

Psychology 2TT3

Animal Behaviour

Outline for Part 1

- Introduction
- Course plan
- Why do we study animal behaviour?

Psychology Questions

- We don't always know how people will behave or what they think. We need to do research.
- For example, answer "**True**" or "**False**" to these questions:

Animal Behaviour

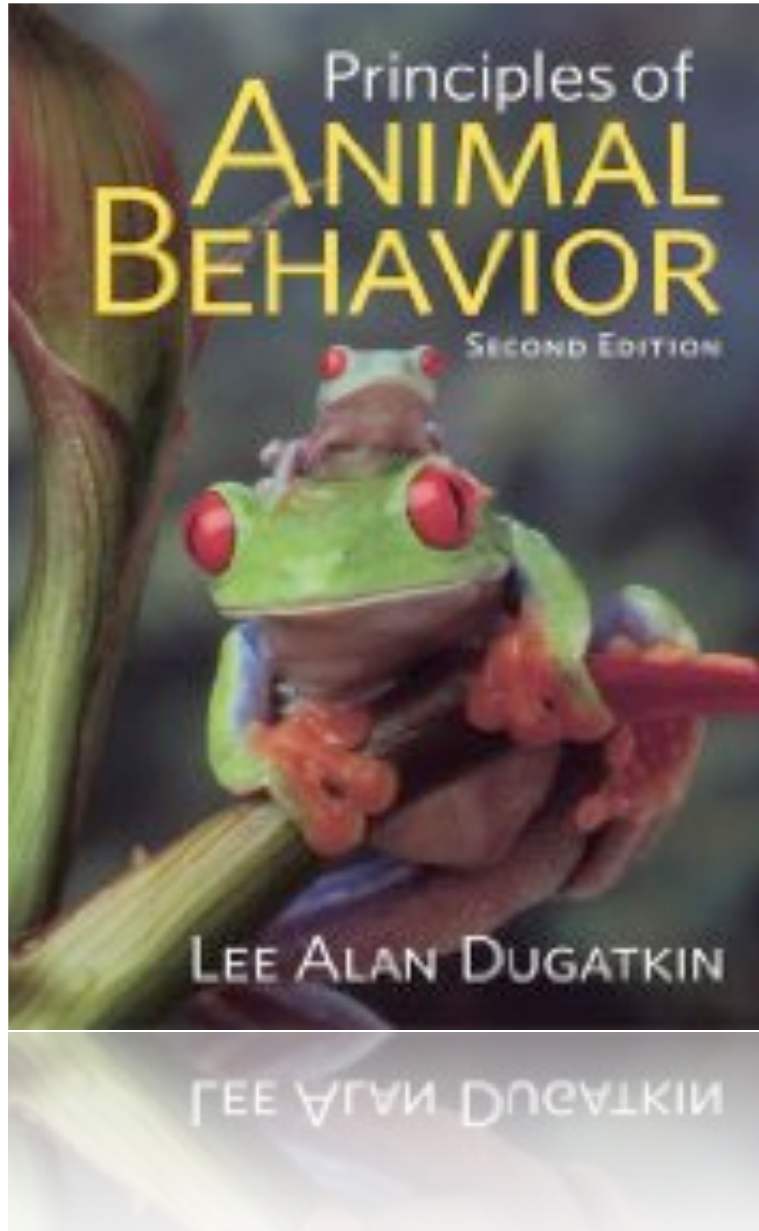
Objectives

By the end of this course the students will be able to:

- Understand the importance of animal behaviour research
- Discuss the two mechanisms that change behaviour over time
- Describe the mechanisms that control and generate behaviour in most animals
- Apply scientific thinking for analyzing novel problems in animal behaviour

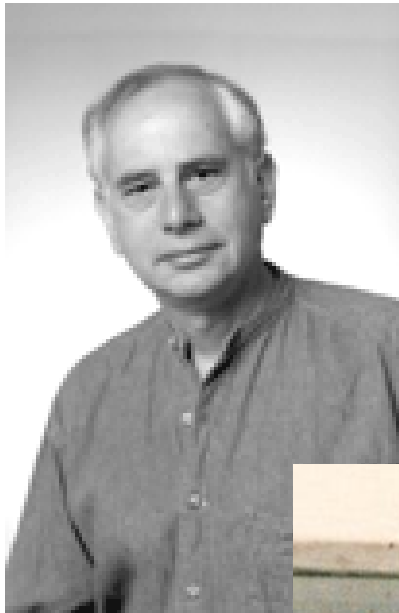
Animal Behaviour Objectives (cont.)

- Detail the major components of behaviour, which are shared by most animal species.
- Explain human behaviour based on concepts and examples studied in the course.



Dugatkin

Psychology's Contribution to Principles of Animal Behaviour



Shepard Siegel



Reuven Dukas



B. Geoff Galef

Animal Behaviour Group

Sigal Balshine (Psychology)
Ana Campos (Biology)
Mertice Clark (Psychology)
Martin Daly (Psychology)
Denys DeCatanzaro (Psychology)
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David Earn (Mathematics)
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Paul Higgs (Physics)
Bennett Galef (Psychology)
Grant McClelland (Biology)
Jim Quinn (Biology)
David Rollo (Biology)
Shepard Siegel (Psychology)
Jonathon Stone (Biology)
Margo Wilson (Psychology)



<http://www.science.mcmaster.ca/psychology/animal/index.html>

Logic of course plan

- We will focus on major concepts that you need to **understand**

Evaluation

Evaluation breakdown		
Term test	February 18th	30%
Assignment 1	January 28th	15%
Assignment 2	March 11th	15%
Final examination		40%

Term test will be held during class time.

Please note - There will be no make up tests given.

The 2TT3 website has only partial lecture notes

- You are responsible for **all** the material covered in the lectures
- You should take your own notes in lectures

How do we depend on animals?

Fly learning and human mental health



Memory-enhancing drugs and the treatment of mental retardation in humans.



