Orientation & Navigation
Birds, Humans & Other Animals

9th Conference in this series

13-15 April 2016
Royal Holloway College
University of London

PROGRAMME AND CONFERENCE GUIDE

Hosted by the Royal Institute of Navigation’s Animal Navigation Group (ANG)
Route to car parks - Green route
The Ninth International Conference on Animal Navigation, hosted by the Animal Navigation Special Interest Group of the Royal Institute of Navigation (RIN) in the UK, will be held at Royal Holloway College, Egham, Surrey, TW20 0EX, in the Runnymede borough of Surrey, UK, on 13-15 April 2016. No animals or pets are allowed on the site.
The conference fee includes two nights in modern en-suite accommodation, all meals, including the Conference Dinner, and an 'ice-breaker' reception.

Royal Holloway College is situated about 20 miles from London and 8 miles from Heathrow. It is served by a direct bus service (Number 441) from Heathrow Airport Bus Station, thence via Terminal 5 Heathrow to the front entrance of Royal Holloway College. Conferees not familiar with the area should ask the driver to stop at Royal Holloway College. Frequency of service is ~ every 30 minutes and the journey takes ~ 55 minutes. Egham is also served by a direct rail service from Waterloo station, London and a slower direct rail service from Victoria station, London. A taxi from Egham station to Royal Holloway College is ~£6. The cheapest taxis from Heathrow Airport are obtained by calling Gemini Cars (Tel: +44 (0)1784 471111) ~£20 from Terminal 5 and ~£23 from all other terminals and from Egham Cars (Tel: +44 (0)1784 434340) ~£20 from Terminal 5 and ~£25 from all other terminals. Conferees arriving by taxi should ask to be taken to The Hub.

On arrival at Royal Holloway College, conferees should check-in at The Hub (see map), where they will be given a key to their accommodation plus Internet Username and Password.

The auditorium is located in Moore Building (see map), about 50m from the main entrance.

The conference will bring together research scientists from the whole range of disciplines that relate to how animals navigate.

We are grateful to the following for their contribution to the success of the conference:

Company of Biologists Ltd, Defence Science & Technology Laboratory (DSTL), the United States Air Force Office of Scientific Research's European Office of Aerospace Research and Development (EOARD) and the United States Office of Naval Research Global (ONRG)

Buffet Lunches on all days will be served in the Moore Building. Dinner on the 13th will be provided in The Hub (see map). Breakfast is available on the 14th and 15th from 0730 in The Hub. The Conference Dinner on the 14th will be held in the Founders Building (see map). A bar will be available each evening in The Hub, thus providing excellent opportunities for networking.
Free Wi-Fi is available throughout the Royal Holloway College site. Conferees should however bring an Ethernet cable with them and a three-pin UK adaptor.

En-suite single accommodation is located in the new halls, very close to The Hub (see map).

Free parking is available throughout the site. See map for location and the routes to the car parks.

### Wednesday 13 April

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>Registration and coffee</td>
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<tr>
<td>1200</td>
<td>BUFFET LUNCH -</td>
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<tr>
<td>1245</td>
<td>Welcome and housekeeping notices</td>
<td>M Liedvogel, Chairman ANG</td>
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<td>P Chapman-Andrews, Director RIN</td>
</tr>
<tr>
<td>1300</td>
<td><strong>Transcriptomic Analysis of Hair Cells with Iron-Rich Organelles from the Rock Pigeon Columba livia</strong></td>
<td>Mr Simon Nimpf, Research Institute of Molecular Pathology, Vienna, Austria</td>
</tr>
<tr>
<td>1315</td>
<td><strong>Magnetically Induced Neuronal Activation in the Pigeon Columba livia</strong></td>
<td>Dr David Keays, Research Institute of Molecular Pathology, Vienna, Austria</td>
</tr>
<tr>
<td>1330</td>
<td><strong>No evidence for the involvement of the inner ear lagena in magnetoreception in the migratory blackcap (Sylvia atricapilla)</strong></td>
<td>Ms Nele Lefeldt, Department of Neuroscience, Baylor College of Medicine, Houston, USA</td>
</tr>
<tr>
<td>1345</td>
<td><strong>Central processing of magnetic information: Insights from C57BL/6J mice</strong></td>
<td>Ms Veronika Blahova, Department of Zoology, Charles University in Prague</td>
</tr>
<tr>
<td>1400</td>
<td><strong>Are the ferrous inclusions in the mole-rat cornea magnetoreceptors?</strong></td>
<td>Mr Pascal Malkemper, Department of General Zoology, Faculty of Biology, University of Duisburg-Essen, Germany</td>
</tr>
<tr>
<td>1415</td>
<td><strong>Planarians as a model for magnetoreception</strong></td>
<td>Mr Benoit Rose, Institut des Neurosciences Cellulaires et Intégratives, Strasbourg, France</td>
</tr>
<tr>
<td>1430</td>
<td><strong>The Design and Testing of an Artificial Magnetoreceptor</strong></td>
<td>Mr Robert Hickman, Research Institute of Molecular Pathology, Vienna, Austria</td>
</tr>
<tr>
<td>1445</td>
<td><strong>A magnetic protein bicompass in animal</strong></td>
<td>Mr Can Xie, Laboratory of Molecular Biophysics, School of Life Sciences, Peking University, China</td>
</tr>
</tbody>
</table>
1500 - 1545  COFFEE AND TEA BREAK

