Psychology 2TT3
Animal Behaviour Lecture 1
Sept.13.2011

Introduction

- What is an animal?
- What is behaviour?
  - We wonder why that behaviour is being done. What is the goal?
  - To really understand behaviour, in addition to observation notes, scientific experiments must be conducted in order to fully assess the behaviour.
- We study animal behaviour for research and not necessarily humans because we don't know what human will do or think.
- Why study behaviour?
  - We can model results on human lives
  - Save endangered animals
  - Entertainment: zoo, pets
  - Reduction and control of damage and pests
- How do we depend on animals?
  - Apes are our closest genetic cousins but the rest of the animal kingdom is not far behind. Fruit flies have striking similarities between our genes and their genes. So in principle, whatever we study in the fruit flies, we can apply it to our human lives.
  - Tim Tully did an experiment on fruit flies and tested their memory and how long they acted on those memories.
  - Alzheimer's and the creb gene manipulation

> Tully conditions a group of flies to associate an unpleasant tingling sensation in their feet with a certain chemical odor. He lowers the flies, elevator-style, into a tube with this odor on one end, and another odor on the other. The flies crowd away from the chemical odor associated with the unpleasant sensation. A week later the flies will forget their experience unless Tully exposes them to a series of trials, spaced about fifteen minutes apart. After these training sessions, the flies are able to form a long-term memory of the unpleasant correlation. However, Tully has found that by giving certain flies a gene that our two species share, known as creb, these flies are able to remember to avoid the smell one week later after just one test, giving them the equivalent of a photographic memory.

    - Can we use drugs to treat disorders of the memory?

Chapter 3: Proximate Factors

- 2 scientific approaches to animal behaviour research
  - WHY?
    - Function? Goal? Adaptive significance? Fitness benefits?
    - Ultimate question
  - WHAT CAUSES? WHERE? WHEN? HOW?
    - Mechanism? Machinery? Immediate causation.
    - Proximate questions
- Example: plumage in male birds (Geoff Hill)
  - Females look very drab compared to males. (what causes this difference (proximate), why does this persist over evolutionary time (ultimate))
  - Between females and females: availability of caretenoid
  - Between females and males: diff foraging
  - Why do males, fitness-wise, search actively for these particular foods?

- Familial correlation: sons tend to seek out same kinds of food as father and acquire similar plumage. Plumage is not hereditary b/c its based on a diet so it must be better foraging behaviour (behaviour has a heritable component)
- Answer using both ultimate and proximate approach:
  - How? Males but not females actively seek carotenoid-rich food.
  - Adaptive Significance?
    - Dyed darker or lighter plumage on birds and observed female choice
    - ↑ red plumage, ↑ mating success
    - ↑ brighter plumage = better quality because = stronger defence against pathogens, more feeding done by the fathers to the young (more than twice than drabber males)
    - females can obtain indirect fitness since these males are better foragers

- Example: hormones changing behaviour
  - Parental care behaviour known to fluctuate with hormones
  - Testosterone and Castration of male mice (Clark and Galef)
    - ↑ testosterone levels in male mice, the time they spend in the nest with their young is approximately similar t the time they would spend in the nest empty (not much)
    - ↓ testosterone levels, male mice tend to spend significantly more time in the nest when there are young than when it was empty
  - Memory and stress (Dominique de Quervain)
    - Shows us how hormonal changes can be associated with spatial memory
    - High level of glucocortcoid hormones interfere and impede spatial memory
    - Corticosterone, a type of glucocorticoid hormone, showed a memory-inhibiting role and its effects are displayed after 30 mins of stress induction
    - Rats were given 8 trials in the water maze (normal, no stress) and they became better and better at finding the platform.
    - Before the 9^{th} trial, rats divided into 4 groups:
      - A: received shock 30 mins before placed in water maze
      - B: received shock 2 mins before placed in water maze
      - C: received shock 4 hours before placed in water maze
      - D: control group; received no shock
    - Results:
      - B and C spent approx same time near platform as the control group, no impaired spatial memory
      - A did show impaired spatial memory and had high levels of corticosterone
    - Shocked or injected → same result (recall corticosterone takes 30 mins to affect)
    - Metyrapone: corticosterone inhibitor injected before the shock → no impairment
- Example: Spatial memory and navigation in honeybees (Gene Robinson)
  - Mushroom shaped bodies (located in front of their brains) house neurons that are the memory consolidations for recalling food sites (hippocampus analog in humans)
  - The mechanisms of spatial navigation and neuroethology in invertebrates can help with questions regarding vertebrates
  - Foragers travel long distances outside hives for food
  - Foragers have a larger volume of mushroom body compared to rest of their brain and a larger mushroom body compared to nursing bees (14.8%)
  - The development of mushroom bodies can be accelerated by forcing juvenile bees to begin foraging
    - Began foraging at seven days of age and their mushroom bodies resembled that of normal aged foragers → neural plasticity