Helicon Therapeutics

- **Our Mission:**

To discover drugs for treating disorders of memory

www.helicontherapeutics.com



Interview with Tim Tully

Uses of animal-behaviour research

- Entertainment (pets, zoos, safaris, nature programmes on TV)
- Model systems for human applications
- Protection of rare, endangered animals
- Control of pests and damage-reduction

- Collisions between wildlife and aircraft have resulted in the loss of over 400 aircraft since 1950, and over 100 human lives since 1995.
- Collisions between aircraft and birds cost the aviation industry over \$1.2 billion per year.
- In Canada, over 800 bird strike incidents are reported each year.

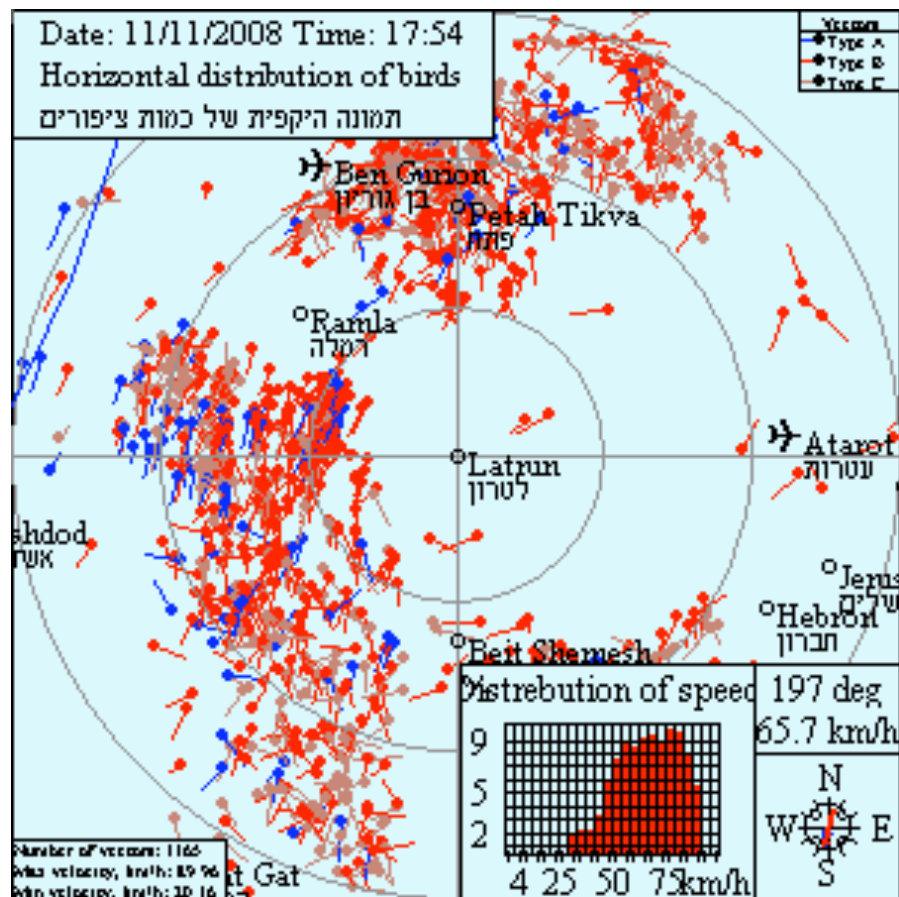
Bird-airplane collision



- Most airports employ control teams that do research on and run programs for reducing bird collision.

Research in Israel has reduced bird-aircraft collisions and damage by ~85%, saved human and bird life and over US\$ 40 million per year.

www.birds.org.il



Chapter 3
Proximate
Factors

Lee Alan Dugatkin

Why do animals do what they do?

Why do birds sing?

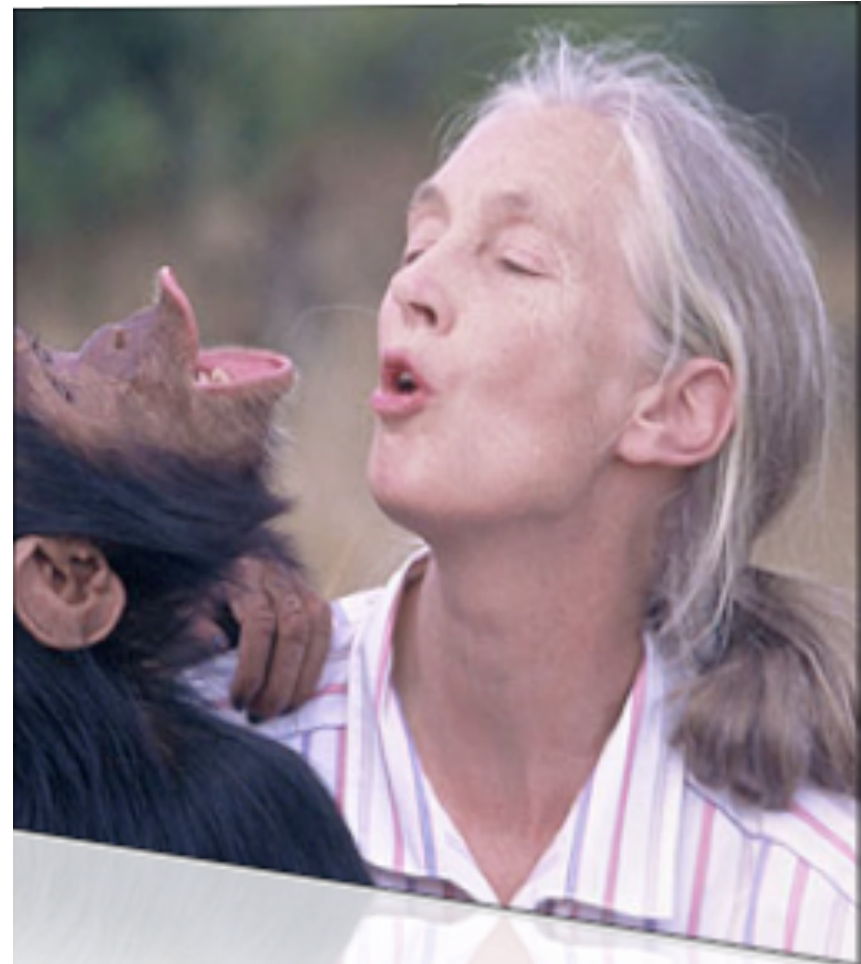
How do sea turtles navigate the ocean to lay their eggs on the same beach where they were hatched?



