

Evolution of Animal Form & Function

ECOL 330 | Fall 2009



Some suggestions for topics of article-based projects:

1) Endurance running, marathons, and limits to athletic performance in humans and other animals

Bramble, D. M., and D. E. Lieberman. 2004. Endurance running and the evolution of *Homo*. *Nature* 432:345-352.
Currie, P. 2004. Muscling in on hominid evolution. *Nature* 428:373-374.

Holden, C. 2004. Peering under the hood of Africa's runners. *Science* 305:637-639.

Spinney, L. 2004. Gasping for victory. *Nature* 430:608

Usherwood, J. R., and A. M. Wilson. 2005. No force limit on greyhound sprint speed. *Nature* 438:753-754.

2) Polymorphism in tadpoles in relation to predation and drought risks; Alternative mating strategies and morphology of horned beetles

van Buskirk, J., and S. A. McCollum. 2000. Functional mechanisms of an inducible defense in tadpoles: morphology and behaviour influence mortality risk from predation. *Journal of Evolutionary Biology* 13:336-347.

Relyea, R. A. 2001. Morphological and behavioral plasticity of larval anurans in response to different predators. *Ecology* 82(2):523-540.

Relyea, R. A. 2002. Competitor-induced plasticity in tadpoles: Consequences, cues, and connections to predator-induced plasticity. *Ecological Monographs* 72:523-540.

Emlen, D. J. 2000. Integrating development with evolution: A case study with beetle horns. *BioScience* 50:403-418.

3) Developing new contraceptives for men

Schultz, N., F. K. Hamra, and D. L. Garbers. 2003. A multitude of genes expressed solely in meiotic or postmeiotic spermatogenic cells offers a myriad of contraceptive targets. *Proceedings of the National Academy of Science of the United States* 100:12201-12206.

4) Learning in your sleep

Shank, S. S. & Margoliash, D. 2009 Sleep and sensorimotor integration during early vocal learning in a songbird. *Nature* 458, 73-77.

5) How to forget quickly...

Anderson, M. C., K. N. Ochsner, B. Kuhl, J. Cooper, E. Robertson, S. W. Gabrieli, G. H. Glover et al. 2004. Neural systems underlying the suppression of unwanted memories. *Science* 303:232-235.

6) Sexual selection and water pollution in cichlids

Seehausen, O., J. J. M. V. Alphen, and F. Witte. 1997. Cichlid fish diversity threatened by eutrophication that curbs sexual selection. *Science* 277:1808-1811.

Seehausen, O., P. J. Mayhew, and J. J. M. Van Alphen. 1999. Evolution of colour patterns in East African cichlid fish. *Journal of Evolutionary Biology* 12:514-534.

Deutsch, J. C. 1997. Colour diversification in Malawi cichlids: evidence for adaptation, reinforcement or sexual selection. *Biological Journal of Linnean Society* 62:1-14.

7) Rapid morphological evolution of diverse foraging apparatus in cichlids

Galis, F., and E. G. Drucker. 1996. Pharyngeal biting mechanics in centrarchid and cichlid fishes: insights into a key evolutionary innovation. *Journal of Evolutionary Biology* 9:641-670.

Liem, K. F. 1980. Adaptive significance of intra- and interspecific differences in the feeding repertoires of cichlids fishes. *American Zoologist* 20:295-314.

Meyer, A. 1990. Morphometrics and allometry in the trophically polymorphic cichlid fish: Alternative adaptations and ontogenetic changes in shape. *Journal of Zoology* 221:237-260.

8) Evolution of sexual differences in height in humans; Reasons for timing differences in growth spurts and puberty between the sexes

Holden, C., and R. Mace. 1999. Sexual dimorphism in stature and women's work: a phylogenetic cross-cultural analysis. *American Journal of Physical Anthropology* 110:27-45.

Bielicki, T., and J. Charzewski. 1977. Sex differences in the magnitude of statural gains of offspring over parents. *Human Biology* 49:265-277.

Gray, J. P., and L. D. Wolfe. 1980. Height and sexual dimorphism of stature among human societies. *American Journal of Physical Anthropology* 53:441-456.

Hall, R. L. 1978. Sexual dimorphism for size in seven 19th century Northwest coast populations. *Human Biology* 50:159-171.

Leigh, S. R. 1996. Evolution of human growth spurts. *American Journal of Physical Anthropology* 101:455-474.

9) Maternal size limits sexual size dimorphism in humans

Guégan, J.-F., A. T. Teriokhin, and F. Thomas. 2000. Human fertility variation, size-related obstetrical performance and the evolution of sexual stature dimorphism. *Proceedings of Royal Society, Lond. Series B.* 267:2529-2535.

