



**D**awn washes slowly across the Crow Valley Campground in northeast Colorado. Soon the morning quiet is shattered by a symphony of bird song.

Listening carefully, one can hear snippets of meadowlark, blackbird, sparrow, warbler and at least a dozen more songbirds. The singing continues for nearly an hour, interrupted only by brief pauses. What sounds like a chorus of birds is actually a single crooner serenading from the top of a cottonwood tree. ↪ Superficially he is an ordinary

# Master Mimic

Article & Photos By BRUCE GILL

bird: Gray like a pigeon but less colorful, medium-sized like a thrush but less handsome, long-tailed like a magpie but less spectacular, he is rather pedestrian. But when it comes to showmanship, he is awesome.

His scientific and common names attest to his stunning pageantry. ↪ He is a northern mockingbird, known among scientists as *Mimus polyglottos*. His generic name translates from Latin to “mimic” and his specific name derives from the ancient Greek word *polyglottos* meaning “many-tongued.” On this crisp, clear May morning, I am treated to a many-tongued melody. If I lived in an urban area, I might also hear the hum of a motor, the creak of a door or toot of a horn. If I lived more rurally I might hear the bark of a dog, the mew of a cat or the croak of a frog. But mostly mockingbirds mimic the songs of other birds to create a melody that is uniquely their own.



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The northern mockingbird is a master mimic. The more talented males can mock snippets of bird-song from up to 100 other species.



A typical mockingbird aerial display consists of several consecutive dance moves.

So entertaining and intriguing is the mockingbird's whimsical song, it begs the question why mockingbirds mimic rather than sing songs of their own like most other songbirds. The answer is as complex as it is interesting. Male mockingbirds sing for two interrelated reasons, combat and courtship. Mockingbirds are aggressively territorial and mostly monogamous. Males fight to gain property, to attract mates and to defend both from competitors. Fighting is strenuous and dangerous. A male that can judge the strength and aggressiveness of another male by his song can avoid the substantial risks of unnecessary combat. Likewise a female that can judge the quality of a male from his song is able to consistently choose higher-quality mates.

Birdsong is complex. It involves intricate coordination between the brain and the muscles that manipulate the airway architecture and control breathing. In general, the more complex the song is, the more sophisticated the coordination must be. As in other songbirds, the northern mockingbird's song is initiated in an organ called the syrinx that is located at the bottom of the windpipe. All inhaled and exhaled air passes through it. As air is expired, the syrinx muscles can be tightened to cause air to flow more rapidly. Increasing airflow velocity vibrates tissues and membranes in the syrinx to produce a note. Tightening or loosening the tension of the membranes changes the pitch of the note and intensifying the force of exhalation ramps up the volume.

Each side of the syrinx can be controlled independently allowing two notes to be generated simultaneously. Rapid mini-breaths are taken between each note so that birds can sing continuously for prolonged periods without running out of breath. Coordinating the difficult respiratory and muscular tasks required to transform sound into song requires brain power and stamina, both potential clues to a male's reproductive quality.

Early in spring, male mockingbirds dramatically pick up the pace of their singing. A typical male begins singing well before dawn and continues almost nonstop until late morning. The rate of singing gradually tapers off throughout the afternoon. Unmated males sing longer during the day than mated males and often resume singing at night, typically between the predawn hours of 1:00 to 4:00 a.m. Robust singing sends at least three messages to unmated females: The singing male has a territory, he is available and he is vigorous.

At least three other characteristics of a male's song are useful to females seeking to judge a male's quality: the size of his song repertoire, the diversity of his song arrangements and the accuracy of his mimicry. A male mockingbird's song repertoire includes all of the soundbites he has excerpted from the songs other birds and stored in his memory throughout his lifetime. Given that males can live up to 10 years, ultimately a repertoire can grow to as large as 500 or more bits of song. So when a female selects a male with a large song repertoire, she is selecting a mature male with brain power,

both of which correlate to higher reproductive success.

Studies of mockingbirds and other songbirds show that males with larger repertoires tend to be older, healthier, occupy territories of higher quality and breed earlier. Healthier male mockingbirds that breed earlier produce more nests during a breeding season, produce larger clutches and fledge more young.

Mockingbirds never sing the entire song of birds they mimic. Instead, they choose a short sequence of phrases from each bird's song. Nor do they just plagiarize song phrases. Like all great composers they reorganize them into genuinely unique compositions. The end product is a song that is clearly only a mockingbird's.

Typically a male starts his song by singing a single phrase three or more times in succession before switching to a different one. Over the course of nearly an hour of continuous singing, he changes song phrases several times. After singing continuously for some time, he pauses. When he resumes, he may add new phrases and rearrange earlier phrases into entirely new songs. Through the course of a single breeding season, the mockingbird's song repertoire can become astonishingly complex.

And to complicate matters even more, each year a male retains only one-third to two-thirds of his song repertoire from the previous breeding season. The rest is entirely new material. Females use all of this complexity to judge a male's braininess and, hence, his reproductive potential.