How do honeybees know when the hive needs more food?

Why do animals do what they do?

- **Animal behaviour** asks what, why, and how.
- Animal behaviour is also referred to as **ethology**.
 - Scientists who study animal behaviour are called **ethologists**.



Jane Goodall

Scientific approaches in animal behaviour research

Ethologists do *not* attempt to describe **WHY** an animal does a behaviour before describing **WHAT** the animal is doing.

For example, you see two gophers interacting with each other, rolling and hopping around, running to and from each other.

Scientific approaches in animal behaviour research

The behaviour you observed could have been many different things...

- *Play.*
- *Mating rituals.*
- *Aggression, defending territory.*

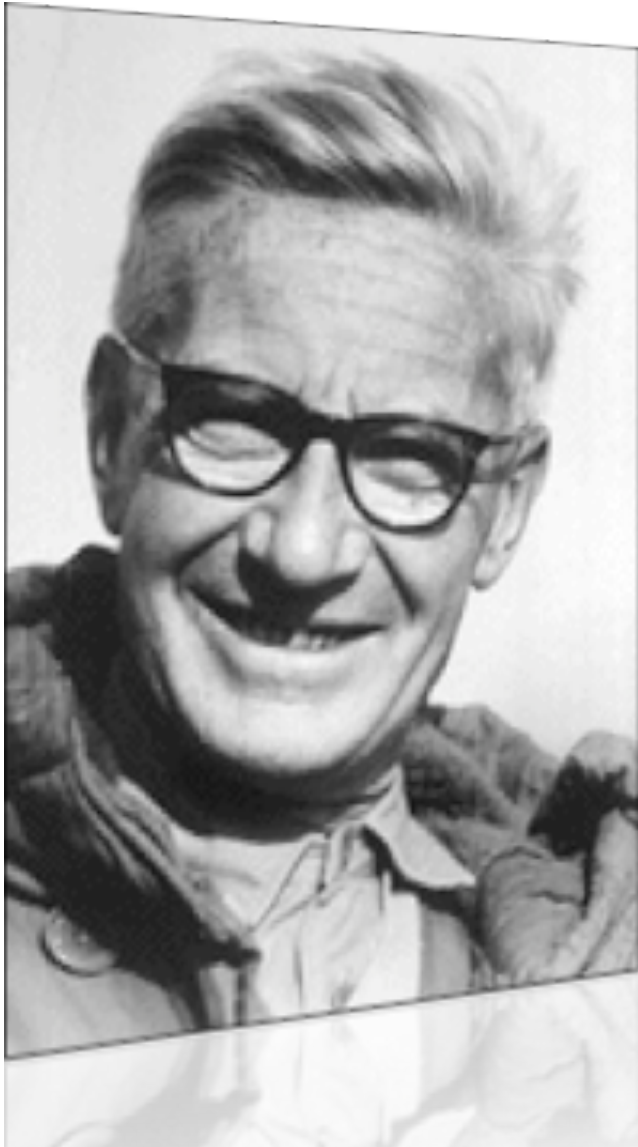


How to determine **WHY** – action patterns.

Action patterns are complex behaviours that are always repeated the same way by a species of animal.

- We say that action patterns are stereotyped, since they occur the same way each time, and through to completion.
- Only then do we attempt to determine **WHY** a behaviour is being done.

Niko Tinbergen



A pioneer in the field of animal behaviour.

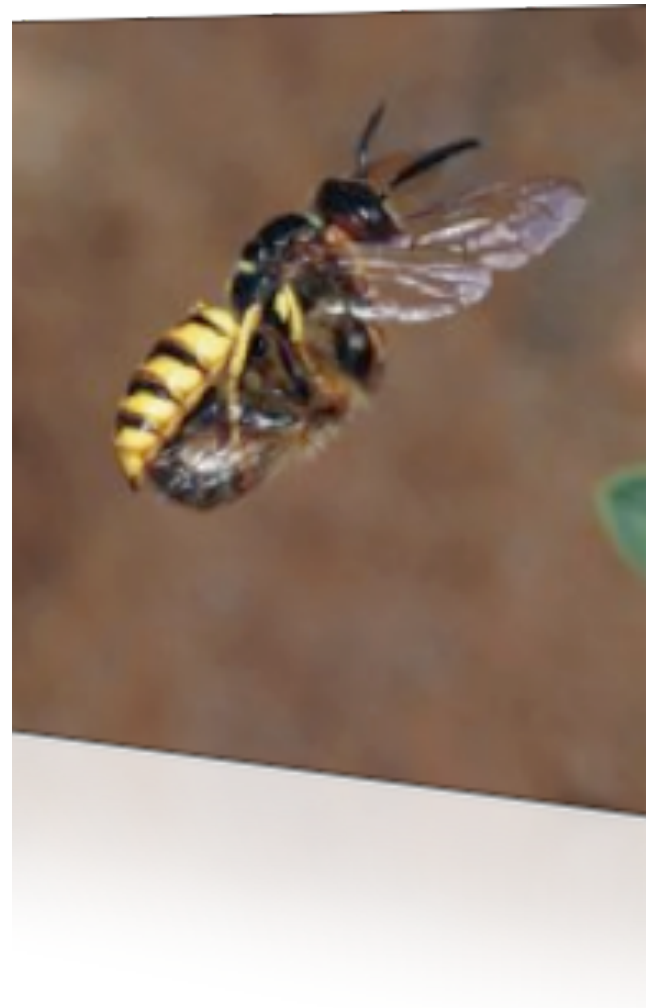
He observed animals in their natural conditions, then manipulated, or *varied* the conditions to see how the animals responded.

Niko Tinbergen

Observed how beewolfs find its nest among other beewolf nests.

beewolfs would circle its nest in an ever-widening circle before flying away to hunt.

This behavior was an action pattern – it was performed exactly the same way each time.



Niko Tinbergen



- After the beewolf flew off, Tinbergen would move certain landmarks around the nests.
- When the beewolf returned, it was disoriented.

Niko Tinbergen

Tinbergen had to describe and investigate **WHAT** the organism was doing before attempting to explain **WHY**.

