Foundations of Evolutionary Genetics

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Spring 2019

►► Main Paper (Read and respond using form)
► Background Paper (Usually an older original source or current review article, read an use to inform discussion)
– Supplementary (Optional, reading will enhance understanding)

1 January 16: Introduction: Darwin, 160 years later

**Note:* No response form due this week.

►► Mallet J, 2008. Mayr's view of Darwin: was Darwin wrong about speciation? Biological Journal of the Linnean Society 95(1):3–16.
URL http://dx.doi.org/10.1111/j.1095-8312.2008.01089.x

► Darwin C, 1859. On the Origin of Species by Means of Natural Selection; or the Preservation of Favoured Races in the Struggle for Life, D. Appleton, New York, chapter Chapter 3: Struggle for Existince. pp. 71–90.
URL http://www.blackwellpublishing.com/ridley/classictexts/darwin1.pdf

– Mayr E, 1972. Lamarck revisited. Journal of the History of Biology 5(1):55–94.
URL http://dx.doi.org/10.1007/bf02113486

– Mayr E, 2000. Darwin's influence on modern thought. Scientific American .
URL https://www.scientificamerican.com/article/darwins-influence-on-modern-thought/

– Hull DL, 2005. Deconstructing Darwin: evolutionary theory in context. Journal of the History of Biology 38(1):137–152.
URL http://dx.doi.org/10.1007/s10739-004-6514-1

– https://plato.stanford.edu/entries/evolution-to-1872/

2 January 23: Population Genetics I: Wright-Fisher Populations

►► Wade MJ, Goodnight CJ, 1998. The theories of Fisher and Wright in the context of metapopulations: when nature does many small experiments. Evolution 52(6):1537.
URL http://dx.doi.org/10.2307/2411328

► Wright S, 1932. The roles of mutation, inbreeding, crossbreeding, and selection in evolution. Proceedings of the Sixth International Congress of Genetics 1:356–366.
URL http://www.blackwellpublishing.com/ridley/classictexts/wright.pdf

– Coyne JA, Barton NH, Turelli M, 1997. A critique of Sewall Wright's Shifting Balance Theory of Evolution. Evolution 51(3):643–671.
URL http://dx.doi.org/10.1111/j.1558-5646.1997.tb03650.x

– Coyne JA, Barton NH, Turelli M, 2000. Is Wright's Shifting Balance process important in evolution? Evolution 54(1):306–317.
URL http://dx.doi.org/10.1111/j.0014-3820.2000.tb00033.x

– Fisher RA, 1930. The genetical theory of natural selection. Clarendon, Oxford .
URL http://www.blackwellpublishing.com/ridley/classictexts/king.pdf

3 January 30: Population Genetics II: Fitness and Selection

►► Lewontin RC, 1970. The units of selection. Annual Review of Ecology and Systematics 1:1–18.
URL https://www.jstor.org/stable/2096764

► Orr HA, 2009. Fitness and its role in evolutionary genetics. Nature Reviews Genetics 10(8):531–539.
URL https://search.proquest.com/docview/223750183

4 February 6: Population Genetics III: Measuring Selection from Molecular Population Data

►► Akey JM, Eberle MA, Rieder MJ, Carlson CS, Shriver MD, Nickerson DA, Kruglyak L, 2004. Population history and natural selection shape patterns of genetic variation in 132 genes. PLoS Biology 2(10):e286.
URL http://dx.doi.org/10.1371/journal.pbio.0020286

– The 1000 Genomes Project Consortium, 2015. A global reference for human genetic variation. Nature 526(7571):68–74.
URL http://dx.doi.org/10.1038/nature15393

5 February 13: Heritability and Components of Variation

►► Keller LF, Grant PR, Grant BR, Petren K, 2001. Heritability of morphological traits in Darwin's Finches: misidentified paternity and maternal effects. Heredity 87(3):325–336.
URL http://dx.doi.org/10.1046/j.1365-2540.2001.00900.x

► Visscher PM, Hill WG, Wray NR, 2008. Heritability in the genomics era: concepts and misconceptions. Nature Reviews Genetics 9(4):255–266.
URL http://dx.doi.org/10.1038/nrg2322

– Morrissey MB, Kruuk LEB, Wilson AJ, 2010. The danger of applying the Breeder's Equation in observational studies of natural populations. Journal of Evolutionary Biology 23(11):2277–2288.
URL http://dx.doi.org/10.1111/j.1420-9101.2010.02084.x