Mascie-Taylor, C. G. N., and J. L. Boldsen. 1988. Assortative mating, differential fertility and abnormal pregnancy outcome. *Annals of Human Biology* 15:223-228.

10) Shrinking birds and mammals – adaptations to migration and hibernation involve shrinking of internal organs

Piersma, T., and J. Drent. 2003. Phenotypic flexibility and the evolution of organismal design. *Trends in Ecology & Evolution* 18:228-233.

11) Hormones and pair-bonds in humans

Burnham, T. C., J. F. Chapman, P. B. Gray, M. H. McIntyre, S. F. Lipson, and P. T. Ellison. 2003. Men in committed, romantic relationships have lower testosterone. *Hormones and Behavior* 44:119-122.

12) Asymmetry in morphology of partners and sex in humans

Thornhill, R., Gangestad, S.W., Comer, R. 1995. Human female orgasm and mate fluctuating asymmetry. *Animal Behaviour* 50: 1601- 1615.

Gangestad, S. W., & Thornhill, R. (1998). Menstrual cycle variation in women's preferences for the scent of symmetrical men. *Proceedings of the Royal Society of London B*, 265, 727-733

Gangestad, S. W., and R. Thornhill. 1997. The evolutionary psychology of extrapair sex: The role of fluctuating asymmetry. *Evolution and Human Behavior* 18:69-88.

Thornhill, R./Gangestad, S.W. 1994. Fluctuating asymmetry correlates with lifetime sex partner numbers and age at first sex in *Homo sapiens*. *Psychological Science* 5: 297—302

13) Preferences for sexual traits in humans: Attractive and unattractive voices, faces, odors

Collins, S.A. and C. Missing. 2003. Vocal and visual attractiveness are related in women. *Animal Behaviour* 65: 997-1004

Kuukasjärvi, S., C. J. P. Eriksson, E. Koskela, T. Mappes, K. Nissinen, and M. J. Rantala. 2004. Attractiveness of women's body odors over the menstrual cycle: the role of oral contraceptives and receiver sex. *Behavioral Ecology* 15:579-584.

Bruckert, L., J.-S. Liénard, A. Lacroix, M. Kreutzer, and G. Leboucher. 2006. Women use voice parameters to assess men's characteristics. *Proc. R. Soc. Lond. B* 273:83-89.

14) Preference of certain body types across human cultures

Dixson, A.F., G. Hallowell, R. East, P. Wignarajah, M. J. Anderson. 2003. Masculine somatotypes and hirsuteness as determinants of sexual attractiveness to women. *Archives of Sexual Behavior* 32 (1) 29-39.

Tovee, M. J., P. J. B. Hancock, S. Mahmoodi, B. R. R. Singleton, and P. L. Cornelissen. 2002. Human female attractiveness: waveform analysis of body shape. *Proc. R. Soc. Lond. B* 269:2205-2213.

15) Temperature of incubation determines sex of an embryo

Mittwoch, U. 1996. Sex-determining mechanisms in animals. *Trends in Ecology and Evolution* 11:63-67.

Crews, D. 1996. Temperature-dependent sex determination: The interplay of steroid hormones and temperature. *Zoological Science* 13:1-13.

Rhen, T., E. Willingham, J. T. Sakata, and D. Crews. 1999. Incubation temperature influences sex-steroid levels in juvenile red-eared slider turtles, *Trachemys scripta*, a species with temperature-dependent sex determination. *Biology of Reproduction* 61:1275-1280.

16) Amazing variations in feathers of domestic birds and ways to create them

Bartels, T. 2003. Variations in the morphology, distribution, and arrangement of feathers in domesticated birds. *Journal of Experimental Zoology* 298B:91-108.

Prum, R. O., and S. Williamson. 2002. Reaction-diffusion models of within-feather pigmentation patterning. *Proc. R. Soc. Lond* 269:781-792

Badyaev, A. V., and E. A. Landeen. 2007. Developmental evolution of sexual ornamentation: Model and a test of feather growth and pigmentation. *Integrative and Comparative Biology* 47:221-233.

17) Conservation biology and sexual selection

Wedekind, C. 2002. Sexual selection and life-history decisions: Implications for supportive breeding and the management of captive populations. *Conservation Biology* 16:1204-1211.

Hill, G. E. 1995. Ornamental traits as indicators of environmental health. *BioScience* 45:25-31.

Gilligan, D. M., and R. Frankham. 2003. Dynamics of genetic adaptation to captivity. *Conservation Genetics* 4:189-197.