Mimicking accuracy may be another way females rate a male's quality. A decade ago, researchers at Indiana University discovered that when a male mockingbird mimics the song of another bird, he not only reproduces the sounds, he also duplicates the vocal mechanics the mimed bird used to produce its original song.

The canary, for example, produces its rapid trilling song by taking several mini-breaths while alternating between the right and left sides of the syrinx. The larger mockingbird is unable to duplicate the canary's rapid mini-breath rate. So it improvises. To compensate, the mockingbird reproduces the canary's rapid notes with a single, long exhalation. Quickly the mockingbird runs out of air and must abbreviate the canary's long song. Researchers believe that female mockingbirds may discriminate among males by how accurately they are able to reproduce the sounds of the birds they mock. Stronger males, for example, may be able to sing longer canary phrases

than less fit males, providing females with a cue to male fitness.

Amazingly, male mockingbirds not only sing they dance, too. The dance is an aerial ballet. It begins with a bachelor male singing from an elevated perch with an unobstructed view. Suddenly he leaps into the air and flaps his wings a few times to gain altitude. At the peak of his leap, he momentarily hangs suspended with wings and tail spread wide. Then he parachutes back toward his perch and lands. He sings nonstop throughout the entire aerial display. The display is repeated several times throughout a singing bout.

The dance ends and his song changes. The once incessant singing is now softer and less frequent. After a pair has mated, singing serves a different purpose. Now a male sings to stimulate his mate's amorous interests. When a female finds a mate with just the right love song, it stimulates hormonal changes that promote ovulation and stimulate her to copulate. The few observations of mockingbird copulations that have been reported say that males produce bursts of song before and during coupling.

At the onset of egg-laying, singing is nearly muted until the brood is almost fledged. Then, even before brood rearing is



Males that occupy the richest territories typically have large song repertoires, diverse song compositions and mimic other birdsongs more accurately than competing males. They also breed earlier, produce more clutches and fledge more young.

To hear the northern mockingbird singing, visit the All About Birds Cornell Lab of Ornithology at [allaboutbirds.org](http://allaboutbirds.org).

The dance is believed to serve two purposes. First it discourages trespassers by displaying visual and auditory cues to the dancer's fighting potential. Second, those same cues attract mates. During the dance, white patches on the undersides of the wing are clearly displayed. Underwing patches of older, larger males are larger, serving notice to smaller males that trespassing invites a vigorous fight. Females use the size of a male's wing patches to evaluate his quality. Older, larger males are able to claim and defend superior territories.

Soon after a female chooses her mate, his

finished, the male starts to build another nest for the next brood. He resumes singing to stimulate the female to ovulate and breed again. After she breeds, she completes the next nest and lays and incubates a new clutch of eggs. Meanwhile, the male continues to feed the first brood until they are able to care for themselves. This cycle of singing to initiate nesting and silence during nesting continues throughout the nesting season.

Autumn brings an end to nesting, and mockingbirds begin to sing a different tune. Most songbirds sing only during the breeding season. Mockingbirds are among those

that sing year-round. Interestingly, both male and female mockingbirds sing in the fall. The mockingbird's fall song has puzzled researchers for quite some time. Why do both sexes sing? What are the functions of their song? Do they differ structurally and functionally from those of the breeding and nesting seasons? The simple answer to all of these questions is that no one yet knows for sure.

Studies of other bird species provide some clues to why mockingbirds sing in the fall. Both male and female mockingbirds defend fall territories, and mated pairs frequently share and defend a single territory. Song sparrows likewise defend winter territories and use song to attract mates and discourage trespassers. Researchers recently discovered that samples of song sparrow blood collected in the fall contain significant levels of a hormone called DHEA (shorthand for Dehydroepiandrosterone). DHEA is normally inactive but is converted to an active form by key enzymes. During the fall these enzymes are stored in centers of the song sparrow brain that are quite close to areas associated with birdsong.

When the enzymes were experimentally blocked song sparrows did not sing. When enzyme levels were boosted, singing resumed. Assuming mockingbirds are like song sparrows, it could be that decreasing daylength triggers the release of the enzymes that activate the normally inactive hormone, prompting fall singing. And fall singing could promote early pairing, strengthen pair bonds and discourage competitors. All of which would allow mated pairs to breed earlier, produce more clutches and fledge more young. Fall song could also serve as practice time during which a male composes and perfects new song routines before spring competition begins.

Now, as spring approaches, the mockingbird once again prepares to perform his stunning song and dance routine. If you haven't already witnessed it, or even if you have, take time to listen to the mockingbird. It is a captivating performance you don't want to miss. 🐦

*Bruce Gill retired from the Division of Wildlife in 2001 after working 35 years in its research section. As the mammals research leader, he was involved in studies of mule deer, elk, mountain goat, bighorn sheep, pronghorn, black bear, moose, lynx, swift fox, kit fox, mountain lion and other wildlife. This article is copyrighted by the author.*