1545  Cryptochrome 2 mediates directional magnetoreception in cockroaches  
Mr Martin Vacha, Masaryk University, Czech Republic

1600  Cryptochrome 1 in Retinal Cone Photoreceptors Suggests a Novel Functional Role in Mammals  
Ms Christine Nießner, Ludwig-Maximilians-University, Germany

1615  Light-dependent magnetic compass orientation in zebra finches  
Mr Atticus Pinzon-Rodriguez, Lund University, Sweden

1630  Long-lived spin coherence improves the compass bearing available from a cryptochrome-based magnetoreceptor  
Mr H G Hiscock, Oxford University, UK

1645  Towards revealing the structure of avian cryptochrome  
Mr Emil Sjulstok Rasmussen, University of Southern Denmark, Denmark

1700  Optimal and robust inhomogeneous ensemble of radical-pairs in biologically realistic chemical compasses  
Ms Maria Procopio, University of California, USA

1715  A Psychophysical and Neuro-Engineering Approach to Human Magnetoreception  
Mr Joseph Kirschvink, California Institute of Technology, USA

1730 Close

1730 RECEPTION Sponsored by the Royal Institute of Navigation

1900 DINNER

Thursday 14 April

Magnetic cues and compass orientation

Chairman: David Keays

0900  Migratory blackcaps (*Sylvia atricapilla*) can use their magnetic compass at 5 degrees inclination, but are completely random at 0 degrees inclination  
Ms Susanne Schwarz, University of Oldenburg, Germany

0915  A virtual magnetic displacement shows that Eurasian reed warblers use a magnetic map  
Mr Nikita Chernetsov, St. Petersburg State University, Russia

0930  The effects of anthropogenic electromagnetic noise on magnetic compass orientation in a migratory bird  
Mr Henrik Mouritsen, University of Oldenburg, Germany

0945  Effect of radio-frequency magnetic fields on orientation of garden warblers *Sylvia borin*  
Mr K Kavokin, St. Petersburg State University, Russia

1000  Bird Navigation in Polar Regions  
Ms Susanne Akesson, Lund University, Sweden
1015  **Magnetic alignment in horses**  
Ms Sabine Begall, University of Duisburg-Essen, Germany

1030-1130  **COFFEE AND TEA BREAK**

1130  **Neural processing of magnetic intensity and inclination cues by lesioned homing pigeons (Columba livia) in a magnetic conditioning paradigm**  
Ms Merissa Acerbi, Bowling Green State University, USA

1145  **Polarized light modulates light-dependent magnetic compass orientation in birds**  
Ms Rachel Muheim, Lund University, Sweden

1200  **Complex Role of Magnetic Cues in Mouse Water Maze Assay: Rapid Learning, Sequence Effects, Rotated Axes of Response, and Cue Transfer**  
Mr John Philips, Virginia Tech, USA

1215  **Characterizing the mouse magnetic sense**  
Mr Michael Painter, Virginia Tech, USA

1230  **BUFFET LUNCH**

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**Magnetic cues and compass orientation**

Chairman: Rachel Muheim

1330  **Rain forest navigators: homing behavior in poison frogs**  
Mr Andrius Pasukonis, University of Vienna, Austria

1345  **One trial landmark learning in wild hummingbirds**  
Mr David Pritchard, University of St Andrews, UK

1400  **Towards a fully predictive model of visual navigation in pigeons**  
Mr Richard Mann, University of Leeds, UK

1415  **The anterior thalamic nucleus and the navigational process**  
Mr Paulo Alexandre Jorge, ISPA, Portugal

1430  **The solar cycle has a global effect on pigeon races**  
Mr Jingjing Zhang, University of Auckland, New Zealand