– Wright S, 1920. The relative importance of heredity and environment in determining the piebald pattern of guinea-pigs. Proceedings of the National Academy of Sciences of the United States of America 6(6):320–332.
URL http://dx.doi.org/10.2307/84353

6 Feburary 20: The Neutral Theory of Molecular Evolution

►► Fay JC, Wyckoff GJ, Wu CI, 2002. Testing the neutral theory of molecular evolution with genomic data from *Drosophila*. Nature 415(6875):1024–1026.
URL http://dx.doi.org/10.1038/4151024a

- ▶ Kern AD, Hahn MW, 2018. The Neutral Theory in light of natural selection. Molecular Biology and Evolution 35(6):1366–1371.
  URL http://dx.doi.org/10.1093/molbev/msy092

- ▶ Kimura M, 1968. Evolutionary rate at the molecular level. Nature 217(5129):624–626.
  URL http://www.blackwellpublishing.com/ridley/classictexts/kimura.pdf

- King JL, Jukes TH, 1969. Non-Darwinian evolution. Science 164(3881):788–798.
  URL http://www.blackwellpublishing.com/ridley/classictexts/king.pdf

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  URL http://ib.berkeley.edu/labs/slatkin/popgenjclub/pdf/ohta-gillespie1996.pdf

- Nei M, 2007. The new mutation theory of phenotypic evolution. Proceedings of the National Academy of Sciences 104(30):12235–12242.
  URL http://dx.doi.org/10.1073/pnas.0703349104

7 February 27: Recombination and Linkage Disequilibrium

- ▶▶ Coop G, Wen X, Ober C, Pritchard JK, Przeworski M, 2008. High-resolution mapping of crossovers reveals extensive variation in fine-scale recombination patterns among humans. Science 319(5868):1395–1398.
  URL http://dx.doi.org/10.1126/science.1151851

- ▶ Weiss KM, Clark AG, 2002. Linkage disequilibrium and the mapping of complex human traits. Trends in Genetics 18(1):19–24.
  URL http://dx.doi.org/10.1016/s0168-9525(01)02550-1

- Pritchard JK, Przeworski M, 2001. Linkage disequilibrium in humans: models and data. The American Journal of Human Genetics 69(1):1–14.
  URL http://dx.doi.org/10.1086/321275

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  URL http://dx.doi.org/10.1038/nature11632

8 March 6: Local Adaptation and Clines

- ▶▶ Turner TL, Bourne EC, Wettberg EJV, Hu TT, Nuzhdin SV, 2010. Population resequencing reveals local adaptation of *Arabidopsis lyrata* to serpentine soils. Nature Genetics 42(3):260–263.
  URL http://dx.doi.org/10.1038/ng.515

- ▶ Haldane JBS, 1948. The theory of a cline. Journal of Genetics 48(3):277–284.
  URL http://dx.doi.org/10.1007/bf02986626

- Li YF, Costello JC, Holloway AK, Hahn MW, 2008. "Reverse Ecology" and the power of population genomics. Evolution 62(12):2984–2994.
  URL http://dx.doi.org/10.1111/j.1558-5646.2008.00486.x

9 *March 13: No Meeting for Spring Break*

10 March 20: Evolutionary Game Theory

►► Turner PE, Chao L, 2003. Escape from Prisoner's Dilemma in RNA phage Φ6. The American Naturalist 161:497–505.
URL http://dx.doi.org/10.1086/367880

► Turner PE, Chao L, 1999. Prisoner's Dilemma in an RNA virus. Nature 398(6726):441–443.
URL http://dx.doi.org/10.1038/18913

► Axelrod R, Hamilton WD, 1981. The evolution of cooperation. Science 211(4489):1390–1396.
URL http://www.jstor.org/stable/1685895

– Smith JM, Price GR, 1973. The logic of animal conflict. Nature 246(5427):15–18.
URL http://dx.doi.org/10.1038/246015a0

11 March 27: Molecular Phylogenetics

►► Jarvis ED, Mirarab S, Aberer AJ, Li B, Houde P, Li C, Ho SYW, Faircloth BC, Nabholz B, Howard JT, et al., 2014. Whole-genome analyses resolve early branches in the tree of life of modern birds. Science 346(6215):1320–1331.
URL http://dx.doi.org/10.1126/science.1253451