18) Human faces, voices and odors: Electing politician and selecting mates

Todorov, A., A. N. Mandisodza, A. Goren, and C. C. Hall. 2005. Inferences of competence from faces predict election outcomes. *Science* 308:1623-1626.

Wyatt, T. D. 2009 Fifty years of pheromones. *Nature* 457, 262-263.

Bruckert, L., Liénard, J.-S., Lacroix, A., Kreutzer, M. & Leboucher, G. 2006 Women use voice parameters to assess men's characteristics. *Proc. R. Soc. Lond. B* 273, 83-89.

Webster, M. A., D. Kaping, Y. Mizokami, and P. Duhamel. 2004. Adaptation to natural facial categories. *Nature* 428:557-560

19) Mother birds put testosterone in eggs and make kids more aggressive and fast growing

Schwabl, H. 1996. Maternal testosterone in the avian egg enhances postnatal growth. *Comparative Biochemistry and Physiology* 114:271-276.

Schwabl, H. 1993. Yolk is a source of maternal testosterone for developing birds. *Proceedings of the National Academy of Sciences of the United States of America* 90:11446-11450.

Royle, N., P. F. Surai, and I. R. Hartley. 2001. Maternally derived androgens and antioxidants in bird eggs: complementary but opposite effects? *Behavioral Ecology* 12:380-385.

Petrie, M., H. Schwabl, N. Brande-Lavridsen, and T. Burke. 2001. Sex differences in avian yolk hormone levels. *Nature* 412:498.

20) Environmental stress and symmetry of dentition: Grizzlies and gorillas

Manning, J. T., and A. T. Chamberlain. 1994. Fluctuating asymmetry in gorilla canines: a sensitive indicator of environmental stress. *Proceedings of the Royal Society Biological Sciences Series B* 255:189-193

Badyaev, A. V. 1998. Environmental stress and developmental stability in dentition of the Yellowstone grizzly bears. *Behavioral Ecology* 9:339-344.

21) Evolution and ecology of bird flight – partridges run uphill using wings, saving energy in flight formations

Dial, K.P. 2003. Wing-assisted incline running and the evolution of flight. *Science* 299: 402-404

Dial, K. P. 2003. Evolution of avian locomotion: correlates of flight style, locomotor modules, nesting biology, body size, development, and the origin of flapping flight. *Auk* 120:941-952.

Weimerskirch, H., J. Martin, Y. Clerquin, P. Alexandre, and S. Jiraskova. 2001. Energy saving in flight formation. *Nature* 413:697-698.

22) Environmental sensitivity in growth differs between sexes

Badyaev, A. V. 2002. Growing apart: An ontogenetic perspective on the evolution of sexual size dimorphism. *Trends in Ecology and Evolution* 17:369-378.

Stini, W. A. 1969. Nutritional stress and growth: Sex difference in adaptive response. *American Journal of Physical Anthropology* 31:417-426.

Stinson, S. 1985. Sex differences in environmental sensitivity during growth and development. *Yearbook of Physical Anthropology* 28:123-147.

Sheldon, B. C., J. Merila, G. Lindgren, and H. Ellegren. 1998. Gender and environmental sensitivity in nestling collared flycatchers. *Ecology* 79:1939-1948.

23) Tool making, learning, and intelligence in animals

Emery, N. J., and N. S. Clayton. 2004. The mentality of crows: Convergent evolution of intelligence in corvids and apes. *Science* 306:1903-1907

Kenward, B., A. A. S. Weir, C. Rutz, and A. Kacelnik. 2005. Tool manufacture by naive juvenile crows. *Nature* 433:121.

Lonsdorf, E. V., L. Eberly, E., and A. E. Pusey. 2004. Sex differences in learning in chimpanzees. *Nature* 428:715-716.

24) Maternal nursing of sons and daughters in sexually dimorphic California sea lions

Ono, K. A., and D. J. Boness. 1996. Sexual dimorphism in sea lion pups: differential maternal investment, or sex-specific differences in energy allocation? *Behavioral Ecology and Sociobiology* 38:31-41.

25) Greater female investment for more attractive males

Petrie, M., and A. Williams. 1994. Peahens lay more eggs for peacocks with larger trains. *Proceedings of Royal Society, Lond. Series B.* 251:127-131.

Sheldon, B. C. 2000. Differential allocation: tests, mechanisms and implications. *Trends in Ecology and Evolution* 15:397-402.

26) Hormonal basis of trust

Kosfeld, M., M. Heinrichs, P. J. Zak, U. Fischbacher, and E. Fehr. 2005. Oxytocin increases trust in humans. *Nature* 435:673-676.