1445  **Evidence for Geomagnetic Imprinting in Sea Turtles**  
Mr Roger Brothers, University of North Carolina, USA

1500 - 1600  **COFFEE AND TEA BREAK**

1600  **The role of olfaction in desert ant navigation**  
Ms Cornelia Buehlmann, University of Sussex, UK

1615  **Nocturnal navigation by amblypygids (Class Arachnida, Order Amblypygi)**  
Mr Daniel Wiegmann, Bowling Green State University, USA

1630  **Evaluating the role of current drift in sea turtle long-distance oceanic migrations**  
Ms Giulia Cerritelli, University of Pisa, Italy

1645  **Nocturnal migratory songbirds adjust their travelling direction aloft: evidence from a radiotelemetry and radar study**  
Ms Sissel Sjoberg, Lund University, Sweden

1700  **Long-distance migratory orientation and navigation in free-flying migrants**  
Mr Kasper Thorup, University of Copenhagen, Denmark
### Friday 15 April

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>0900</td>
<td><strong>Is polymorphism in personality-associated genes driving changes in migratory behaviour?</strong>&lt;br&gt;Mr J Ferrer-Obiol, University of Barcelona, Spain</td>
</tr>
<tr>
<td>0915</td>
<td><strong>Examining the genetic basis of migratory orientation in a songbird</strong>&lt;br&gt;Ms Kira Delmore, Max Planck Institute for Evolutionary Biology, Germany</td>
</tr>
<tr>
<td>0930</td>
<td><strong>Elucidating the genetic basis of magnetite crystal production in eukaryotes</strong>&lt;br&gt;Ms Renee Bellinger, University of Hawaii, Hawaii</td>
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<td>0945</td>
<td><strong>Visual control of flight speed in Budgerigars</strong>&lt;br&gt;Mr Ingo Schiffner, Queensland Brain Institute, Australia</td>
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<tr>
<td>1000</td>
<td><strong>Cross-Model object recognition in a fish</strong>&lt;br&gt;Ms Theresa Burt de Perera, Oxford University, UK</td>
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<tr>
<td>1015</td>
<td><strong>Motion improves contrast sensitivity in bumblebee</strong>&lt;br&gt;Mr Aravin Chakravarthi, Lund University, Sweden</td>
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<tr>
<td>1030-1130</td>
<td><strong>COFFEE AND TEA BREAK</strong></td>
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<tr>
<td>1130</td>
<td><strong>Place cells, grid cells and navigation in complex space</strong>&lt;br&gt;Mr RM Grieves, University College London, UK</td>
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<tr>
<td>1145</td>
<td><strong>Magnetic Maps and Multi-modal Navigation in Sea Turtles and Salmon</strong>&lt;br&gt;Mr Kenneth Lohmann, University of North Carolina, USA</td>
</tr>
<tr>
<td>1200</td>
<td><strong>The compass system of homing and migratory bats</strong>&lt;br&gt;Mr Richard Holland, Queens University, Northern Ireland</td>
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<tr>
<td>1215</td>
<td><strong>A model for navigational errors in complex environmental fields</strong>&lt;br&gt;Ms Claire Postlethwaite, University of Auckland, New Zealand</td>
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<tr>
<td>1230</td>
<td><strong>The role of wind regimes and constraints to navigation in shaping non-stop flight strategies</strong>&lt;br&gt;Mr James McLaren, University of Delaware, USA</td>
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<tr>
<td>1245</td>
<td><strong>CLOSING ADDRESS</strong>&lt;br&gt;E Baird, Hon Secretary ANG</td>
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<tr>
<td>1300</td>
<td><strong>END OF CONFERENCE</strong></td>
</tr>
<tr>
<td></td>
<td><strong>BUFFET LUNCH</strong></td>
</tr>
</tbody>
</table>
**Posters**

P1  **Directional swimming in coral reef fish larvae**  
Igal Berenshtein et al., Department of Life Sciences, Eilat Campus, Ben-Gurion University, Be’er Sheva 84105, Israel

P2  **Can internal waves be used as a compass?**  
Igal Berenshtein et al., Department of Life Sciences, Eilat Campus, Ben-Gurion University, Be’er Sheva 84105, Israel

P3  **Localisation of the Putative Magnetoreceptor Cryptochrome 1b in the Retinae of Migratory Birds and Homing Pigeons**  
Petra Bolte et al., University of Oldenburg, Germany

P4  **A magnetic pulse induces directed orientation in the Caribbean spiny lobster: Evidence for magnetite-based magnetoreception**  
David A. Ernst et al., University of North Carolina at Chapel Hill, US