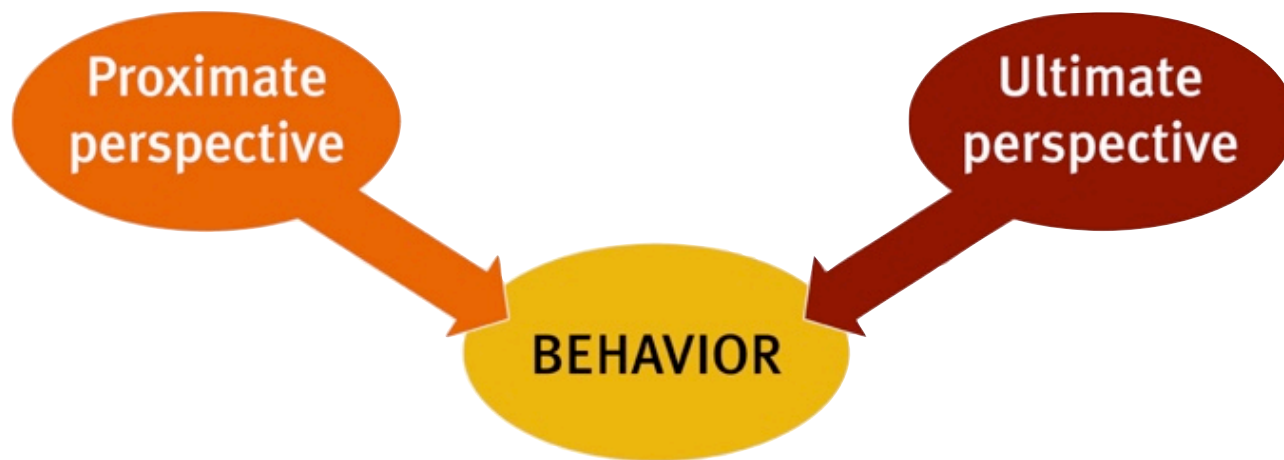
Scientific approaches in animal behaviour research



From a scientific approach, explain why songbirds sing?

Scientific approaches

- Function (why) vs. mechanism (how)
- =Ultimate vs. proximate mechanisms
- = Adaptive significance vs. machinery (genetics, physiology, neurobiology, endocrinology)



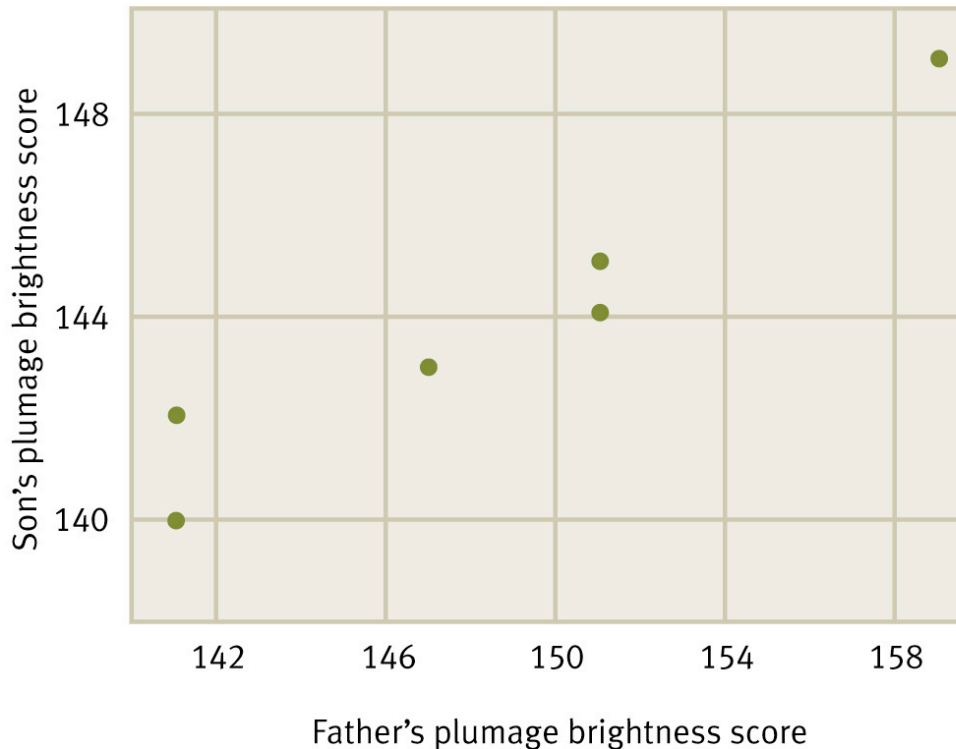
Example

Plumage color in male house finches

- Why is there such large plumage variation (among males & between males & females)?
- What is the adaptive significance of red plumage?
- How is the red coloration generated?



Proximate mechanisms

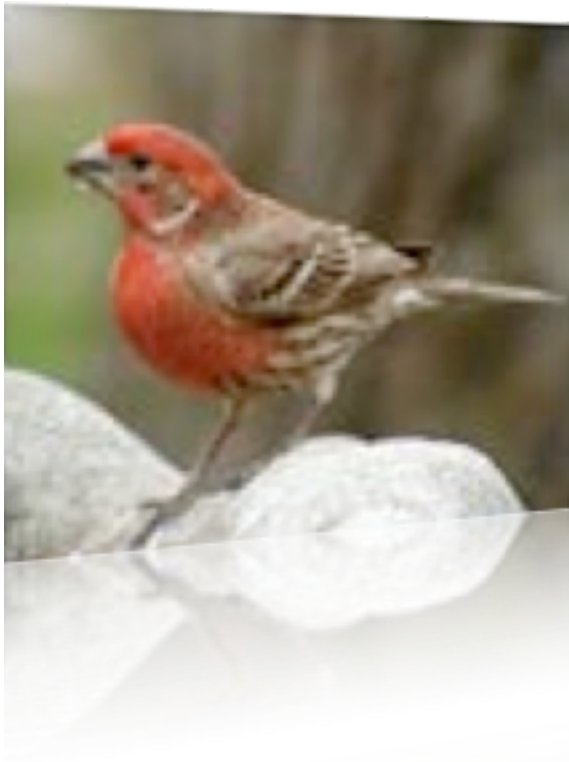


- How is the red coloration generated?
- The red coloration comes from carotenoid pigments ingested in food
- Choosing to eat more carotenoid-rich food results in more red plumage

But... why is there a positive relationship between father and son plumage scores?


