Summary of Introduction to Evolutionary Biology

v0.1

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Preface

This document aims to summarize the lecture Introduction to Evolutionary Biology as it was taught in the autumn semester of 2017. Unfortunately I can't guarantee that it is complete and free of errors. You can contact me under **glebert@student.ethz.ch** if you have any suggestions for improvement. The newest version of this summary can always be found here: `https://n.ethz.ch/~glebert/`

1 Introduction

Definition: Evolution means biological change over time
Technical basis: Phenotypes of individuals that are encoded by heritable genotypes vary in a population and their frequencies change

1.1 History

Aristotle: Ladder of nature / perfection
Carl von Linné: Systematic classification of life
James Hutton & Charles Lyell: Gradual long-term processes shaped earth (Uniformitarianism)
Jean-Baptiste de Lamarck: Inheritance of acquired characteristics (Lamarckian evolution)
Charles Darwin: Evolution is descent with modification and results in survival of the fittest

1.2 Microevolution

direct observation: small time-scales → short-term changes

Evidence of Microevolution

1) Observation from natural populations
- Bacterial adaptation to antibiotic stress
- Soapberry bug adaptation to fruit

2) Observation from living anatomy
Vestigal and rudimentary traits
- Kiwi wings
- Human coccyx (Steissbein)
- Human arrector pili muscle (Haaraufrichter-Muskel)
- (Appendix might be safe house for good gut bacteria)

1.3 Speciation

Ring species are one species splitting into two. They provide evidence of speciation.

1.4 Macroevolution

indirect observation: long time-scales → long-term changes

Evidence of Macroevolution

1) Successions & Extinctions
Law of succession: pattern of correspondence between fossile and recent forms from the same locale
Comparative anatomy: Georges Cuvier argued that certain species are extinct. Recent macrofauna is only a fraction of all that ever existed

2) Transitional forms
Darwinian evolution predicts intermediate forms between a species and its ancestor (e.g. *Microraptor gui* and *Archaeopteryx* between dinosaurs and modern birds

3) Homologies (Owen: "the same organ in different animals under every variety of form and function) can be found through comparative anatomy and comparative embryology. The similarity is due to inheritance from a common ancestor. They are phenotypically and genetically defined and enable the use of model organisms.
Some molecular homologies are
- the universal genetic code: bases and codons
- the small-subunit (SSU) ribisomal RNA genes