Somewhere over the (mathematical) rainbow bluebirds fly...
Why, oh why are they blue?

Professor Rodolfo Torres
University of Kansas

There are blue skies and blue birds over the rainbow as the song says, but not all blues are the same. The blue and green colors we see in birds, and even some of the ultraviolet that we cannot see, are produced by the way in which the light interacts with ordered microscopic structures in the tissues of the birds. This order in the structures can be measured using Fourier analysis, a powerful mathematical tool. Like a prism that decomposes a beam of light into a rainbow of colors, Fourier analysis transforms the geometrical arrangements observed in electron microscope images of the tissues into a mathematical rainbow of basic components that quantify order or periodicities.

We will illustrate how Fourier analysis processes the images and helps to decipher the colors of birds and other animals. The talk will be accessible to all those who are curious about some of the mathematics and physics behind the bright blue and green colors found in nature.

Professor Rodolfo Torres - University of Kansas

Professor Torres received a Licenciatura from the Universidad Nacional de Rosario, Argentina in 1984; he received his M.A. in 1988 and his Ph.D. in mathematics in 1989, both from Washington University in St. Louis. He held then postdoctoral visiting positions at the Courant Institute of New York University and the University of Michigan, Ann Arbor, before joining the University of Kansas in 1996, where he is presently a Professor.

Professor Torres' research interests include Fourier analysis; applications in partial differential equations, signal analysis, and biology. He specializes in the study of singular integrals, functions spaces, and decomposition techniques. His work has been supported by national and international grants and has resulted in numerous publications in mathematics and biology journals. In 2007 he was invited to write a “Highlight” report for the National Science Foundation about his interdisciplinary work in biology, which was also showcased in the media through articles in The New York Times, Science, and Discovery Channel on-line.

Professor Torres has given numerous lectures and workshops around the world and has mentored many graduate and undergraduate students. He received various teaching and mentoring awards for his efforts with students, including a Teaching Excellence Award from the T. Kemper Foundation.

Sponsored by the Center for the Integration of Undergraduate, Graduate, and Postdoctoral Research (I-Center) Mathematics Department, KSU