Ultimate mechanisms

- What is the adaptive significance of red plumage?
- Positive correlation between male mating success and red-color intensity



Ultimate mechanisms

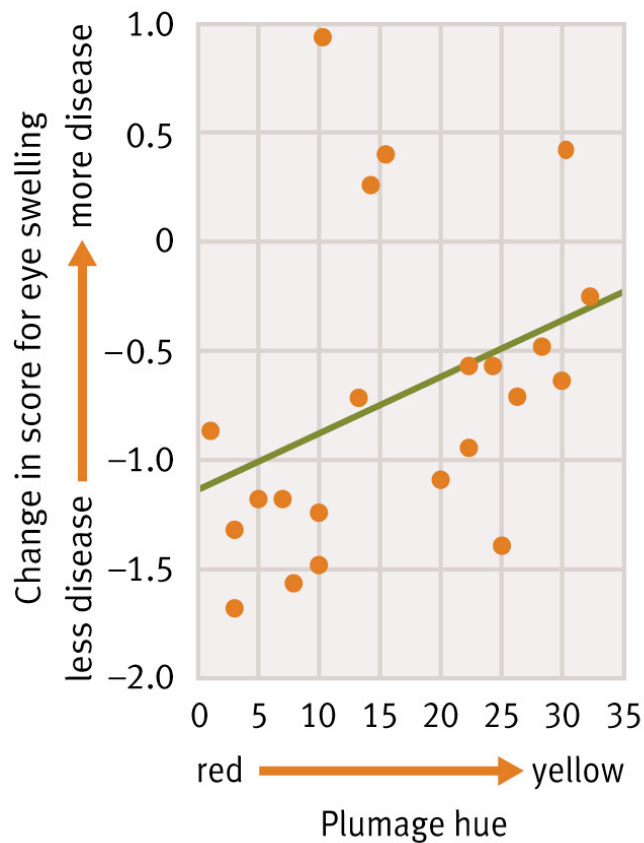
- What is the adaptive significance of red plumage?
- Positive correlation between male mating success and red-color intensity

MALE CHARACTERISTICS	BRIGHTENED	SHAM CONTROL	LIGHTENED	STATISTICAL SIGNIFICANCE (P)
Original plumage score	140.7	139.9	141.00	0.95
Manipulated plumage score	161.6	139.9	129.40	0.0001
Proportion paired				0.0001
Time to pair (days)				0.07

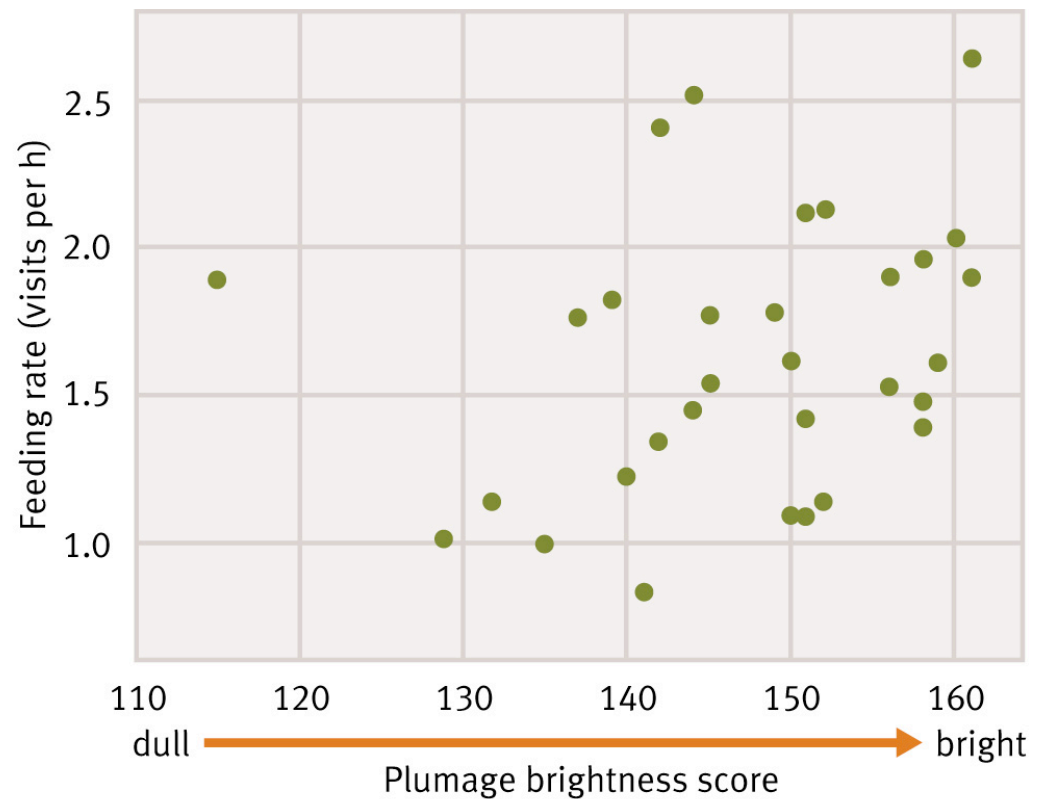


Ultimate mechanisms

What is the adaptive significance of red plumage?



Recovery from Infection



Feeding young

Why is there such large plumage variation?

- Males but not females actively seek carotenoid-rich food
- Males who can afford seeking colour instead of energy are probably of better quality
- Females estimate male quality based on the red colour

(Note that the answer involves both proximate and ultimate mechanisms)

Proximate vs. Ultimate Causes

The question of “WHY” can have different answers.

- **Proximate causes** are related to *internal changes* in the animal.
 - Hormones.
 - Messages from the nervous system.
 - “Proximate” means close.
- **Ultimate causes** are related to the *survival and reproductive success* of the animal.
 - “Ultimate” means furthest, or utmost.

