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Northern Mockingbird

photo by Stan Telioka

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From the editor: On page 43 is an image of a Northern Mockingbird performing a loop flight. Using software on my computer, I created this composite image from a series of digital images taken in rapid sequence. My intent was to show, as accurately as possible, the various phases of the loop flight display.

I am pleased with the technical results but even more so with the astounding pictures. I had no idea that mockingbirds go to such extremes to showoff their white feathers. For example, the male starts the loop (bottom left) making a near vertical ascent and ends in a near vertical descent. Throughout the display, the male's body is positioned to maximally expose the white feathers on the wings and tail. Not only were the primary and tail feathers spread completely open but the male faced directly into the early morning sun. Over the past few weeks, I noted more loop flights performed in the morning than at any other time of day.

Since the camera picked up details that my unaided eyes were unable to appreciate, it makes me wonder if the visual capabilities of onlooking mockingbirds surpasses that of humans. Are they capable, for example, of assessing the difficulty of the male's loop flight? Do they differentiate between males based on the amount of white that's exposed during displays? Is this why mockingbirds perform loop flights in the morning? There is obviously more to loop flight displays than I originally believed. Perhaps I should buy a digital camrecorder to further investigate this seemingly simple display.

Jim Davis

Song patterns and species relationships in oropendolas

by Jordan Price

Even novice birdwatchers know that many songbirds can be readily identified in the field by their sounds. From the melodious trills of Song Sparrows to the harsh “conc-a-reeee” of Red-winged Blackbirds, each vocalization has features that are characteristic of each species. Despite some variations among individuals of the same species, most songbirds can therefore be easily recognized by their distinctive, species-specific melodies. Beyond the usefulness of these sounds for field identification, ornithologists have also suspected that bird songs might provide information about taxonomic relationships as well.^{1,2} Similar song patterns in different species could indicate that they are closely related and share a recent evolutionary ancestor, whereas songs with few shared features could suggest more distant relationships. In other words, song patterns could be used to reconstruct the genealogy of evolutionary relationships, or the phylogeny of a group.

Physical characteristics of birds such as beak shape and plumage patterns have long been used to indicate phylogenetic relationships among taxa, as any field guide will show. Birds with similar features are typically placed in the same taxonomic group based on such shared traits. However, the possibility that complex vocal patterns of songbirds can provide similar information has not been well studied. Why? Because, unlike beaks and plumage colors, songs are often thought to be too complex and variable to provide useful taxonomic information.

To see just how well vocal sounds reflect relationships, we conducted a study on a group of birds with particularly elaborate songs, the oropendolas (genera *Psarocolius*,



Most oropendolas are polygynous, with one dominant male defending a harem of females at a colony. The two species shown in this painting by Ed Durose are the Crested (top) and Monteuma (bottom) Oropendolas. Used with the permission of the James Ford Bell Museum of Natural History, University of Minnesota.

Gymnostinops and *Ocyalus*).³ This group of about 11 species occurs throughout the New World tropics from Mexico to Argentina. It is a subgroup of the New World black-

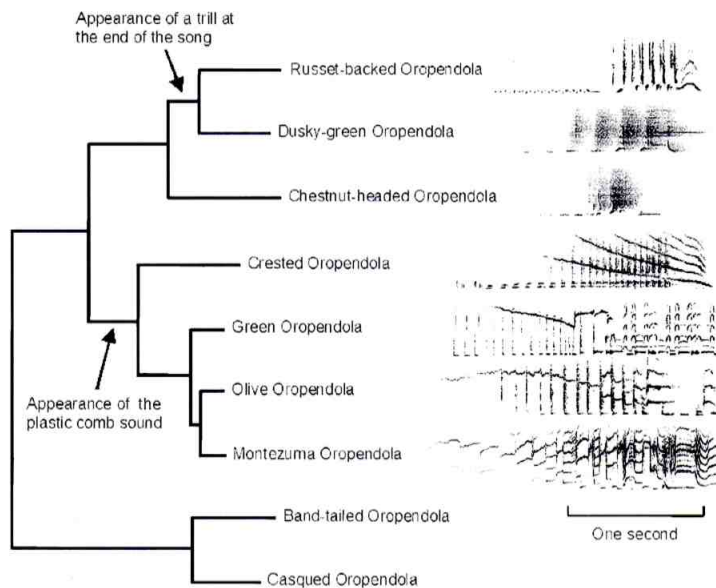
bird family (Icteridae), which also includes orioles, grackles, meadowlarks, and their relatives. Evolutionary relationships between species and subspecies of oropendola are

well understood, based on a recent analysis of DNA sequences, so song patterns can be compared with this phylogeny to test how well each bird's sounds reflected its position within the group.⁴

Most oropendolas are polygynous, with one dominant male defending a harem of females at a colony, and it is within these colonies that males perform their unusual songs. Oropendolas produce some truly bizarre sounds, described as "liquid gurgles, metallic sounds, bubbly tinkling notes" and rattles that sound like "a finger being run over the teeth of a plastic comb."⁵ Vocalizations are often accompanied by a dramatic visual display in which the male bows forward on a branch, frequently hanging nearly upside down. People are often surprised that these sounds can be produced by a bird, and few folks who are lucky enough to hear an oropendola ever forget it.

Despite such amazing vocal complexity, our acoustical analyses of multiple birds recorded across a wide geographical area show that many aspects of songs are surprisingly conserved within species. Members of the same species, even birds thousands of miles apart, sing parts of their songs in much the same way. Our studies have also revealed that different species with close taxonomic relationships tend to share aspects of song as well. For example, the Russet-backed Oropendola (*Psarocolius angustifrons*) and Dusky-green Oropendola (*P. atrovirens*) are each other's closest relatives and are also the only birds that produce a rapid trill at the end of their songs (see figure above). Likewise, the closely related Crested Oropendola (*Psarocolius decumanus*), Green Oropendola (*P. viridis*) and Olive Oropendola (*Gymnostinops bifasciatus*) all begin their songs with a "plastic comb sound" not found in other more distantly related oropendola species. In both of these examples, a feature of song evolved only once in a distant evolutionary ancestor and now appears only in the species that have descended from that ancestor. Apparently, these and a variety of other complex song features that we documented reflect phylogenetic relationships remarkably well. A more recent study, in which we used DNA sequences to test just how well songs reflect relationships, shows that oropendola songs can be used to judge species relationships with surprising accuracy.⁶

Songs, like beaks and plumage, are products of evolution, and changes in their acoustic structure can tell us a great deal about past evolutionary relationships within and across species. Studies like ours on oropendolas have



Phylogeny for nine oropendola species showing when the trill and the "plastic comb sound" appeared during vocal evolution. Spectrograms show typical song patterns for seven species. The phylogeny is based on DNA sequence data from two mitochondrial genes.

not yet been done on many songbird groups, but there are data that indicate we might find similar patterns in other species.^{1,3} Birds have apparently been advertising this information all along, but only recently have we begun to listen.

Jordan Price became interested in oropendolas during his postdoctoral research with Scott Lanyon at the University of Minnesota. He is now a biology professor at St. Mary's College of Maryland, in St. Mary's City, MD. Current research interests include the evolution of bird song, molecular phylogenetics and echolocation in birds.

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