- 1 day old (reside within hive) < nurses (clean hive, feed larvae) < foragers (older bees that go outside) → but this is more due to their task than their age

Psychology 2TT3
Animal Behaviour Lecture 2
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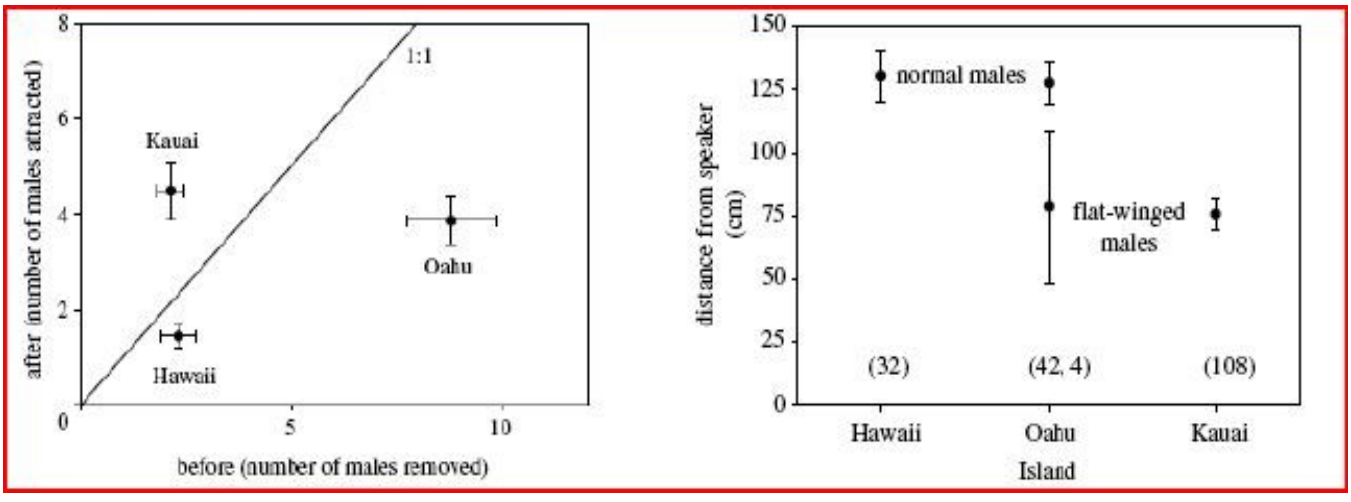
Chapter 1: Principles of Animal Behaviour

- Animal behaviour: is a self-generated movement of either a body part or the whole body
  - There are many species of animals but general classes of behaviour innate to all of them
    - Foraging: feeding habits
    - Social behaviour: family life
    - Mating
    - Predation
    - Fleeing from prey: require very little experience and seen right at the earlier age
      - Quando Omni Flunkus Moritati
        - When all else fails, play dead
        - Fight or flight response: rush of adrenaline when in a dangerous/threatening situation
          - Hypothalamus → adrenal gland → behavioural response
          - Basic intrinsic mechanism; very ancestral behaviour
- What is more scary: a snake or a car? Most people would say a snake. But the possibility of even getting a snake bite over running into a car is very miniscule. At least on pedestrian is dying everyday.
  - But snakes are more intimidating. This could be due to a biologically innate reaction.
  - Cars, fighting, and war: thousands die, are we ignoring other elements?

