

AT A GLANCE FILM GUIDE

DESCRIPTION

Evolution is happening right now, everywhere around us, and adaptive changes can sweep through a population in an evolutionary eyeblink. Dr. Michael Nachman, working in the field and lab, has quantified predation on rock pocket mice and identified adaptive changes in coat-color genes that allow the mice to travel under the radar of hungry predators.

KEY CONCEPTS

- A mutation is a random change to an organism's DNA sequence.
- The environment contributes to determining whether a mutation is advantageous, deleterious, or neutral.
- Mutations that increase the fitness of an organism increase in frequency in a population.
- Evolution can happen quickly (in hundreds of years, or even less); advantageous genetic mutations can increase in frequency in a population quite rapidly, even if the fitness advantage to the organism is small.
- Different mutations in the same gene, or even mutations in different genes, can result in the same phenotype.
- While mutations can be random, natural selection is not random.
- Selective pressure depends on the environment in which an organism lives. This means that other organisms in the environment (in this case, the predators) can be a selective force.

CURRICULUM AND TEXTBOOK CONNECTIONS

Curriculum	Standards
NGSS (April 2013)	MS.LS2.A, MS.LS2.C, MS.LS3.A, MS.LS3.B, MS.LS4.B, MS.LS4.C HS.LS1.A, HS.LS2.A, HS.LS2.C, HS.LS3.A, HS.LS3.B, HS.LS4.B, HS.LS4.C
AP Biology (2012–13)	1.A.1, 1.A.2, 1.C.3, 3.C.1, 3.C.2
IB Biology (2009)	4.1, 5.4, D2
APES: Themes and Topics (2013)	Themes: 1, 3 Topics: II.A, II.C

Textbook	Chapter Sections
Miller and Levine, <i>Biology</i> (2010 ed.)	13.3, 16.3, 16.4, 17.1, 17.2
Reese et al., <i>Campbell Biology</i> (9th ed.)	1.2, 17.5, 22.2, 22.3, 23.1, 23.3, 23.4
Cunningham, <i>Environmental Science: A Global Concern</i> (11th ed.)	4.1, 4.2
Friedland, Relyea, and Courard-Hauri, <i>Environmental Science for AP*</i> (2012 ed.)	Chapter 5

PRIOR KNOWLEDGE

Students should

- have a basic understanding of natural selection, evolution, and adaptation;
- have a basic understanding of what a food web is and that organisms fill specific niches in their environments;
- know what a gene is and that genes can code for proteins that determine traits; and
- know that genes and the traits they produce are inherited and that some traits provide organisms with a greater chance to survive and reproduce.

KEY REFERENCES

Carroll, Sean B. "Evolution in Black and White." *Smithsonian Magazine*. February 10, 2009.

Nachman, Michael W., Hopi E. Hoekstra, and Susan L. D'Agostino. "The Genetic Basis of Adaptive Melanism in Pocket Mice." *Proceedings of the National Academy of Sciences* 100, no. 9 (April 29, 2003): 5268–5273.

You can find additional references in the *In-Depth Film Guide*.