Why study animal behavior?

- Conservation

*Forest thinned: exposed and wet butterflies lose freeze protection*

*Ambient temperature at which 50% of the butterflies die (°C)*

*Exposure to open sky (%)*

*Wetness (mg H₂O per butterfly)*

*Low Freeze protection*

*High Freeze protection*

*Forest intact: butterflies protected from freezing*
Atrazine induces complete feminization and chemical castration in male African clawed frogs (Xenopus laevis)

Tyrone B. Hayes\textsuperscript{a,1}, Vicky Khoury\textsuperscript{a,2}, Anne Narayan\textsuperscript{a,2}, Mariam Nazir\textsuperscript{a,2}, Andrew Park\textsuperscript{a,2}, Travis Brown\textsuperscript{a}, Lillian Adame\textsuperscript{a}, Elton Chan\textsuperscript{a}, Daniel Buchholz\textsuperscript{b}, Theresa Stueve\textsuperscript{a}, and Sherrie Gallipeau\textsuperscript{a}

![Graph showing comparison between control (Con) and atrazine (Atr) treatments for testosterone levels and successful amplexus.](image)
Why study animal behavior?

• Human health
  – Avian influenza and bird migration routes
  – Pair bonding / social attachment and autism

https://www.youtube.com/watch?v=Iko7UXC-M94&list=PLA1D7BD1295076BB1&index=1

• More generally, all new drug candidates must succeed in animal trials before human clinical trials, without exception.
  • For autism, depression, schizophrenia, Alzheimer’s disease, cancer, AIDS, diabetes, etc.
Why study animal behavior?

- **Economic**
  - Honeybees annually pollinate more than $14 billion worth of seeds and crops in the US
  - “Every third bite we consume in our diet is dependent on a honeybee to pollinate that food”

---

**Relying on Bees**

Some of the most valuable fruits, vegetables, nuts and field crops depend on insect pollinators, particularly honeybees.

<table>
<thead>
<tr>
<th>Crop value in billions 2006</th>
<th>Percentage pollinated by honeybees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybeans</td>
<td>$19.7</td>
</tr>
<tr>
<td>Cotton</td>
<td>5.2</td>
</tr>
<tr>
<td>Grapes</td>
<td>3.2</td>
</tr>
<tr>
<td>Almonds</td>
<td>2.2</td>
</tr>
<tr>
<td>Apples</td>
<td>2.1</td>
</tr>
<tr>
<td>Oranges</td>
<td>1.8</td>
</tr>
<tr>
<td>Strawberries</td>
<td>1.5</td>
</tr>
<tr>
<td>Peanuts</td>
<td>0.6</td>
</tr>
<tr>
<td>Peaches</td>
<td>0.5</td>
</tr>
<tr>
<td>Blueberries cultivated</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Besides insects, other means of pollination include birds, wind and rainwater.

**Sources:** United States Department of Agriculture; Roger A. Morse and Nicholas W. Calderone, Cornell University
Why study animal behavior?

- **Curiosity** – “basic” or “fundamental” research is a long-term investment, which can yield revolutionary advances and unexpected benefits!

Course goals

• How to study animal behavior using the scientific method
  – Inspire curiosity

• Encourage critical and creative thinking
  – Strengths of a study?
  – Weaknesses / limitations of a study?
  – What is not known? Propose new experiments

• Find & read original scientific literature
  – Web of Science, PubMed, Google Scholar

• Improve oral and written communication
Science is a process

• Science is a way of trying to understand the natural world. Science is not a list of facts to memorize.

• Science is a process of human inquiry
  • Systematic approach – controls, random assignment, “blind” etc.
  • Skepticism – try to refute hypotheses
  • Dynamic – old ideas are re-evaluated in light of new data
  • Uncertainty – no single study is perfect; converging lines of evidence decrease uncertainty and increase confidence

• Our society needs people in all walks of life that can interpret and critically evaluate the results of scientific studies
Science is for everyone

Background: Real science has the potential to not only amaze, but also transform the way one thinks of the world and oneself. This is because the process of science is little different from the deeply resonant, natural processes of play. Play enables humans (and other mammals) to discover (and create) relationships and patterns. When one adds rules to play, a game is created. This is science: the process of playing with rules that enables one to reveal previously unseen patterns of relationships that extend our collective understanding of nature and human nature. When thought of in

Principal finding: ‘We discovered that bumblebees can use a combination of colour and spatial relationships in deciding which colour of flower to forage from. We also discovered that science is cool and fun because you get to do stuff that no one has ever done before. (Children from Blackawton)’.

http://www.ted.com/talks/beau_lotto_amy_o_toole_science_is_for_everyone_kids_included.html
The following was delivered as the commencement address at the California Institute of Technology, on Friday, June 10th.

If this place has done its job—and I suspect it has—you’re all scientists now. Sorry, English and history graduates, even you are, too. Science is not a major or a career. It is a commitment to a systematic way of thinking, an allegiance to a way of building knowledge and explaining the universe through testing and factual observation. The thing is, that isn’t a normal way of thinking. It is unnatural and counterintuitive. It has to be learned. Scientific explanation stands in contrast to the wisdom of divinity and experience and common sense.
Put a little science in your life

http://www.guardian.co.uk/science
http://news.sciencemag.org/sciencenow/
http://www.cbc.ca/quirks/
https://www.sciencefriday.com/
http://www.uroubc.ca/
http://psa.psych.ubc.ca/
http://murc.ubc.ca/
http://students.arts.ubc.ca/involvement/research-in-arts/

Volunteer, Directed Studies, Work Learn, Summer Research etc.
SIGNATURE VERSUS PERCEPTUAL ADAPTATIONS FOR INDIVIDUAL VOCAL RECOGNITION IN SWALLOWS

by

PATRICIA LOESCHE, PHILIP K. STODDARD, B. J. HIGGINS
and MICHAEL D. BEECHER

(Animal Behavior Program, Department of Psychology, University of Washington,
Seattle WA 98195, U.S.A.)

https://www.youtube.com/watch?v=0Rnq1NpHdmw&sns=em
What is the most important thing you learned in this class?

What are you most likely to remember in 5 years?

What is one thing that you have changed your mind about, as a result of this class?