

Course Outline

- 1) definitions and types of morphology
 - homology, analogy and importance of evolutionary perspective
 - science and hypothesis testing
 - historical treatment
- 2) development and classification
 - hexapods vs. insects, exopterygotes, endopterygotes, holometabolous, parometabolous, hemimetabolous, imago, stage, instar, imaginal discs, larvae, pupae, etc.
 - tagma and segmentation; serial homology
 - key evolutionary innovations of arthropods
 - anatomical terms (position and orientation)
 - sutures and sulci; sclerites and membranes
 - terms for muscles
- 3) Integument: structure and function
 - epidermis
 - cuticle: pro-, endo-, exo-, epi-, etc.
 - cuticle composition
 - molting and apolysis
 - setae
 - apodemes, apophyses, phragmata, coloration
- 4) Evolution of insect head
 - Snodgrass and Rempel
 - mouthparts and corresponding parts of the cranium and sutures/sulci
 - antenna, clypeus, labrum; mandibles, maxilla, labium, epi- and hypopharynx, cibarium; cibarial and pharyngeal pumps
 - labium and back of head
 - tentorium
- 5) Modifications of mouthparts in different insect groups
 - beetle and neuropteran larvae
 - Hymenoptera (bees)
 - Lepidoptera
 - thrips, lice, fleas
 - Hemiptera
 - Diptera (biting and non-biting)
- 6) Antennae: types and function
- 7) Thorax
 - primary vs. secondary segmentation
 - cervix
 - muscles used in flight (direct and indirect)
 - parts of notum; including flight muscle attachment
 - parts and origin of pleuron; function
 - parts and diversification of sternum
- 8) Legs and their modifications
- 9) Evolution of wings
 - Paleoptera and Neoptera
 - Axillary sclerites
 - wing regions, folds, and furrows
- 10) Wing venation: general pattern and ordinal diversification
 - wing coupling
 - wing modifications (e. g. elytra)
- 11) Musculature

- muscle types; flight muscles (again); mouthparts
- 12) The Abdomen
 - segmentation; numbers of segments; major modifications
 - epiproct and paraproct
 - appendages: fossil groundplan vs. present day forms
 - cerci and urogomphi
 - other abdominal modifications
 - gills, prolegs, Collembola; Microcoryphia
 - ovipositors: origins, types, and modifications
 - coxopodite (valvifer); stylus (gonostylus) and valvulae (gonapophyses)
- 13) Male genitalia
 - Odonata
 - Internal fertilization
 - lock and key concept; speciation
- 14) Arthropoda
 - Classification: 4 subphyla; 7 orders of Arachnida
 - Tagmata; segmentation; modification and homology of appendages (handout)