1. Evolution
2. Quammen 1985, Red Sky Ch. 2
3. 206 Lab Website for handouts and assignments
4. Thank Taylor Edwards
5. Exam Wed 15 Feb

Modern Synthesis (Evolutionary Synthesis), 1930s

- Mendel (genetics, 1865)
- Darwin (natural selection, 1859)
- Paleontology (speciation, extinction, plate tectonics [Lyell Geology])

- Ernst Mayr (1942 Systematics and the Origin of Species)
- Theodosius Dobzhansky
- George Gaylord Simpson
- G. Ledyard Stebbins

Species = ?

Biological Species Concept (Mayr)
“a group of interbreeding populations that are reproductively isolated from other such groups”

2-morphological/typological species concept (plants)
3-evolutionary species concept
4-genetic species concept
5-paleontological species concept
6-cladistic species concept

Ernst Mayr interviewed in Campbell 1993

Ernst Mayr (1904-2005)
Published papers for > 80 years

Guy McPherson

"Threats to Biological Diversity in the Sky Islands: Can an Informed Citizenry Overcome Society?"

Guy McPherson, a professor at the University of Arizona, will address this question in his presentation on February 15, 2006, at the Sky Islands Alliance and Environmental Law Society speaker series. The event will be held on Wednesday, February 15, 2006, at 6 p.m. at the University of Arizona Rogers College of Law, 1201 E. Speedway Blvd., Room 140. The event is free and open to the public. For more information, call Sky Island Alliance at 624-7080 x209.

Abstract:

Development of a just, sustainable human enterprise requires us to acknowledge and account for the explicit links between environmental protection, social justice, and the human economy. This will require contributions from virtually every segment of society, and while striving for global ideals, we must start with local actions. I describe historical and contemporary "drivers" behind relatively coarse-scale ecosystems in the Sky Islands of the American Southwest. Cursory inspection of factors such as fire, livestock grazing, urbanization, biological invasions, and regional climate change indicates the important role played by the current generation of decision-makers in creating a just, sustainable future. I provide a general template and some specific examples that may facilitate the transition to sustainability.

Biographical sketch:

Guy R. McPherson is a professor in the University of Arizona’s School of Natural Resources, and he holds an adjunct appointment in the Department of Ecology & Evolutionary Biology. He is an award-winning researcher, teacher, and mentor. Read about his latest book, "Killing the Natives: Has the American Dream Become a Nightmare?" at http://en.groundspring.org/EmailNow/pub.php?module=URLTracker&cmd=track&j=61195702&u=563514

We hope to see you there!

Our March speaker event will be on March 9th with speaker Bruce Babbitt.
Biological Species Concept
1. Testable and operational
2. Definition compatible with established legal concepts
3. Focus on level of biodiversity that agrees with tradition of conservation

Conserve Species as TYPES or as EVOLUTARY UNITS

David Quammen 1985
Is Sex Necessary?
Natural Acts
- Parthenogenesis (“virgin birth”)
- Asexual vs. Sexual Reproduction
- Recombination

Aphids are excellent opportunists (v. equilibrium ‘K’ species)
- Asexual (rapid, exploitation)
- Then Sexual (shuffle the genes once/year)

Maintain
- variability
- diversity
- adaptability

1 aphid, 6 generations, \( \Rightarrow 318,000,000 \)

Mendelian Genetics
One gene
Two alleles
Dominant (purple)
Recessive (white)
DNA sequence Codes for Proteins etc.

**Genetic Code**

- **A** (adenine), **T** (thymine), **U** (uracil)
- **C** (cytosine), **G** (guanine)

<table>
<thead>
<tr>
<th>Coding sense strand</th>
<th>Template antisense strand</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATGGAATTCTCGCTC</td>
<td>TACCTTAAGAGCGAG</td>
</tr>
<tr>
<td>(5' -&gt; 3')</td>
<td>(5' -&gt; 3')</td>
</tr>
</tbody>
</table>

**Proteins of amino acids**

1. Transcription
2. Translation

**Result of Disruptive Selection** (Favors Both extremes)

**Disruptive Selection** (Favors Both extremes)

**Directional Stabilizing**

**Disruptive**

**Selection for Human Birth Weight**
Speciation often result of:
1. Geographic Isolation
2. Reproductive Isolation

Evolution by Natural Selection
vs. Lamarck

Stalk Eyed Flies
Sexual Selection

Galapagos Finches
Brassica oleracea

Alfred Wegener, winter 1912-1913
Crustal Plates moving 1-12 cm / year

Plate Tectonics
Convergent Evolution

Pangea 200 million years ago

Figure 19.3: This shows the base fit of South America and Africa along the continental edge at a depth of 1300 meters (about 4400 feet). The areas where continental blocks overlapped are in green. (After Ar. G. Smith, "Continental Drift," in Understanding the Earth, edited by E. G. Cress. Courtesy of Amaya Press.)

Figure 19.4: Results of molecular dating have been found on several scales of the South Atlantic, and reveal distinct phylogenetic relationships between various species. This figure illustrates how South America appears to link with Australia during the Late Pleistocene and Early Holocene.
Convergent Evolution

In many instances, animals which live in similar habitats resemble each other in outward appearance. These similar looking animals may, however, have quite different evolutionary origins.

Swifts, swallows and martins all hunt for insects while they fly. They have streamlined bodies with long wings.

Hummingbirds and sunbirds feed on nectar from flowers. They have long bills to reach the nectar at the base of flowers.

Based on appearance only we would conclude that sunbirds are related to hummingbirds and that swifts are related to swallows and martins. In reality, genetic techniques have shown that swifts are related to hummingbirds, while sunbirds are related to swallows and martins.

Threats:
1. Land Use Conversion (1/3 forests gone, ½ wetlands)
2. Land Degradation
3. Freshwater Shortages
4. Watercourse Modifications
5. Invasive Species
6. Overharvesting
7. Climate Change
8. Ozone Depletion
9. Pollution

Only need ~$30 billion/year to set aside 15% land area