



Charlie Woodrow

Charlie Woodrow

POST-DOC IN POLLINATION
BIOMECHANICS

Postdoctoral researcher at Uppsala University using theoretical and empirical tools to study bee and flower vibrations and deploy micro-robotic actuators ("robo bees") to study buzz pollination.

CONTACT

-  Norbyvägen, Uppsala, Sweden
-  charlie.woodrow@ebc.uu.se
charlie.woodrow@gmail.com
-  +44 7508148101
-  @CharlieZoology

SKILLS

- Laser vibrometry, acoustics
- Mechanics, electronics
- Micro-CT, Synchrotron, 3D data
- Insect rearing/management
- Planning/conducting fieldwork
- Data analysis (R, Matlab, Excel)
- Writing, reviewing, publishing
- Grant writing, editing

SUMMARY

Evolutionary biologist with a drive to learn, create, and bridge techniques to investigate complex biological subjects across fields. I am a multi-disciplinary researcher interested in comparative morphology, bioacoustics, and biomechanics. Further experience spans broad themes from analytical chemistry, palaeontology, and wildlife handling to science communication.

EMPLOYMENT



Uppsala University

June 2023 - present

Post-doc. Human Frontier Science Program: Bridging robotics and pollination: Reconstructing a bee's buzz through micro-robots. Reports to Prof. Mario Vallejo-Marin.



University of Lincoln

June 2022 - June 2023

Research Assistant. NSF/NERC: Building a large phylogeny of the Ensifera and coupling genomics to acoustic communication. Reported to Prof. Fernando Montealegre-Z.

EDUCATION



University of Lincoln

Oct 2019 - June 2023

- Ph.D. in Zoology/Evolution & Ecology, Advisor: Fernando Montealegre-Z

THESIS - Changing the channel: Biomechanical and biophysical adaptations for acoustic niche expansion in the Ensifera



University of Southern Denmark

August 2019

- Bioacoustics field module



University of Lincoln

Sept 2016 - June 2019

- B.Sc. (first class Hons.) in Zoology

THESIS - Haemoproteus parasites and passerines: the effect of local generalists on inferences of host-parasite coevolution in the British Isles

GRANTS & AWARDS

2022 - Present -
University of Lincoln,
Cross-disciplinary
research grant - £1,250
Project title:
Diffraction-based binaural
hearing in theropod
dinosaurs and the
emergence of the avian
inter-aural canal

2022 - ERASMUS+,
Doctoral training mobility
grant - €500

2021 – Present -
Orthopterist's Society,
Theodore J. Cohn
Research Fund - \$1,500
Project title:
Evolution of the ensiferan
ear canal – a phylogenetic
assessment of form and
function

2019 - University of
Lincoln, PhD stipend and
tuition fee waiver -
£65,000

CONFERENCE (HOST)

Royal Entomological Society
Student forum 2022
Hybrid event at The Temple
of Peace, Cardiff, UK.

 60+

 10 countries

EntoCareers 2021
Student and early career
virtual forum focusing on
industry, EDI, and research in
entomology.

 300+

 37 countries

PEER REVIEWED PUBLICATIONS (RECENT)

Preprints/in review

- **Woodrow, C.**, Goode, C., Harrison, S., Deeming, C. & Sutton, G. Control of high-speed jumps in muscle and spring actuated systems: a comparative study of take-off energetics in bush-crickets (*Mecopoda elongata*) and locusts (*Schistocerca gregaria*).
Received major revisions at J. Comp. Physiol. B.

- **Woodrow, C.**, Cullen, D., Montealegre-Z, F. & Gonzalez-Rodriguez, J. Non-invasive characterisation of tough and elastic insect tissues using Raman spectroscopy
In review at Int. J. Biol. Macromol.

