Media Centre home

News releases

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Media toolkit (for staff and students)

Fast facts

Meet the team

08 April 2010

New genetic map to reveal songbird secrets

Researchers from the University of Sheffield have helped to sequence the entire genome of the zebra finch, unravelling the genetics underpinning some of the uniquely fascinating traits of birds such a plumage and song.

Zebra Finch

Published in Nature, the study involved an international team of researchers from the Middle East, USA and Europe, including scientists from the University of Sheffield´s Department of Animal and Plant Sciences (APS).

The zebra finch is a model organism for behavioural ecologists and neurobiologists. Zebra finches and other songbirds have one important thing in common with humans – they learn how to vocalise by listening to their parents. They therefore offer a unique opportunity to help us understand the genetics behind the wiring and re-wiring of our brains when we learn and memorise.

The zebra finch belongs to the Passerine group of birds, which makes up around half of all bird species. Passerines, or `perching birds´, bring the sound of spring to gardens all over Europe and include garden birds such as the blue tit, blackbird, thrush and robin. The zebra finch is the first passerine, and only the second bird species, after chickens, to have its genome sequenced.

The Sheffield team of Dr Jon Slate, Professor Tim Birkhead, Dr Jess Stapley and Professor Terry Burke helped the international effort by building a zebra finch genetic map containing around 1000 genes, using data collected from over 500 birds. This map was used as the `scaffolding´ onto which the zebra finch DNA sequences, generated by other teams in the project, could be added.

Explaining the importance of this project, Dr Jon Slate said: "Sequencing the zebra finch genome is tremendously exciting for several reasons. First, it provides far greater understanding into how bird genomes have evolved over the last 100 million years. For example, we now know that bird genomes are not as evolutionarily conserved as was once thought. Second, the genome assembly will be a great resource to researchers all over the world. The zebra finch is a model organism in several biological disciplines and the

genome provides the tools to find the genes responsible for the remarkable diversity of bird plumage, song and behaviour that have fascinated biologists and ornithologists for centuries."

Tools from the genome project will also help researchers to better understand biological processes such as immunity and fertility. Dr Slate and Professor Birkhead have discovered that there is a genetic component to sperm length and speed in the zebra finch. This means that the genome could be invaluable for research into human fertility. Dr Slate said: "Discovering the genes that explain these differences in fertility is now possible, and it is likely that the same genes will have similar effects in humans as well."

Another member of the Sheffield team, Dr Robert Ekblom, helped out by identifying zebra finch immunity-related genes. By comparing these genes to their equivalents in other species, it will be possible to better understand how immunity to parasites can evolve.

Notes for Editors: The research has been funded by the Biotechnology and Biological Sciences Research Council (BBSRC). BBSRC is the UK funding agency for research in the life sciences. Sponsored by Government, BBSRC annually invests around £380 million in a wide range of research that makes a significant contribution to the quality of life for UK citizens and supports a number of important industrial stakeholders including the agriculture, food, chemical, healthcare and pharmaceutical sectors.

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- Nature paper

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