



BIG4
Biosystematics, Informatics, Genomics



seit 1558

Midterm Report

Si-Pei Liu 2016-10-14

+ Phyletisches Museum Jena, Germany



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Morphological background of flight and flightlessness

- Adaptations towards different modes of locomotion
- Flightlessness in Holometabola evolutionary history
- Different roles of thoracic muscles for movement

Lepidoptera



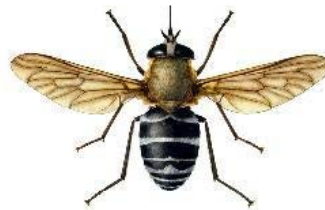
Hymenoptera



Coleoptera

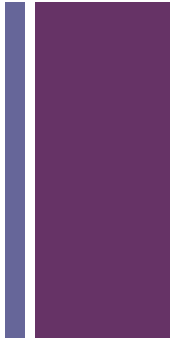


Diptera

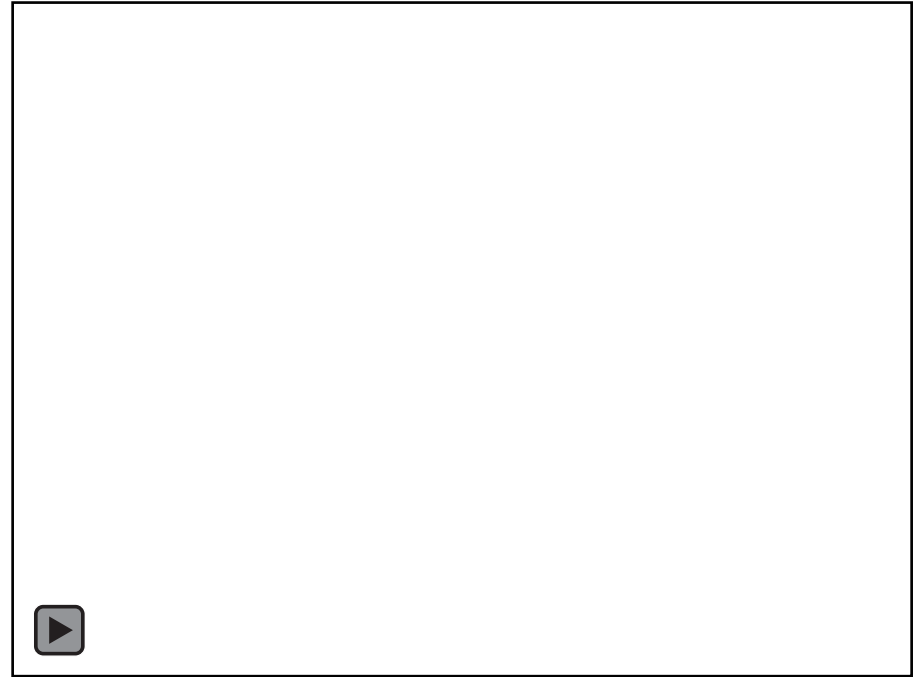




Methods: μ -Computer Tomography (μ -CT) & 3D-Reconstruction



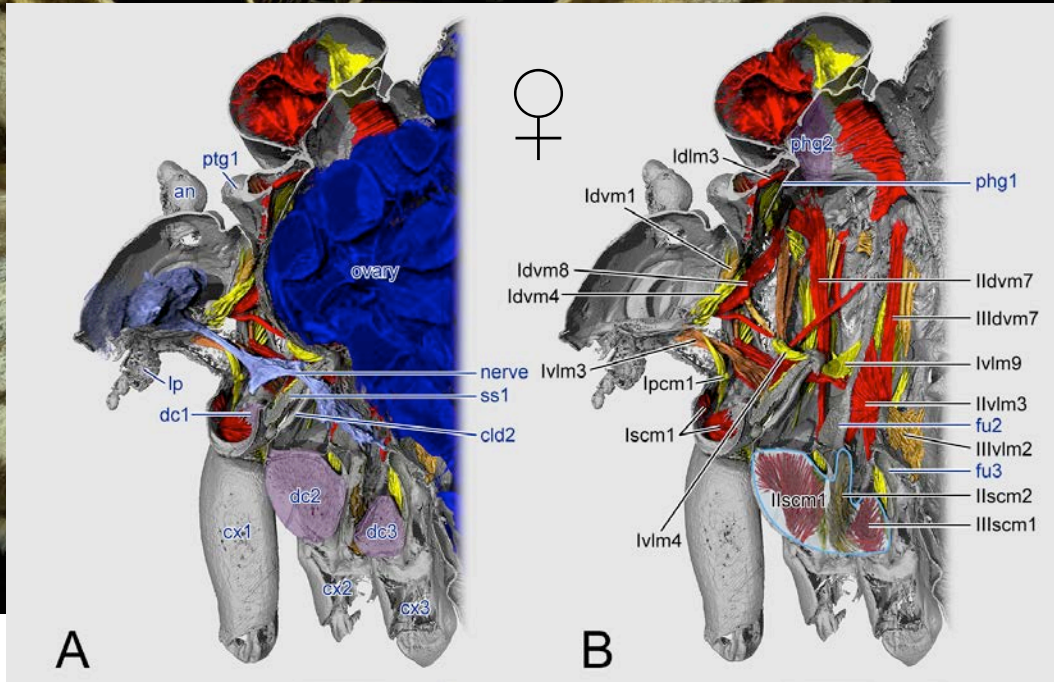
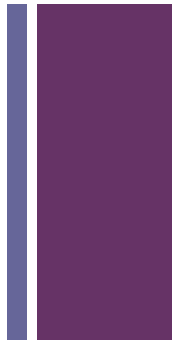
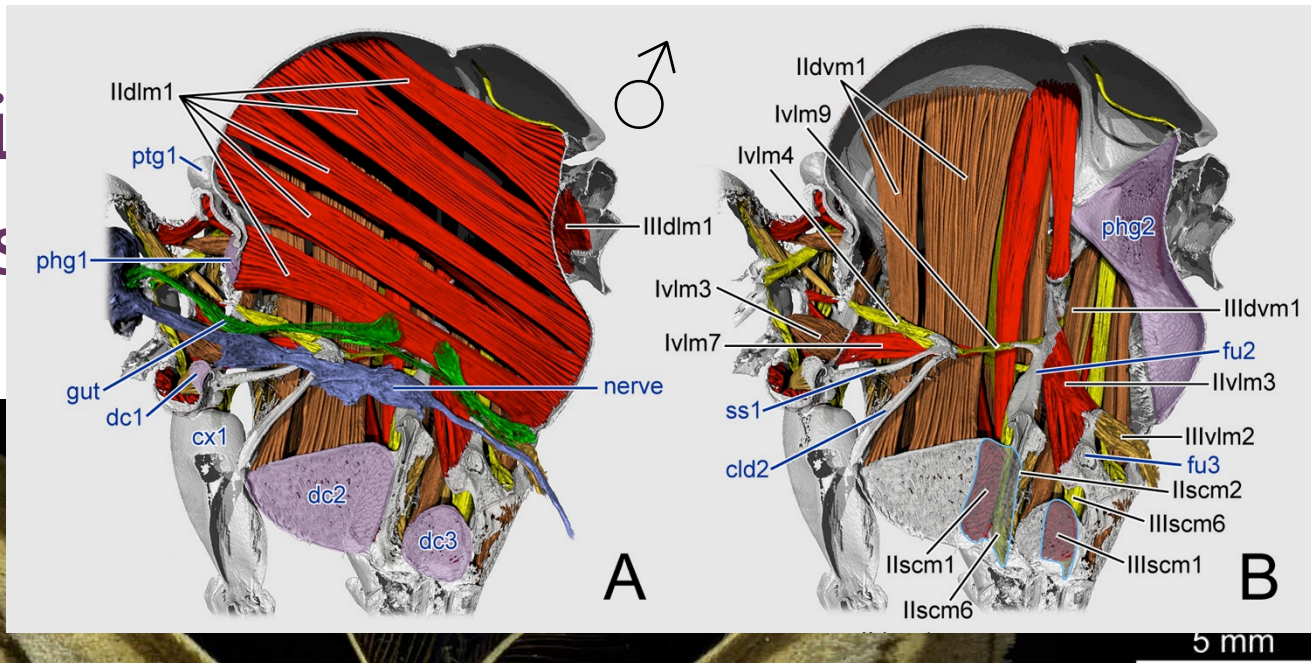
μ -CT