2023

- 14** **Woodrow, C.**, Rosca, A.T., Fletcher, R.M., Hone, A.L., Ruta, M., Hamer, K.C. & Dunn, J.C. Haemoproteus parasites and passerines: the effect of local generalists on inferences of host-parasite coevolution in the British Isles. *Parasitology* 1–9. <https://doi.org/10.1017/S0031182023000628>

- 13** Hemp, C., Montealegre-Z, F., **Woodrow, C.**, & Heller, K-G. Bush-crickets with very special ears and songs - review of the East African Phaneropterinae genus *Dioncomena* Brunner von Wattenwyl, 1878, with notes on its biogeography and the description of new species. *Dtsch. Entomol. Z.*
<https://doi.org/10.3897/dez.@.100804>

- 12** **Woodrow, C.** & Montealegre-Z, F. Auditory system biophysics in a new species of false-leaf katydid (Tettigoniidae: Pseudophyllinae) supports a hypothesis of broadband ultrasound reception. *Zoologischer Anzeiger* 304, 94-204.
<https://doi.org/10.1016/j.jcz.2023.04.002>

- 11** Luke, S.H., Roy, H., ..., **Woodrow, C.**, et al. What can entomology achieve? A collaborative prioritization exercise to identify challenges for entomology.
Insect Conservation and Diversity. 16:173-189.
<https://doi.org/10.1111/icad.12637>

2022

- 10** Celiker, E., **Woodrow, C.**, Rocha-Sanchez, A., Chivers, B.D., Barrientos-Lozano, L. & Montealegre-Z, F. Beyond the exponential horn: a bush-cricket with ear-canals which function as coupled resonators. *R. Soc. Open Sci.* 9: 220532.
<https://doi.org/10.1098/rsos.220532>

- 9** Pulver, C., Celiker E., **Woodrow, C.**, Giepel, I., Soulsbury, C., Cullen, D.A., Rogers, S.M., Veitch, D. & Montealegre-Z, F. Ear pinnae in a neotropical katydid (Orthoptera: Tettigoniidae) function as ultrasound guides for bat detection. *eLife* 2022; 11: e77628. <https://doi.org/10.7554/eLife.77628>

TEACHING

University of Lincoln:
Graduate teaching assistant (field, lab, theory) for various modules including ecology, anatomy and physiology, vertebrate zoology, pollination ecology, health and disease, invertebrate zoology, palaeontology.

University of Lincoln:
Preparation of 3D printed teaching materials for an entomology course for the UK Ministry of Defense on vector borne diseases.


Higher Education Academy:
In the process of applying for a HEA fellowship based on reflections and improvements of past teaching experience.


FIELD COURSES


Instructor on 'the cricket course' - Practical skills, lab, knowledge in Orthoptera science - Archbold Biological Field Station June 2-8 2023.

FURTHER CERTIFICATION

 **CERES INTERNATIONAL**
Fieldwork co-ordinator

 **ROYAL ENT. SOCIETY**
Student rep 2019-2022 & member

 **DINOSAUR ISLE**
Fossil excavator,
Wessex formation

 **RSPB**
Trainee C-permit bird ringer
(awaiting new instructor)

- 8 Siamantouras, E., **Woodrow, C.**, Celiker, E., Cullen, D.A., Hills, C.E., Squires, P. & Montealegre-Z, F. Quantification of Bush-Cricket Acoustic Trachea Mechanics Using AFM Nanoindentation. *Acta Biomaterialia*, S1742-7061(22)00532-3. <https://doi.org/10.1016/j.actbio.2022.08.056>
- 7 Celiker, E., **Woodrow, C.**, Mhatre, N. & Montealegre-Z, F. A numerical approach to understanding the transmission of acoustic energy to the bush-cricket inner-ear. *Front. Insect Sci.* 2:957385. <https://doi.org/10.3389/finsc.2022.957385>
- 6 Blockley, A., Ogle, D., **Woodrow, C.**, Montealegre-Z, F. & Warren B. Physiological changes throughout the ear due to age and noise - a longitudinal study. *iScience* 25, 104746. <https://doi.org/10.1016/j.isci.2022.104746>
- 5 **Woodrow, C.**, Baker, E., Jonnson, T. & Montealegre-Z, F. (2022) Reviving the sound of a 150-year-old insect: the bioacoustics of *Prophalangopsis obscura* (Ensifera: Hagloidea). *PLoS ONE* 17(8): e0270498. <https://doi.org/10.1371/journal.pone.0270498>
- 4 **Woodrow, C.**, Pulver, C., Song, H. & Montealegre-Z, F. (2022) Auditory mechanics in the Grig (*Cyphoderris monstrosa*): Tympanal travelling waves and frequency discrimination as a precursor to inner ear tonotopy. *Proceedings of the Royal Society B.* 289: 20220398. <https://doi.org/10.1098/rspb.2022.0398>

