

Professor Designs 3-D Tool to Explore Diversity of World's 10,000 Bird Species

By Richard Pierce

Jean Marc Gauthier, assistant arts professor in the Interactive Telecommunications Program at the Tisch School of the Arts, is part of the All Birds Barcoding Initiative (ABBI), which will collect DNA barcodes for the world's 10,000 bird species. Gauthier is a pioneer in designing 3-D interactive technology, chiefly for displaying data in a small space in order to show its relationship to other information.

Gauthier, in collaboration with Mark Stoeckle of The Rockefeller University, is adapting that same 3-D technology to graph a usable map for birds. Approximately 1.7 million species of plants and animals have been named, of the potentially 10 million total. Researchers around the world are collaborating on constructing a reference library of DNA barcodes derived from specimens identified by experts and stored in museums.

"Working with Jean-Marc has thus far been an exciting collaboration that I believe will help us better understand genetic diversity among the 10,000 species of birds," said Stoeckle. "Birds are a window into biodiversity. What we learn by graphically exploring DNA barcodes of birds we can apply to fish, butterflies, beetles, and plants."

Despite several hundred years of careful study, genetic surveys including those with DNA barcoding suggest there are

hundreds of as yet undescribed avian species. ABBI aims to help speed discovery of new species, provide a practical tool for specimen identification, and open new avenues for scientific investigation. One way to do this is by depositing its records in other DNA barcode databases, thereby establishing an open-access electronic library linking its DNA barcodes and other material for others.

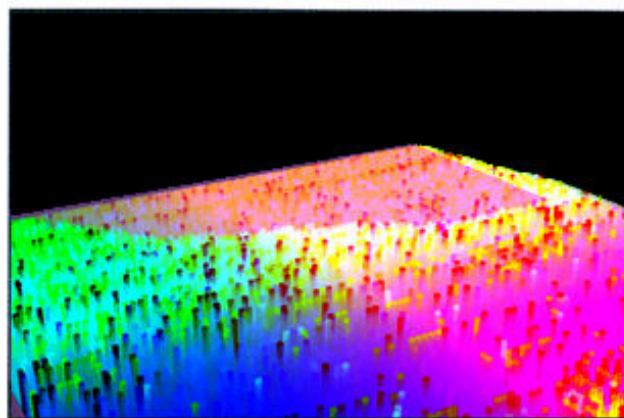
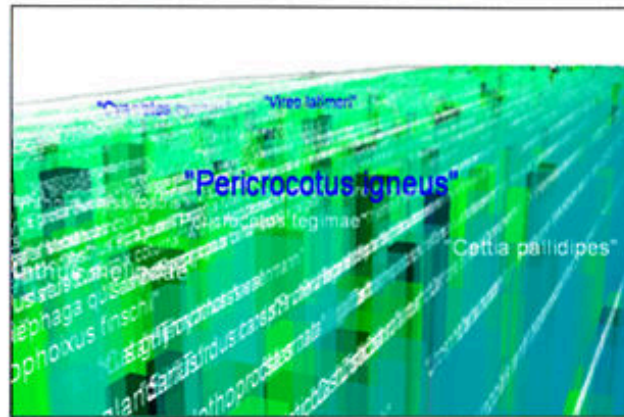
The growing avian barcode library will be a valuable resource for conservation planners, ornithologists, ecologists, public health officials, and the interested public. For instance, DNA barcoding can be applied to confirm identification regardless of age, sex, or plumage, including from individual feathers. This will aid banding and customs operations, for example, and help improve airline safety by identifying feathers and tissue remnants from bird strikes. And ABBI is a testing ground for DNA

barcoding, providing benchmarks for the larger initiative to barcode all animal and plant life.

"The difficult and interesting part is how to display DNA barcode data for thousands of individuals," said Gauthier.

Gauthier created, his "bird map" plot with 10,000 squares, and each of the world's 10,000 species is assigned a square, using X and Y coordinates of the grid. The species are arranged on the grid according to their taxonomic order, which reflects evolutionary history and puts closely related birds near to each other, starting with the most ancient lineages.

"What we are doing now is building small neighborhoods inside of the map where bird species can be viewed by height and color," says Gauthier, "creating an array of 'virtual buildings' that display whatever features are of interest."



Top photo: the concept of interactive flying through a virtual city allows users to browse large amount of data at a glance. Above: data can be visually organized in virtual neighborhoods.