- Two things that can change/shape/help originate a behaviour: evolution and learning

  - Evolution: there is a change in proportion of heritable traits w/in a population; found over many generations
    - There must a trait that must be heritable and that have high reproductive advantage over other traits
    - Natural selection: a testable theory provided by Darwin
      - A process
      - Required 3 principles: 1) must be variation in trait, then difference within that trait can be seen; 2) fitness consequences: that trait should help animals survive AND reproduce; 3) the trait must be heritable and passed down to offsprings
    - Darwin:
      - Went on a 5 year voyage on the HMS Beagle
      - Sept 16th 1835: reached Galapagos Islands
      - 5 weeks spent on Galapagos Islands
      - Noticed that throughout the lay of the land, there were many different species of turtles

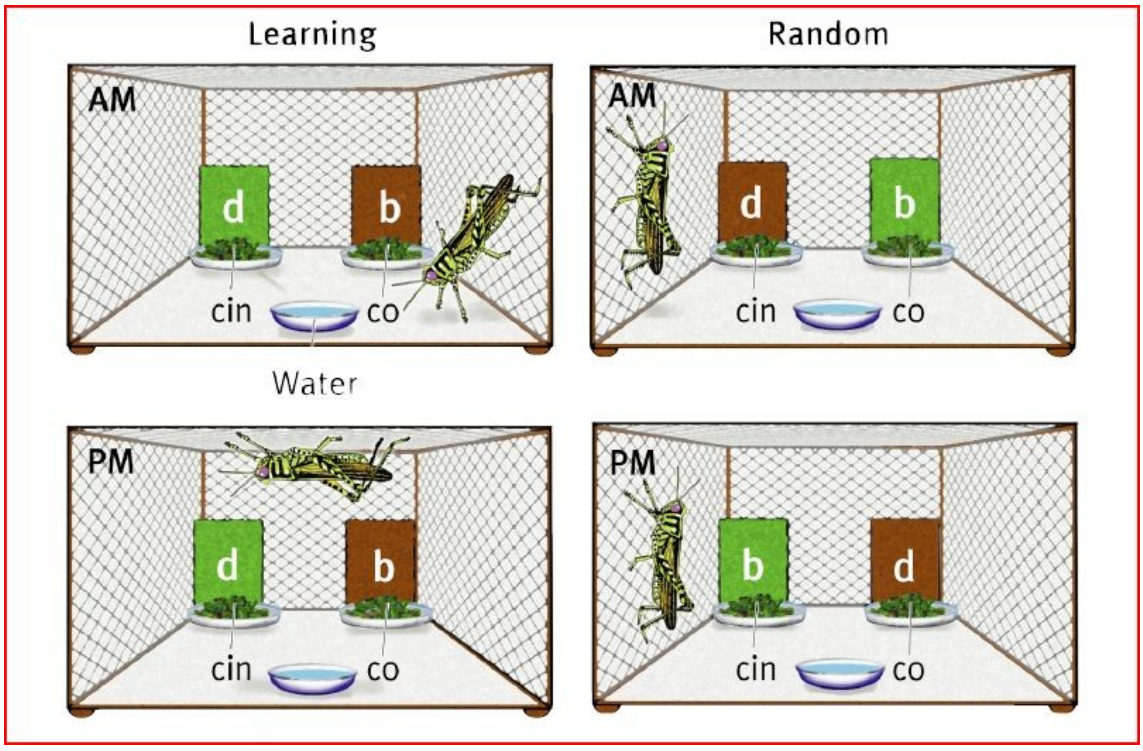
        - Turtles near coast more similar and turtles ranging farther from coast were more different
    - Wondered: why, on the same island, would you need a whole different bunch of turtles
    - Figured that species are not formed by God, there has to be some element of change
- Finches: evolution of a larger beak size
    - Heritable beak dimension was related to the kinds of food eaten
    - Large beaks can access whatever food including fruit with thorns, called caltrop, and are more efficient at cracking seeds
    - DRY YEARS:
        - Few small seeds found
        - Only tough seeds found like caltrop (small birds can't gain access)
    - WET YEARS:
        - Small seeds common
    - DROUGHT (1877-1878):
        - 80% finches killed
        - High selection pressure, unequal survival
        - Large beaked birds survived longer / were more likely to survive
        - Very big difference in proportion seen
- Crickets:
    - Males "sing" to attract females; in turn, tend to attract parasites too
        - Parasites lay eggs on the males, eggs hatch and eat male
    - Females refuse to mate with un-singing male crickets
    - Singing is possible in males b/c of the serrated edge of their wings rubbing together (females don't have them)
    - On islands: Kauai, Oahu, Hawaii, many singing crickets are prevalent
    - But parasitism most in Kauai > Oahu > Hawaii
    - What they found was that some males' wing shaped change to give a modified serrated edge that played no song (most of these kinds of males were found where parasitism was most prevalent (for surviving better against parasites)
    - Males on Kauai can survive longer, can't mate ∴ need a different mechanism for reproduction
    - Normally, males don't like to compete and so if they see that another male is already singing at a spot to attract a female, the other male would move to a different location to ensure that the female does not confuse herself between the two and pick the wrong guy
    - What they found with males with the flat wings was that, when recorders playing the songs were placed in spots on the islands, the un-singing males tended to move closer to the recorders