2021

- 3 **Woodrow, C.**, Judge, KA., Pulver, C., Jonnson, T. & Montealegre-Z, F. (2021) The Anders organ: a mechanism for anti-predator ultrasound in a relic ensiferan. *Journal of Experimental Biology.* 224 (2): jeb237289. <https://doi.org/10.1242/jeb.237289>
- 2 Veitch, D., Celiker, E., Aldridge, S., Pulver, C., Soulsbury, C., **Woodrow, C.** & Montealegre-Z, F. (2021) A narrow ear canal reduces sound velocity to create additional acoustic inputs in a microscale insect ear. *PNAS.* 118 (10): e2017281118. <https://doi.org/10.1073/pnas.2017281118>

2019

- 1 **Woodrow, C.**, Pulver, C., Veitch, D., & Montealegre-Z, F. (2019) Bioacoustic and biophysical analysis of a newly described highly transparent genus of predatory katydids from the Andean cloud forest (Orthoptera: Tettigoniidae: Meconematinae: Phlugidini). *Bioacoustics.* 1-17. <https://doi.org/10.1080/09524622.2019.1694992>

****For full list and website, visit QR code on page 1**

CONFERENCE AWARDS AND DISSEMINATION (RECENT)

2023 - Invertebrate Sound and Vibration (ISV23) best talk

- ***Woodrow, C.** & Montealegre-Z, F. A comparative analysis of the katydid 'ear canal' suggests acoustic niche expansion through isometry. ISV2023, Lincoln, UK, April 1 2023. Talk.
- ***Woodrow, C., ...** & Montealegre-Z, F., Función y diversidad de pinnas acústicas de saltamontes. 1 er Congreso Colombiano de Bioacústica y Ecoacústica, Villa de Leyva, Colombia, October 28, 2022. Talk.
- ***Woodrow, C.,** Pulver, C., Song, H. & Montealegre-Z, F. Auditory mechanics in the Grig (*Cyphoderris monstrosa*): Tympanal travelling waves and frequency discrimination as a precursor to inner ear tonotopy. Lincoln University College of Science research showcase 2022. Lincoln, UK, June 9, 2022. Poster.

2022 - Royal Entomological society, Student forum best poster

- ***Woodrow, C.,** Bluck, B., Ulloa, J.S., Sarria-S, F. & Montealegre-Z, F. The scuba diving orthopteran: a unique anti-predator behaviour in *Ragoniella pulchella*. Ento22, Lincoln, UK, September 16, 2022. Talk.
- ***Woodrow, C.,** Jonsson, T., Baker, E., Song, H. & Montealegre-Z, F. Lost Songs: Reconstructing the acoustic signals of extinct insects. Palaeontological Association, ProgPal 2022, Lincoln, UK, June 13-17, 2022. Keynote talk.
- ***Woodrow, C.,** Jonsson, T., Baker, E., Song, H. & Montealegre-Z, F. Reconstructing Insect Stridulation Sounds from the Middle Jurassic. Irish Geological Association, invited lecture, online, October 12, 2022.

2021 - University of Lincoln, Student forum best poster and presentation

PUBLICATION REFEREE

Biological Journal of the Linnean Society	(1)	Biology Letters	(1)	Current Biology	(1)
Ecological Entomology	(1)	Proceedings of the Royal Society B	(1)	The Science of Nature	(1)

COMMUNITY & OUTREACH

Popular science writer for Ecology for the Masses
<https://ecologyforthemasses.com/> (8 articles published online)

I believe art amplifies science, and enjoy creating artworks for my own work, and the work of others. Below is a list of publications where my contribution is only in artwork:

<https://doi.org/10.3819/CCBR.2020.150005E>

<https://doi.org/10.3819/CCBR.2020.150002E>

<https://doi.org/10.1101/2020.05.19.104422>

FOR REFERENCES, PLEASE CONTACT:

PhD supervisor (primary)

Prof. Fernando Montealegre-Z (fmontealegrez@lincoln.ac.uk)

Current postdoctoral advisor

Prof. Mario Vallejo-Marin (mario.vallejo-marin@ebc.uu.se)

External collaborator

Dr. Kevin Judge (judgek3@macewan.ca)