► Yang Z, Rannala B, 2012. Molecular phylogenetics: principles and practice. Nature Reviews Genetics 13(5):303–314.
URL http://dx.doi.org/10.1038/nrg3186

► Fitch WM, Margoliash E, 1967. Construction of phylogenetic trees. Science 155(3760):279–284.
URL http://dx.doi.org/10.1126/science.155.3760.279

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URL http://science.sciencemag.org/content/suppl/2001/12/13/294.5550.2310.DC1

12 April 3: Coevolution and Comparative Methods

►► Lagomarsino LP, Condamine FL, Antonelli A, Mulch A, Davis CC, 2016. The abiotic and biotic drivers of rapid diversification in Andean bellflowers (Campanulaceae). New Phytologist 210(4):1430–1442.
URL http://dx.doi.org/10.1111/nph.13920

► Boettiger C, Coop G, Ralph P, 2012. Is your phylogeny informative? measuring the power of comparative methods. Evolution 66(7):2240–2251.
URL http://dx.doi.org/10.1111/j.1558-5646.2011.01574.x

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URL http://dx.doi.org/10.1080/10635150701607033

– Davis MP, Midford PE, Maddison W, 2013. Exploring power and parameter estimation of the BiSSE method for analyzing species diversification. BMC Evolutionary Biology 13(1):38.
URL http://dx.doi.org/10.1186/1471-2148-13-38

– Rabosky DL, 2014. Automatic detection of key innovations, rate shifts, and diversity-dependence on phylogenetic trees. PLoS One 9(2):e89543. (.
URL http://dx.doi.org/10.1371/journal.pone.0089543

13 April 10: Controversies I: Adaptationism and "Spandrels"

►► Gould SJ, Lewontin RC, 1979. The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme. Proceedings of the Royal Society of London. Series B. Biological Sciences 205(1161):581–598.
URL http://dx.doi.org/10.1098/rspb.1979.0086

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URL http://dx.doi.org/10.1111/j.1558-5646.2009.00799.x

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14 April 17: Controversies II: Parallel and Convergent Adaptation

►► Colosimo PF, Hosemann KE, Balabhadra S, Jr GV, Dickson M, Grimwood J, Schmutz J, Myers RM, Schluter D, Kingsley DM, 2005. Widespread parallel evolution in sticklebacks by repeated fixation of ectodysplasin alleles. Science 307(5717):1928–1933.
URL http://dx.doi.org/10.1126/science.1107239

► Stern DL, 2013. The genetic causes of convergent evolution. Nature Reviews Genetics 14(11):751–764.
URL http://dx.doi.org/10.1038/nrg3483

15 April 24: Controversies III: Hybrid Speciation

►► Mavárez J, Salazar CA, Bermingham E, Salcedo C, Jiggins CD, Linares M, 2006. Speciation by hybridization in *Heliconius* butterflies. Nature 441(7095):868.
URL http://dx.doi.org/10.1038/nature04738

► Mallet J, Besansky N, Hahn MW, 2016. How reticulated are species? BioEssays 38(2):140–149.
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– Joron M, Papa R, Beltrán M, Chamberlain N, Mavárez J, Baxter S, Abanto M, Bermingham E, Humphray SJ, Rogers J, et al., 2006. A conserved supergene locus controls colour pattern diversity in *Heliconius* butterflies. PLoS Biology 4(10):1–10.
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URL http://dx.doi.org/10.1016/j.cub.2018.04.072

16 May 1: Controversies IV: Evolvability

►► Woods RJ, Barrick JE, Cooper TF, Shrestha U, Kauth MR, Lenski RE, 2011. Second-order selection for evolvability in a large *Escherichia coli* population. Science 331(6023):1433–1436.
URL http://dx.doi.org/10.1126/science.1198914

► Payne JL, Wagner A, 2019. The causes of evolvability and their evolution. Nature Reviews Genetics 20(1):24–38.
URL https://doi.org/10.1038/s41576-018-0069-z

► Lynch M, 2007. The frailty of adaptive hypotheses for the origins of organismal complexity. Proceedings of the National Academy of Sciences USA 104(suppl 1):8597–8604.
URL http://dx.doi.org/10.1073/pnas.0702207104

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URL https://doi.org/10.1038/nature10875