

Honors Seminar 259 — cheat sheet for 11/5/2008 — Andrew Baker

Krützen et al. (2005)

You should read the whole article. Key questions:

1. What is the authors' working definition of "culture", and in what species has this phenomenon been observed?
2. What is the significance of the authors' endorsement of "the approach suggested by Whitten et al., which hinges on dismissing alternative explanations for the observed behavior, in particular ecological and genetic ones"?
3. How do the authors rule out the scenario that sponging is a behavior driven principally by the properties of the environment?
4. Table 1 shows that the "sponging" dolphins in this study almost all share the same (haplo)type of mitochondrial DNA. What exactly does this fact suggest about how sponging is passed from one generation to the next?
5. Why don't male dolphins sponge? (Are they just not as smart?)
6. How does the "cultural diversity within a population" identified here compare to cultural diversity within primate species?
7. What broader implications does this work have for the evolution of intelligence?

Key terms:

- **allele** = a particular version of a gene
- **assortative mating** = a behavior pattern in which individuals tend to mate (or tend to avoid mating) with other individuals whom they resemble in one or more respects; this is different from *random* mating
- **autosomal** = adjective that describes inheritance mechanisms that do *not* involve the X and Y chromosomes that determine sex
- **cetacean** = any member of the taxonomic order that includes whales, dolphins, and porpoises
- **coancestry coefficient** = a number that characterizes the fraction of two individuals' ancestors that they have in common
- **conspecific** = a fellow member of the same species
- **expression** = the manifestation of a gene in an organism's observed traits (a gene is *expressed* if it is "turned on")
- **fission-fusion society** = a form of social organization in which animals spend part of the day in small groups that for the rest of the day merge together into a larger group

- **fixed kernel utilization distribution** = in the context of this paper, a map of the likely distribution of sponging behavior that is based on assumptions about the range covered by individual dolphins (these assumptions are embodied in the “fixed kernel”)
- **haplotype** = any collection of alleles that is transmitted as a unit (e.g., as part of a chromosome or as an entire mitochondrial DNA sequence) from one generation to the next
- **heterozygote deficit** = a pattern observed in species that tend to divide into distinct, non-intermingling sub-populations, in which there are few individuals that contain genetic contributions from *both* sub-populations
- **hypervariable microsatellite locus** = a region in a DNA sequence that (a) can contain one of a large number of possible alleles, and (b) consists of several repeating base pair units
- **longitudinal** = adjective describing a study that involves repeated observations of the same individuals at many different times
- **mtDNA** = mitochondrial DNA
- **one-zero sampling** = an approach to scoring animal behavior studies in which a behavior is given a “1” if it occurs at least once within some period of time, and a “0” otherwise
- **polygenic** = adjective describing a phenotypic (observed) trait that depends on *multiple* genes
- **recombination** = the swapping of material between different DNA strands (in eukaryotic organisms, this happens most frequently during *meiosis*, the process by which gametes are generated)
- **rostrum** = the “bottle nose” of the bottlenose dolphin
- **single-locus trait** = a phenotypic (observed) trait that depends on only a single gene

Prior et al. (2008)

You should read the whole article; you may wish to read the “Materials and Methods” section at the end of the paper *first*, so that the references to magpie behavior in the body of the paper make more sense. Also, you may wish to look at the online videos that are linked to the class web page (partly educational, partly entertaining). Key questions:

1. What evidence do the authors cite for variation of intelligence *between* and *within* species?
2. What evolutionary pressures might make the magpie (relative to other bird species) more likely to show complex intelligent behaviors?

3. What arguments do the authors make against the possibility that the observed behaviors are merely random chance?
4. What are the “control” aspects of this experiment?
5. What broader implications does this work have for the evolution of intelligence?

Key terms:

- **agonistic** = adjective describing hostile behavior (either aggressive or defensive) towards a member of the same species
- **allometric** = adjective describing any scaling relation between two properties of living organisms
- **corvid** = any member of the crow family
- **empathy** = in the context of animal behavior, the capacity to understand what another organism is thinking or feeling (this is not the same thing as sympathy!)
- **forebrain** = the most forward portion of the (vertebrate) brain relative to the spinal column; in humans, the forebrain is dominated by the *cerebrum*, which is the site of critical thinking
- **homologous trait** = a property shared by two species because of common ancestry (as reflected by similar genetic sequences) rather than because of convergent evolution
- **laminated cortex** = multiple-layered outer surface of the brain
- **neocortex** = a particular tissue within the cerebral cortex (the outer layer of the cerebrum), which in humans constitutes the bulk of the cerebral cortex
- **operant conditioning** = behavior modification by reward and punishment, respectively, of voluntary actions that are desired and undesired
- **pallium** = in vertebrates, another term for the cerebral cortex
- **[Piagetian] object permanence** = the awareness on the part of an organism that an object continues to exist even when it cannot be seen (the term “object permanence” was coined by the Swiss philosopher Jean Piaget)
- **somesthetic** = adjective referring to sensory input that comes via the body