Proximate vs. Ultimate Causes

- Belding's ground squirrels.
 - When males reach about two months old, they leave the burrow where they were born.
 - It is an increase in testosterone, or a *hormonal* change that triggers this behaviour.

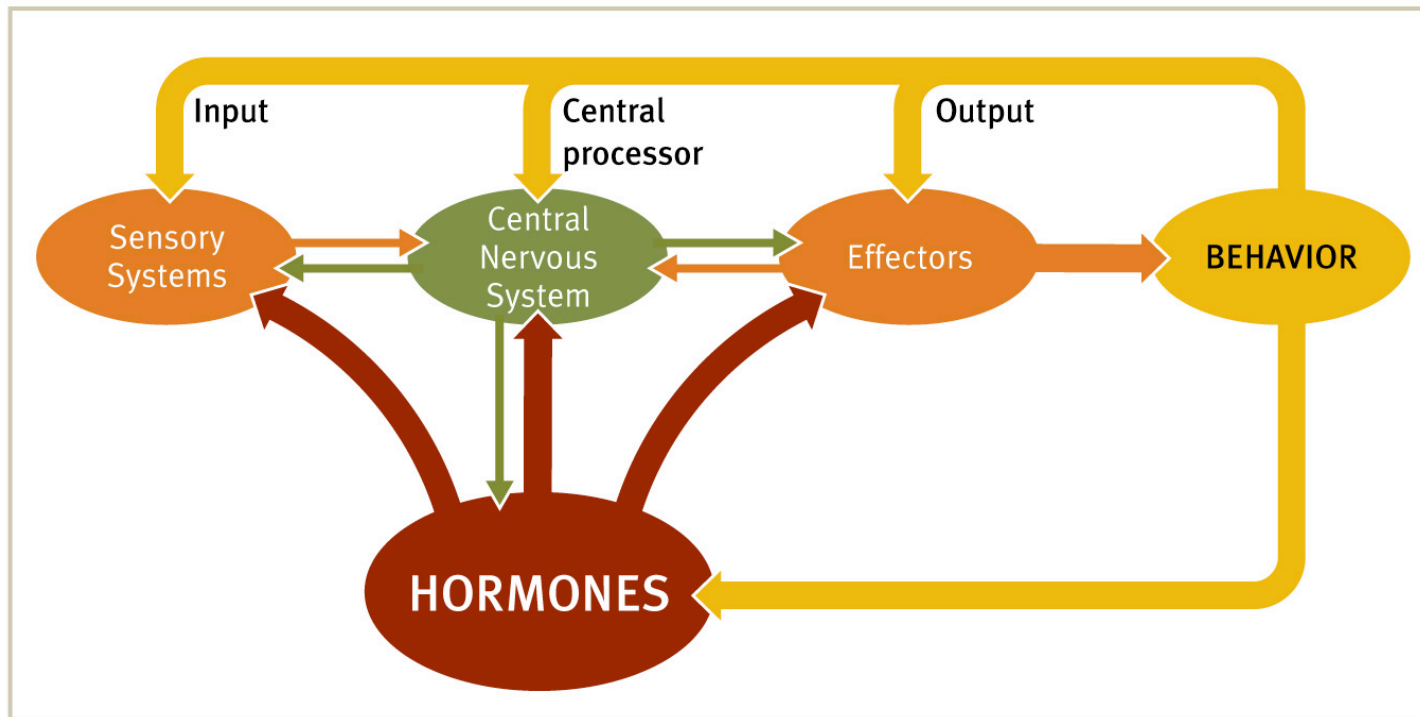


Proximate vs. Ultimate Causes

There is more to the story than just
hormones!

Other Examples of Proximal Causation

Hormone changes describe behavioural modifications



HORMONES

Other Examples of Proximal Causation

Hormone changes describe behavioural modifications

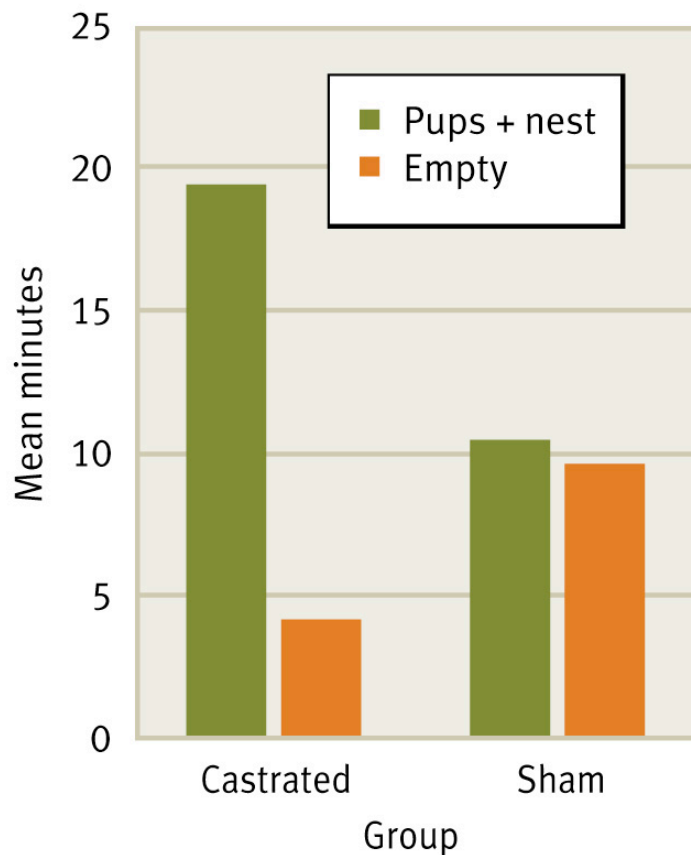


Hormone changes in new fathers

- What is the change?
 - New fathers show lower testosterone (T) than non-fathers for nearly 5 years.
 - Not just that men with reduced T are more likely to have children
 - Even greater for those who cared for children for at least 3 hours.

