THE UNIVERSITY of EDINBURGH

News Release

Issued: Monday 8 December 2014

EMBARGOED BY THE JOURNAL SCIENCE: Not for release or re-distribution until 19:00 GMT Thursday 11 December, 2014

Gene study traces birds' family tree back to dinosaurs

How birds evolved to have characteristics including feathers, flight and song is revealed with new clarity in a major study of their family tree.

The international study charts a burst of evolution that took place after the mass extinction of dinosaurs, 66 million years ago. This step-change gave rise to nearly all of the species of birds that we see on the planet today - more than 10,000 varieties.

The four-year project – which included researchers from the University of Edinburgh's Roslin Institute – decoded and compared the entire genetic fingerprint of 48 bird species.

Species were selected from all major groups of modern birds – including the woodpecker, owl, penguin, hummingbird and flamingo.

The major study provides fresh insights into how bird genes differ from those of mammals, and the biological mechanisms that give rise to the vast diversity among birds.

Researchers compared the genomes of the 48 bird species with those of three other reptile species and humans. This enabled them to investigate at which point in each species' history specialised characteristics developed, such as feathers, flight and song.

They found that birdsong evolved independently at least twice. Parrots and songbirds gained the ability to learn and mimic vocal activity independently of hummingbirds, despite sharing many of the same genes. This is surprising because animals with similar characteristics usually share a common ancestor.

The findings are important because some of brain processes that are involved in bird singing are also associated with human speech production.

Birds are the most geographically diverse group of land animals. They help scientists investigate fundamental questions in biology and ecology and they are also a major global food resource, providing meat and eggs.

More than 200 scientists contributed to the Avian Phylogenomics Project, which was led by BGI (China), University of Copenhagen, Duke University, the Howard Hughes Medical Institute and the Natural History Museum of Denmark.

The findings are published in 23 scientific papers, including eight in the journal *Science*.

Building on this research, scientists at the National Avian Research Facility in Edinburgh have created 48 open access databases to share and expand on the information associated with the birds' genomes. They hope that researchers from around the world will continue to upload their own data, offering further insights to the genetics of modern birds.

Such information will be useful for helping scientists to understand why infectious diseases, such as bird flu, affect some species but not others.

Professor David Burt, Acting Director of the National Avian Research Facility at the University of Edinburgh's Roslin Institute, said: "This is just the beginning. We hope that giving people the tools to explore this wealth of bird gene information in one place will stimulate further research.

"Ultimately, we hope the research will bring important insights to help improve the health and welfare of wild and farmed birds."

The Roslin Institute receives strategic funding from the Biotechnology and Biological Sciences Research Council (BBSRC). The National Avian Research Facility, which is based at the Roslin Institute, is supported by the University of Edinburgh, BBSRC, Wellcome Trust and Roslin Foundation.

For further information, please contact:
Jen Middleton, Press and PR Office, tel 0131 650 6514; email jen.middleton@ed.ac.uk

More information, including a copy of the paper, can be found online at the *Science* press package at http://www.eurekalert.org/jrnls/sci. You will need a user ID and password to access this information.