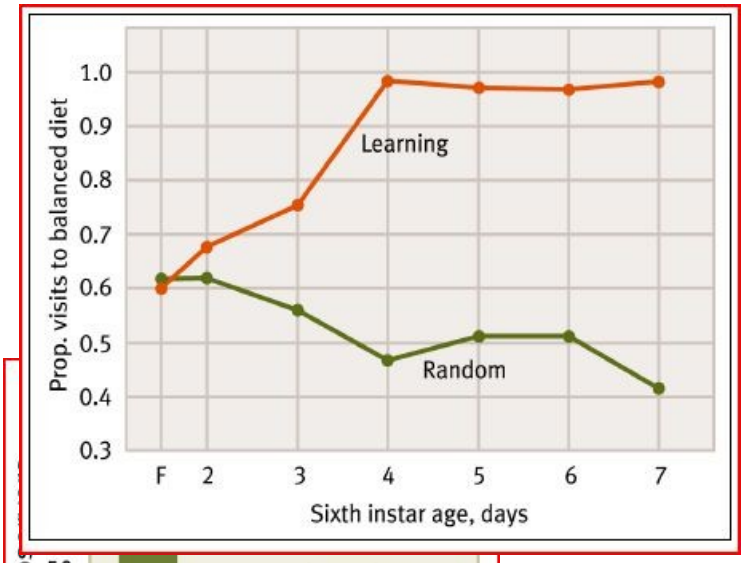
How far are they moving? Where parasitism is the highest, there is greater chance of danger of predation. Males are moving closer to the speaker box. The triangle on the left corner showcases males who can't sing. Right bottom corner shows males who can sing as there are less males present after song is being played.	Hawai: move the farthest Oahu: much closer to the speaker box

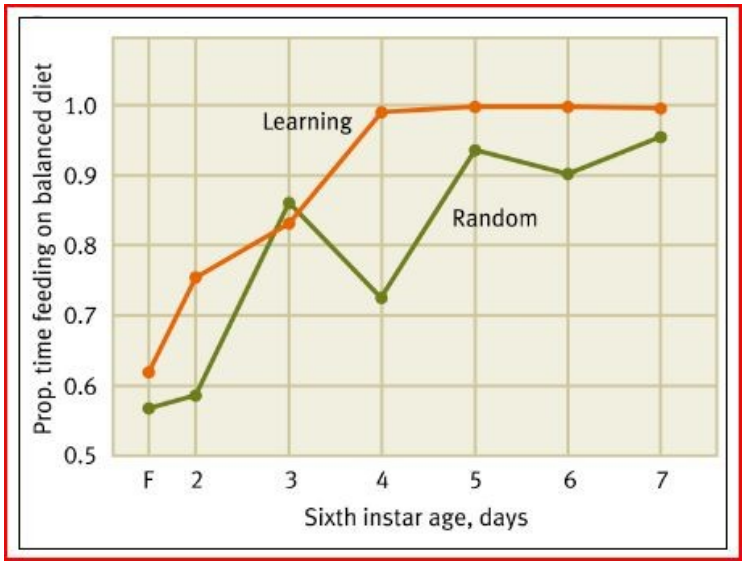
- Runway Selection Model:
  - Snowball effect: if no males are equipped to sing, choosiness is not a good thing. Some females may be less choosy and gain advantage.
- This example portrays change in behaviour as a result of selective pressure (can't sing, can't attract females themselves, then go towards "singer", in this case, the speaker box)