Other Examples of Proximal Causation

Hormone changes describe behavioural modifications



Parental Care

males with lower testosterone levels spend more time with young

Hormone changes in new fathers

- Why is there a change?
 - Likely reflects the idea that men with lower testosterone are more likely to be monogamous and care for their children

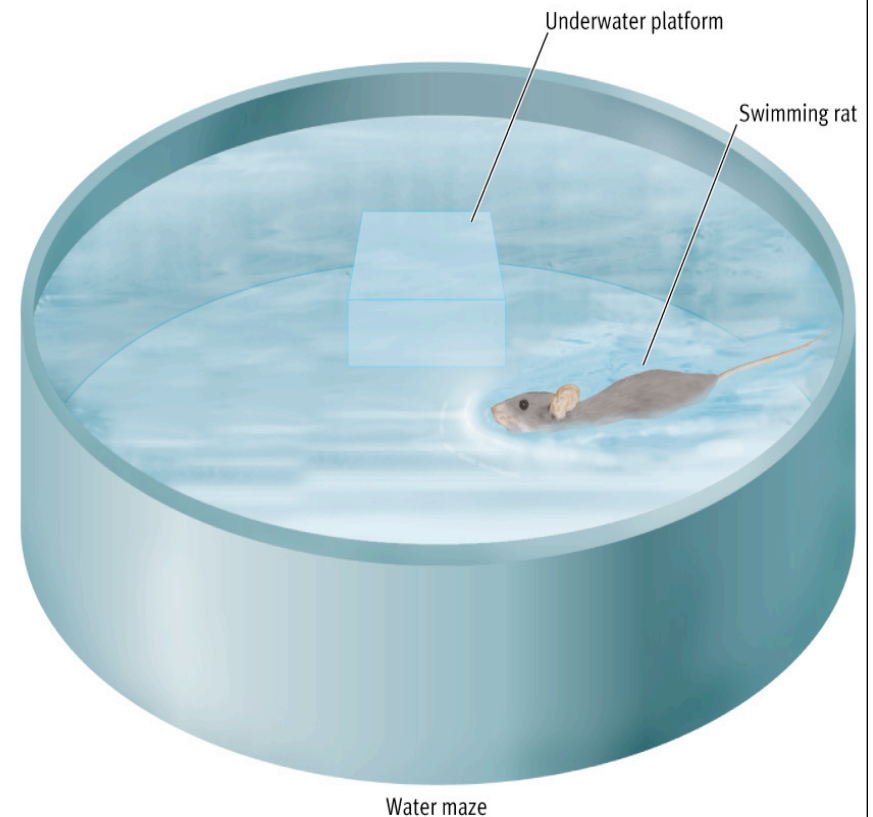
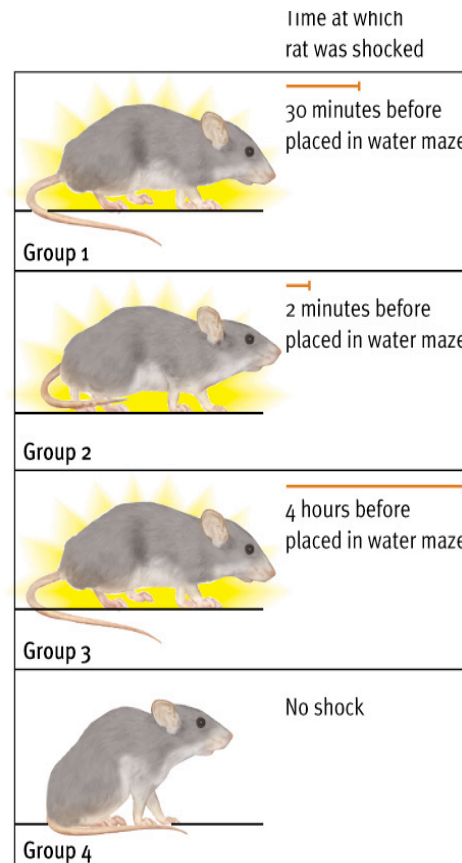
Other Examples of Proximal Causation

