MONTCLAIR STATE UNIVERSITY

Media Contact:
Suzanne Bronski
973-655-4334
917-292-9554
bronskis@mail.montclair.edu

FOR IMMEDIATE RELEASE

MONTCLAIR STATE PROFESSOR'S RESEARCH CONCLUDES THAT BIRDS LOST THEIR TEETH MORE THAN 100 MILLION YEARS AGO

***Results of International Collaborative Study Published in* Science**

Montclair, NJ. December 17, 2014 – Robert Meredith, an assistant professor of biology and molecular biology at Montclair State University has long wondered whether teeth were lost in the common ancestor of all living birds, or whether they were lost convergently in several independent bird lineages. Meredith is a lead author of "Evidence for Tooth Loss and the Acquisition of a Horny Beak in the Common Avian Ancestor," a report published in the December 12, 2014 issue of *Science* that concludes that the common ancestor of all living birds lost its teeth approximately 116 million years ago.

Toothless vertebrates including birds, turtles and a few groups of mammals, such as anteaters and baleen whales, have all descended from ancestors with enamel-capped teeth. Aardvarks, sloths and armadillos are mammals whose teeth lack enamel.

Modern birds, which evolved from toothed theropod dinosaurs such as *Tyrannosaurus Rex*, use a horny beak and a muscular gizzard instead of teeth to grind up and process their food.

"For the past several years, I have been involved in Avian Genome Working Group, an international collaboration of more than a hundred investigators and dozens of universities and museums," said Meredith. "The group has been sequencing and analyzing the genomes of representatives of 48 major lineages of birds, including ostriches, chickens, ducks, raptors and songbirds.

While the fossil record of early birds is fragmentary, a research team led by Meredith and Mark Springer, a biology professor at the University of California, Riverside, has examined remnants of tooth genes in birds to determine that bird edentulism, or absence of teeth, stems from a common ancestor.

Tooth formation in vertebrates involves many different genes, with six genes deemed essential for the formation of dentin and enamel.

"Our report presents a comparative genomic analysis of the six genes that are involved in tooth formation in representative toothed, toothless and enamelless vertebrates," Meredith explained. "All genomes of toothless vertebrates have inactivating mutations in dentin and enamel-related genes that render them non-functional. All bird genomes share inactivating mutations in tooth-related genes, which provide the molecular evidence for our hypothesis that teeth were lost in the common ancestor of modern birds."

Meredith's team findings that the 48 bird species share these inactivating mutations in the dentin and enamel-related genes suggest that tooth loss and beak development evolved together in the common ancestor of all modern birds.

Meredith and Springer's team included scientists from the China National GeneBank; the University of Copenhagen Oster Voldgade, Denmark; and the Duke University Medical Center. The team, with the addition of several other scientists, contributed to "Genome Evolution in Birds," a second paper published in the same issue of *Science* that seeks to discover what makes a bird a bird.

According to Meredith, a total of eight papers authored by scientists involved in the Avian Genome Working Group were published in the December 12 issue of *Science*, the world's leading journal of original scientific research, global news and commentary.

Montclair State University

Building on a distinguished 106-year history, Montclair State University is proud to be a leading institution of higher education in New Jersey. The University's six colleges and schools serve over 20,000 undergraduate and graduate students in more than 300 doctoral, master's, and baccalaureate level programs. Situated on a beautiful, 250-acre suburban campus just 14 miles from New York City, Montclair State delivers the instructional and research resources of a large public university in a supportive, sophisticated and diverse academic environment.
montclair.edu