P5  **Multimodal coding of gravity, angular acceleration, temperature and hydrostatic pressure in crab statocyst sensory neurones**  
Peter J. Fraser, School of Biological Sciences, University of Aberdeen

P6  **Seasonal changes in atmospheric noise levels and the annual variation in pigeon homing performance**  
Jonathan T. Hagstrum et al., U.S. Geological Survey, Menlo Park, California 94025; University of Denver, Denver, Colorado 80208; Naval Research Laboratory, Washington, DC 20375

P7  **Magnetoreception in dogs revisited**  
Vlastimil Hart et al., Czech University of Life Sciences and University Duisburg-Essen

P8  **The Neural Basis of Long-Distance Navigation in Birds**  
Dominik Heyers et al., Institute of Biology and Environmental Sciences, Carl-von-Ossietzky-Universität Oldenburg, D-26111 Oldenburg, Germany

P9  **Molecular Characterisation of Pigeon Cryptochromes**  
Tobias Hochstoger, David Keays, Research Institute of Molecular Pathology, Vienna, Austria

P10  **Sensory mechanisms of long-distance navigation in migratory songbirds: new insights from displacement and magnetic pulse experiments**  
Dmitry Kishkinev, Queen's University Belfast

P11  **Biophysical Puzzles Concerning Magnetoreception in the Common Nematode, Caenorhabditis elegans.**  
Joseph L. Kirschvink, California Institute of Technology

P12  **Does Caenorhabditis elegans respond to earth-strength magnetic fields?**  
Lukas Landler et al., Institute of Molecular Pathology (IMP), Vienna Biocenter (VBC), 1030 Vienna, Austria

P13  **Bumblebee flight performance in environments of different proximity**  
Nellie Linander et al., Lund University, Sweden

P14  **Possible lateralization of the mole-rat’s magnetic sense**  
Sandra Malewski, RIN Associated Membership

P15  **Exploring magnetic-dependent navigation in the genetic model organism zebrafish**  
A. Myklatun*, A. Lauri*, et al., Helmholtz Zentrum München, TU München (*equal contribution)
P16  **Inertial Animal Navigation**  
Antonio Nafarrate, www.animalnav.org

P17  **Magnetically induced freezing in cockroach. Effect of interstimulus interval.**  
Radek Netusil et al., Masaryk University, Brno

P18  **How does Animal Navigation work?**  
Richard Nissen, www.animalnav.org

P19  **Iron-rich Structures in the Upper Beak of Pigeons: Magnetoreceptors or Macrophages?**  
Christine Nießner, Michael Winklhofer, Dept. Earth & Environmental Science, University of Munich; Max-Planck-Institute for Brain Research, Frankfurt am Main; Faculty of Physics, University Duisburg Essen

P20  **Long-distance songbird migrant, garden warbler Sylvia borin, does not calibrate its magnetic compass during autumn migration**  
Alexander Pakhomov, Biological Station Rybachy

P21  **Weak broadband oscillating fields are more disruptive than strong single-frequency electromagnetic fields to magnetic compass orientation in a night migratory songbird (Erithacus rubecula)**  
Susanne Schwarze et al., Res. Centre for Neurosensory Sciences, Oldenburg University, Germany

P22  **Constructing Cryptochrome: A complete model for plant Cryptochrome from Arabidopsis thaliana**  
Ilia A. Solov'yov, Claus Nielsen, University of Southern Denmark

P23  **Theoretical insights into cryptochrome magnetoreception**  
Ilia A. Solov'yov, Department of Physics, Chemistry and Pharmacy, University of Southern Denmark (SDU)

P24  **Literal Grid Map Models of Animal Navigation: Assumptions and Predictions**  
Rebecca Turner et al., The University of Auckland

P25  **Cue conflict experiments between magnetic and visual cues on Dunlin Calidris alpina and Curlew sandpiper Calidris ferruginea**  
Lorenzo Vanni et al., Department of Biology, Ethology Unit, University of Pisa, Via Volta 6, Italy

P26  **The migration program in a nocturnal and solitary long-distance migrant**  
Marta L. Vega et al., University of Copenhagen

P27  **Radio frequency effects on spontaneous magnetic alignment in deer mice (Peromyscus)**  
Jack Whitehead, John Phillips, Virginia Tech Dept. Biological Sciences, USA

P28  **Are experimentally displaced adult common cuckoos navigating using a map based on geomagnetic coordinates?**  
Mikkel Willemoes, Kasper Thorup, Center for Macroecology, Evolution and Climate; Natural History Museum of Denmark; University of Copenhagen