Guest Letter by George Didden, III
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THROWIM WAY LEG

"Throwim Way Leg" is the title of a fascinating book written in 1998 by Tim Flannery about his more than 20 years of field research in Papua New Guinea and neighboring Irian Jaya. The title, in New Guinea pidgin, means to throw your leg out to begin an adventurous journey of exploration into the unknown.

Throwim Way Leg is an apt description of every scientific field endeavor conducted by National Zoo researchers. Many would be surprised to learn that the National Zoo is one of the leading biological research institutions in the country. A strong force of highly qualified zoo scientists conduct an impressive number of inquiries each day trying to unlock the secrets of nature. This research is conducted at the National Zoo and the Zoo's Conservation and Research Center in Front Royal, Virginia, and throughout the world in such countries as Malaysia, Burma, India, Venezuela and on remote Sable Island, a hundred miles southeast of Nova Scotia's Cape Canso. The National Zoo is blessed to be a bureau of the Smithsonian Institution whose extraordinary resources provide enormous collaborative leverage "for the advancement of science and the instruction and recreation of the people."

My avocation as a watcher of, and listener to, birds leads me to focus attention on my ornithological predilections. It is the sheer life force exuberance of birds, the frailest-appearing creatures, possessing Tinkerbell-like flashes of brilliant color and near magical sounds, that drew me into their special world in the first place. I clearly remember an October day in 1994 when I was standing on a windswept beach on a barrier island comprising the southernmost tip of the Delmarva peninsula. A group had gathered there to watch the vast fall migration of birds stacked up waiting for favorable winds to carry them down the mighty Chesapeake Bay and out into the Atlantic Ocean, many for destinations in Central and South America. Suddenly, birding expert Michael O'Brien pointed skyward while looking us straight in the eyes and exclaimed, "Cape May Warbler." None of us could even see this bird, but as Michael explained, no one could. It was simply too small and too high up. He had identified the Cape May (*Dendroica tigrina)* by its single distinctive call note. Michael acquired this incredible skill over many years listening to tapes of bird sounds and many more years of field experience.

Sooner or later, many birders identify birds aurally 90% of the time by memorizing their songs and calls. Although initially this requires considerable effort, it more than offsets the energy spent endlessly peering into thick vegetation, only to realize your quarry is the same species you had seen frequently earlier that day. Aural birding also conserves enormous energy by comparing the sounds you hear with those stored in memory. The new sounds are worth investigating while the familiar sounds can be safely ignored at the birder's option.

The National Zoo is fortunate to have its own expert in bird sounds. Dr. Eugene S. Morton has achieved true guru status over a long and very productive career as an ornithological research scientist specializing in this complex matter. His achievements are too numerous to list here, but I will highlight a few.

It was Gene who discovered that birds communicate using frequency modulation (FM) more than amplitude modulation (AM) because frequency modulation is less subject to "clipping" and other forms of interference that plague amplitude modulated transmissions. Similarly, we tune our car radios more often to the FM band than the AM, especially in remote areas.

In 1996, Dr. Morton wrote an article published by Science and Technology Letters in Great Britain for the Poultry and Avian Biology Review, entitled *"Why songbirds learn songs: an arms race over ranging*". In this article, Gene considered questions, such as the one in the title, that had been asked for years but had gone unanswered. Then with much intensive field research coupled with brilliant insight, he proceeded to provide perfectly plausible explanations.

We have long known that oscine passerines (songbirds) actually learn songs and even use different dialects while their closely related cousins -- the non-oscines, of the same family *Passeriformes* -- do not. Songbirds are also physiologically different in that their forebrains contain cell clusters of song nuclei absent in other birds. Why do songbirds sing? Why does song repertoire size vary between and within species? Why do individuals in some populations share all song types while in other populations they do not? More importantly, why do these birds memorize the songs and even the accents of con-specifics (same species)? Hard questions indeed, necessitating difficult "outside-the-box" reasoning to deduce a unified theoretical solution.

Gene posits that a thorough study of the characteristics of this sub-family (oscine passerines) discloses that its members are typically the birds with the smallest mass. Their size compels them to use strategies to function within the limits of their energy availability. The ability to learn songs allows these small birds more time to forage and reproduce with minimal interference from competing males of their own species. This theory is further supported by evidence that at least one tiny, non-oscine -- Anna's hummingbird (*Calypte anna*) -- learns bird songs as well.