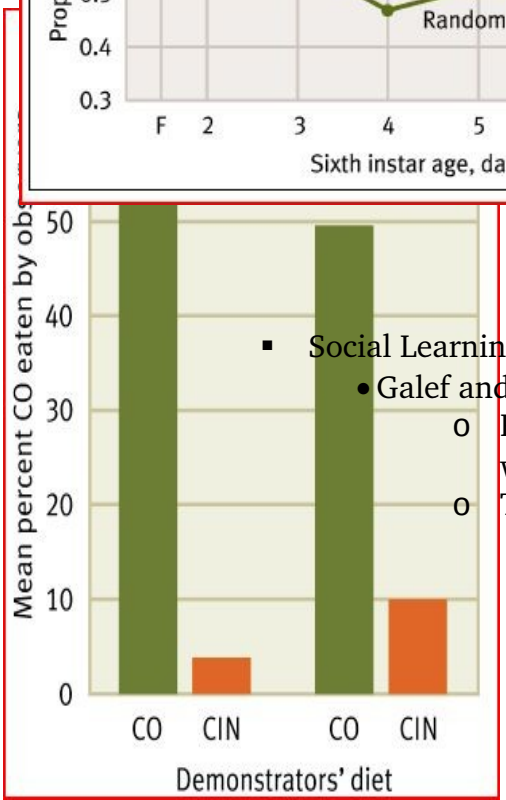
- Learning: some change that happens in the brain when you acquire new info, can be used to determine what/how to behave
  - Recognizing phenotypic characteristics of males, and to remember whether that male is of high reproductive success, can affect a female's choice
  - Dukas and grasshoppers
    - Knew that grasshoppers learn but what do they gain?
    - They learn what plant provides them the most nutrients and choose a particular healthy diet



So what do they gain from learning? Experiment growth rate of learning and non-learning grasshoppers	
Learning Situation: - Allowed to learn 'naturally' to prefer balanced over deficient diet lacking in complex carbs - The was a constant cue of colour and scent provided - Learn associatively to take the balanced diet due to confusion - Allowed a 20% higher growth rate and was at a faster rate than grasshoppers in the random situation, gaining advantage - Female eggs: larger number of eggs, larger size of eggs if there is higher growth rate	**Random Situation:** - Faced changing environment, made learning impossible - Cues and scents are mixed up for both diets - Beneficial diet in morning to the right, left at night - Grasshoppers can't form consistent association between cues and food - Their learning of cues was cemented in morning and they experienced confusion in the night and vice versa - Had to sample both diets each time - But do figure out in the daytime, which is the healthy one and at nighttime, which is the healthy one at that time and do spent most of their time around that diet







- Social Learning: learning from others (ex. Copying others)
  - Galef and rats:
    - Rats are very cautious to try novel foods. They'd rather sit back and watch what others do first instead. (safer)
    - The experiment concerned what the rats would do:
      - A rat was taken from a pack, AKA demonstrator rat (D.R)
      - (D.R) was provided a diet with a scent associated with it
      - (D.R) fed on it

- (D.R) put back in the pack taken from
- (D.R) allowed to interact w/ one another, sniff scent (15 min)
- Analyzed to show that the rat pack are now biased towards some foods
- If (D.R) eats something, observer rats and next generations observing the observer rats eat what (D.R) eats too. After hours same thing follows (for example, chocolate scented food (see image)
- Only avoided what (D.R) ate if they observed the (D.R) to be dead

- Mammals are not the only ones to learn from one another
    - Octopi near Italy are invertebrates that can copy each other after observing
    - Who can open the jar? Mimicking one who can

- Knowledge that is learned by an individual is lost when the individual dies
- With social learning, learning spreads and remains with subsequent generations of a population