraduate co-authorships.

Specific publications since 2010 include:

**bold** = undergraduate coauthor
underline = Davidson faculty member (non-Bio)
double underline = Davidson Biology faculty member

**2019** 5 publications by 3 Biology professors with 9 undergraduate coauthorships


**2018** 7 publications by 4 Biology professors with 27 undergraduate coauthorships


**2017** 7 publications by 4 Biology professors with 18 undergraduate coauthorships

2016  11 publications by nine Biology professors with 16 *undergrad co-authorships
Andersen KS, Lom B, Sandlin BA (2016) The challenges of promoting instructional improvement: Teaching behaviors and teaching cultures at liberal arts institutions in the Associated Colleges of the South. To Improve the Academy: A Journal of Educational Development 35: 72-120 DOI: 10.1002/tia2.20035


2015  22 publications by eight Biology professors with 32 *undergrad co-authorships


https://doi.org/10.1371/journal.pone.0118322


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2014 27 publications by eight Biology professors with 24 *undergrad co-authorships*


2013 18 publications by seven Biology professors with 20 *undergrad co-authorships*


2011 18 publications by six Biology professors with 29 *undergrad co-authorships


2012 18 publications by six Biology professors with 32 *undergrad co-authorships