Causation

Hormone changes describe behavioural modifications

Memory

Stress affects our ability to remember details



Other Examples of Proximal Causation

Horomone changes describe behavioural modifications

Horomone changes describe behavioural modifications

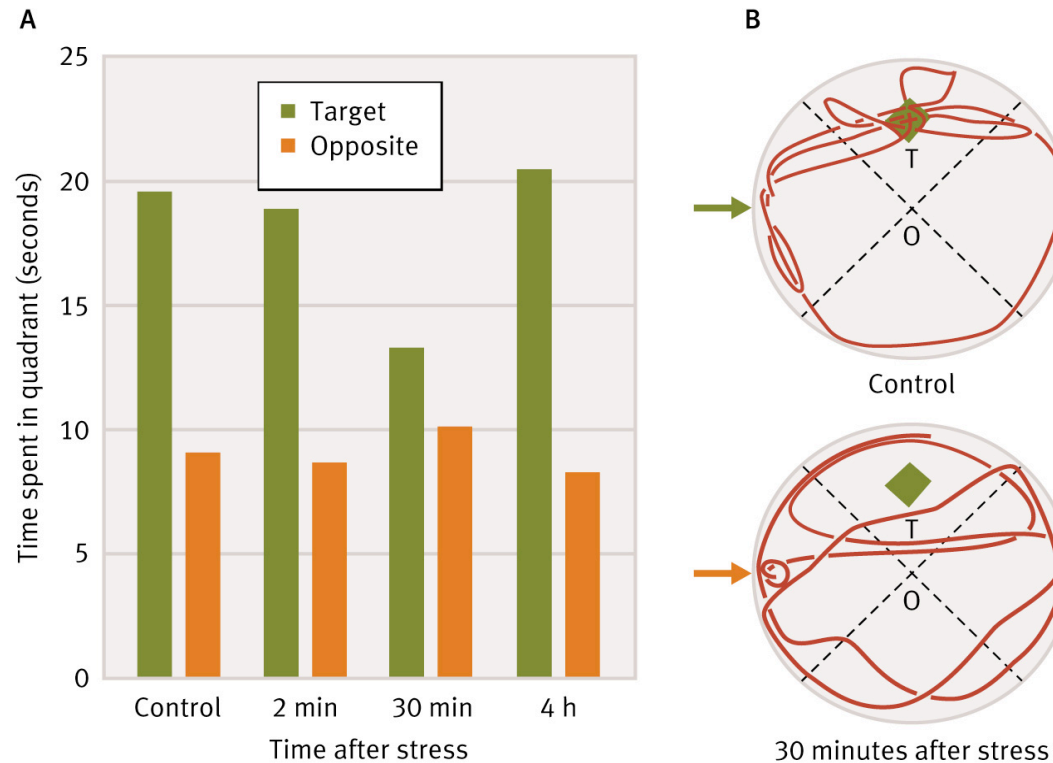


FIGURE 3.17: Shock and spatial memory in rats

Other Examples of Proximal Causation

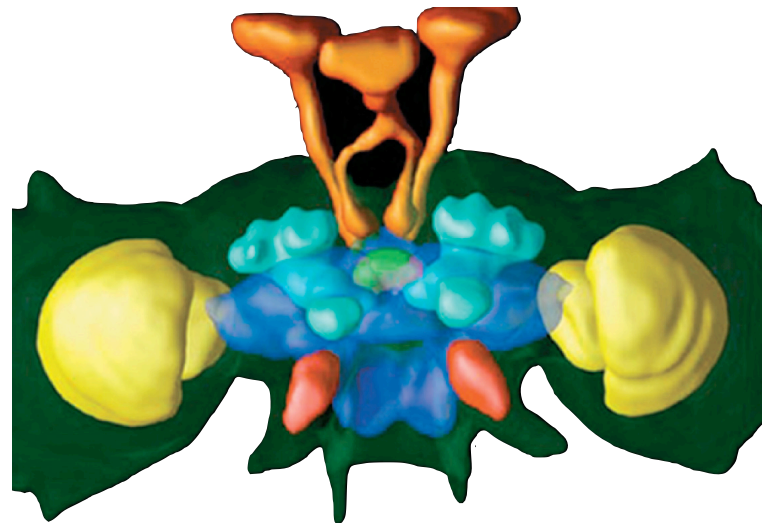
Neurological examples of Proximal Causation



Spatial learning in honeybees

Neurological examples of Proximal Causation

- The ability to remember and retrieve information from the environment is critical for many aspects of animal behaviour



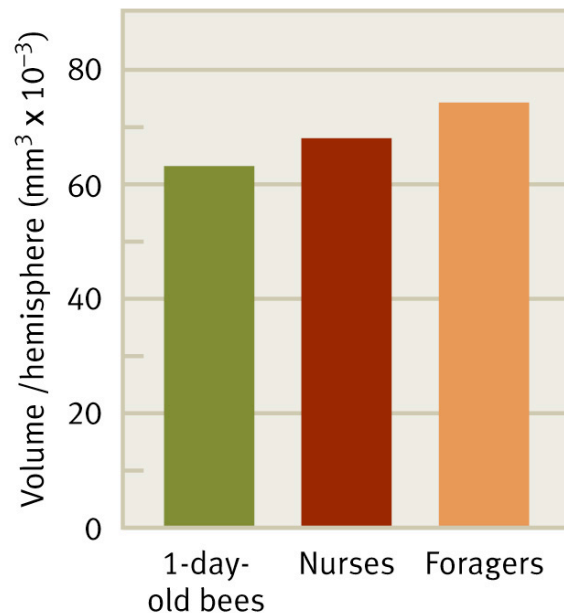
- Spatial learning in insects is often associated with a cluster of small neurons called “**Mushroom bodies**”

Neurological examples of Proximal Causation

Foragers have **larger** (14.8%) mushroom bodies than do nursing bees

The development of mushroom bodies can be accelerated by forcing juvenile bees to begin foraging

Nursing bees



Foraging bees



Assignment 1: "Proximate Perspectives"
Instructions

DUE
Jan 28, 2013 7PM

Assignment #1: "Proximate Perspectives"

Animal behaviour research often approaches research questions from two different conceptual pathways; from a proximate level of analysis (i.e. “how does that work”) or from an ultimate perspective (i.e. “why does that behaviour exist”).

In this assignment, I want you to evaluate how we have come to understand behaviour at a “proximate level”. Write a review of one of the provided articles (around 2 pages in length, double spaced).

When you are writing your review, I want you to think about the following information;

What question(s) are they trying to address?

Why are they trying to address this question?

What is their hypothesis?

How do they go about conducting the experiment?

What do they find and what do the results mean!

What conclusions can they draw from this study?

You will be evaluated on your ability to clearly convey that you understand the rationale (purpose), the approach, main findings and conclusions of this article. Spelling, grammar and logical organization of content will also be evaluated.

Please make sure that your name, student ID and a title are included in your work. References in your paper and a reference section should be presented in APA style. Note: the reference section is not included in the total length of your paper.

Your report should be uploaded to the dropbox in microsoft word or .pdf format. **IT IS NECESSARY TO UPLOAD ALL REPORTS TO AVENUE TO LEARN. REPORTS CANNOT BE GRADED OTHERWISE.** Please make note of the due date and TIME. Late penalties will be applied to those who do not submit their report on time.

List of journal articles to choose from:

Clark, M. M., & Galef, B. G., Jr. (1999). A testosterone-mediated trade-off between parental and sexual effort in male mongolian gerbils (*Meriones unguiculatus*). *J Comp Psychol*, 113(4), 388-395.

Jacobs, L. F., Gaulin, S. J., Sherry, D. F., & Hoffman, G. E. (1990). Evolution of spatial cognition: sex-specific patterns of spatial behavior predict hippocampal size. *Proc Natl Acad Sci U S A*, 87(16), 6349-6352.

Kawamura, S., Blow, N. S., & Yokoyama, S. (1999). Genetic analyses of visual pigments of the pigeon (*Columba livia*). *Genetics*, 153(4), 1839-1850.

Mello, C. V., Vicario, D. S., & Clayton, D. F. (1992). Song presentation induces gene expression in the songbird forebrain. *Proc Natl Acad Sci U S A*, 89(15), 6818-6822.

Rattenborg, N. C., Lima, S. L., & Amlaner, C. J. (1999). Facultative control of avian unihemispheric sleep under the risk of predation. *Behav Brain Res*, 105(2), 163-172.