3D-Reconstruction

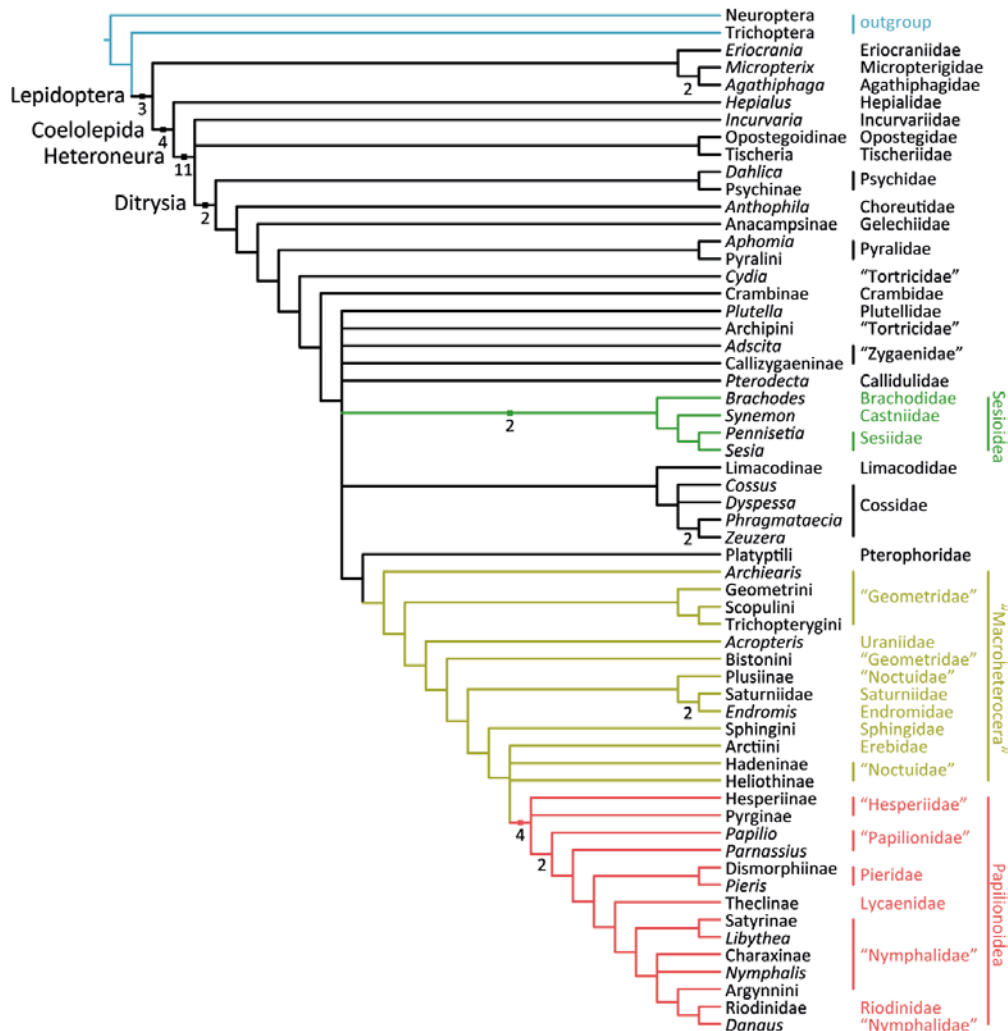
+

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Nys





Finished: Lepidopteran evolutionary implication from thorax



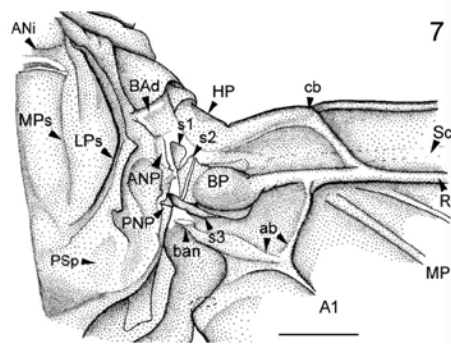
- With 59 terminals, referring to 111 lepidopteran taxa
- 160 muscular and skeletal characters
- Lepidoptera
Coelolepida
Heteroneura
Ditrysia
- **Papilionoidea**
Sesiioidea



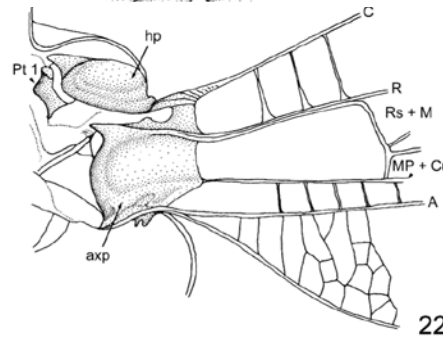
Finished: Unfolding-wing mechanism



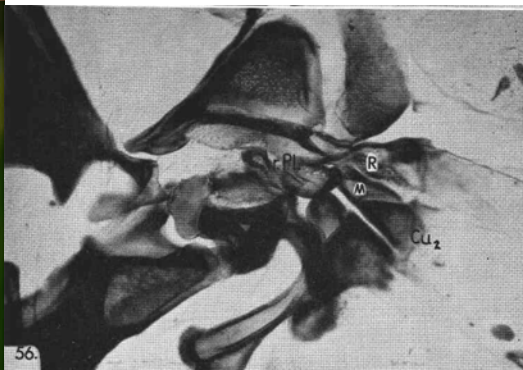
Ephemeroptera



Odonata



Lepidoptera



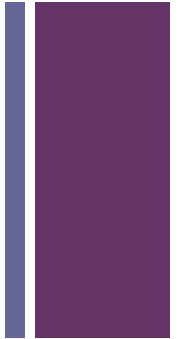
- Ephemeroptera, Odonata and **Lepidoptera** (**Papilionoidea**, **Bombyboidea** and **Geometridae**)
- Homologous musculature and sclerites, different shape and arrangement.
- Non-foldable wing base may be apomorphies for respective groups; foldable wing is groundplan for Pterygota.



- Musculature comparison:
- Between male and female *Nyssiodes lefuarius*;
- With other wingless female Geometridae (*Operophtera brumata*)
- With other wingless female Lepidoptera (Psychidae)



Next: thoracic 3D-reconstruction of *Orectochilus villosus* (Gyrinidae)



- 9 metathoracic muscles versus “primitive” 36.
- Still able to fly
- Exploration for muscle function



Impact on My Career



- Thinking independently and logically
- Good chance to learn newest ideas and techniques among European countries
- New foreign language – German
- Another angle of view to think about my country
- If you want to do it, just do it.



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