27) Conception probability depends on side of ovulation; Sex-determination at conception?

Fukuda, M., K. Fukuda, C. Y. Andersen, and A. G. Byskiv. 2000. Right-sided ovulation favors pregnancy more than left-sided ovulation. *Human Reproduction* 15:1921-1926.

James, W. H. 1996. Evidence that mammalian sex ratios at birth are partially controlled by parental hormone levels at the time of conception. *J. theor. Biol.* 180:271-286.

28) 30 hours to become male!

Mittwoch, U. 1993. Blastocysts prepare for the race to be male. *Human Reproduction* 8:1550-1555.

29) Sperm competition and cooperation

Moore, H. D. M., M. Martin, and T. R. Birkhead. 1999. No evidence for killer sperm or other selective interactions between human spermatozoa in ejaculates of different males in vitro. *Proceedings of the Royal Society Biological Sciences Series B* 266:2343-2350

Moore, H., K. Dvorakova, N. Jenkins, and W. Breed. 2002. Exceptional sperm cooperation in the wood mouse. *Nature* 418:174-178.

delBarco-Trillo, J., and M. H. Ferkin. 2004. Male mammals respond to a risk of sperm competition conveyed by odours of conspecific males. *Nature* 431:446-449

30) Temperature and hormonal effects on mammal coat color. How to recolor your pet cat (or lion)?

Ilijin, N. A., and V. N. Ilijin. 1930. Temperature effects on the color of the Siamese cat. *Journal of Heredity* 21:309-321.

West, P. M., and C. Packer. 2002. Sexual selection, temperature, and the lion's mane. *Science* 297:1339-1343.

31) How to climb waterfalls?

Gillis, G. B., and R. W. Blob. 2001. How muscles accommodate movement in different physical environments: aquatic vs. terrestrial locomotion in vertebrates. *Comparative Biochemistry and Physiology Part A* 131:61-75.

32) Why is limb regeneration possible in amphibians but not in reptiles, birds, and mammals?

Galis, F., G. P. Wagner, and E. L. Jockusch. 2003. Why is limb regeneration possible in amphibians but not in reptiles, birds, and mammals? *Evolution & Development* 5:208-220.

33) Poisonous newts and poison-resistant snakes that eat them

Brodie, E. D., Jr., B. J. Ridenhour, and E. D. Brodie, III. 2002. The evolutionary response of predators to dangerous prey: hotspots and coldspots in the geographic mosaic of coevolution between garter snakes and newts. *Evolution* 56(10):2067-2082.

Geffeney, S., E. D. Brodie, Jr., P. C. Ruben, and E. D. Brodie, III. 2002. Mechanisms of adaptation in a predator-prey arms race: TTX-resistant sodium channels. *Science* 297:1336-1339.

34) Many other topics...

Klar, A. J. S. 2003. Human handedness and scalp hair-whorl direction develop from a common genetic mechanism. *Genetics* 165:269-276.

Calsbeek, R., and T. B. Smith. 2003. Ocean currents mediate evolution on island lizards. *Nature* 426:552-555

Oddie, K. R. 2000. Size matters: competition between male and female great tit offspring. *Journal of Animal Ecology* 69:903-912.

Pongracz, P. 2003. Successful application of video-projected human images for signalling to dogs. *Ethology* 109:809-821

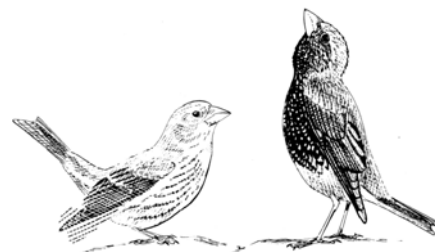
Saikawa, Y., K. Hashimoto, M. Nakata, and e. al. 2004. The red sweat of the hippopotamus. *Nature* 429:363.

Burnham, D., C. Kitamura, and U. Vollmer-Conna. 2002. What's New, Pusycat? On Talking to Babies and Animals. *Science* 296:1435.

Galis, F., and J. A. J. Metz. 2003. Anti-cancer selection as a source of developmental and evolutionary constraints. *BioEssays* 25:1035-1039

Hill, R. A., and R. A. Barton. 2005. Red enhances human performance in contests. *Nature* 435:293.

Packer, C., R. Hilborn, A. Mosser, B. Kissui, M. Borner, G. Hopcraft, B. Wilmshurst et al. 2005. Ecological change, group territoriality, and population dynamics in Serengeti lions. *Science* 307:390-393.



Fry, B. G., et al. 2006 Early evolution of the venom system in lizards and snakes. *Nature* 439, 584-588.