Dr. Morton contributed a new perspective on the theory of song learning called "Ranging Theory" that helps us understand why birds learn songs and that is fully compatible with the evolutionary imperative that all animals "select" behavior in their own self-interest. Ranging Theory suggests that listeners learn and store songs so that they can compare the degradations in the songs they hear in nature from those stored in memory. They use this information to determine the distance to the singer and regulate their response accordingly. If the song is perceived "near," they attack the singer; if perceived "far away," they can ignore it and preserve precious energy. Other researchers have discovered that ranging birds in habitats with abundant food sing more persistently because they have fewer interruptions. Also, females select males with more persistent songs as mates because they are territorially dominant and thus would be good providers, needing less time to contend with competition.

However, the evolutionary imperative demands that the singer also act in its best interest. It follows that the singer would like to have the listener believe that it is very close, thus disrupting and destabilizing the listener's territory. It is one of those opportunistic scientific ironies that Drs. Morton and Gish were inspired to test this theory on a non-oscine species. They employed sophisticated equipment to record and play back Carolina Wren (*Thyrothorus ludovicianus)* songs in three habitats: one in a Maryland forest, one in an open palmetto hummock in Florida, and one in a neutral "control" site. They then compared sonographic changes in the energy/time distribution in each undegraded song with its distribution after travelling about 50 meters in each different habitat. The results of this remarkable study showed that Carolina wren songs are physically structured to retain their source characteristics during propagation. The study confirmed that Florida songs played in Maryland suffered serious degradation and Maryland songs played in Florida were similarly more degraded than songs broadcast in the place they were recorded. Songs replayed in the neutral site degraded equally, but less. The study also showed that the different dialects recorded were specifically calculated to degrade as little as possible depending on the type of habitat. These findings led to the theory that listeners memorize songs of their fellow species to conserve energy by minimizing disruptions while singers use memorized songs as a countermeasure to ranging.

Every birder has wondered why some singing birds seem to have an accent, but few realize that accent maximizes sound travel through a specific habitat. Furthermore, developing and using a dialect in an unstable neighborhood, such as during migration layovers or on temporary breeding grounds in the North, make it difficult for the listener to utilize ranging techniques because it cannot learn that unheard, precise song. Dr. Morton demonstrated that the singers escalated the arms race by learning the listener's song and returning it as if the singer was close. The evolutionary imperative is thus intact and the arms race continues. As usual, much research remains to be done on bird songs.

My personal experiences with bird sounds -- memorizing to conserve energy and storing and comparing sounds to make the "hunt" more productive -- reinforce my feelings that we human animals play by the same rules the evolutionary imperative imposes upon all species. Come to think if it, why do we Americans develop accents depending on where we were raised, and why do we lose those accents over time when we relocate? Could it be that the Texan's drawl travels farther in Texas habitat or the Bostonian's clipped "r" elided speech travels more efficiently in the skyscrapered forest of that city? Maybe some bright young anthropologist should test for this – just to rule it out!

I have great admiration for research scientists such as Gene Morton and the rest of the research team at the National Zoo and the Conservation Research Center. As a person trained in law and banking, I am used to problems that present themselves and are then resolved. Not so for research scientists. Their innate curiosity divines a question, develops a theory, and then summons from within the creativity to test whether the theory is not false. The answers found are diamond chips pried with difficulty from the hardest stone on earth, then placed with the multitude of other chips to reconstruct the whole. Every question answered and successfully defended raises more questions to be studied and resolved.

I believe it would behoove each of us to remember the words of Stephen Covey: ***" One person can be a change catalyst, a transformer in any situation. Such an individual is yeast that can leaven an entire loaf."*** I am delighted that David asked me to write this December guest letter. It is my hope that our collective curiosity, the genuine "fun" of our existence, so amply seasoned as it has been by our relationship with the National Zoo, will continue to enrich each of our lives in the exciting times ahead. Let us join together to support and encourage NZP's talented research team to continually Throwim Way Leg!

Happy Holidays!!

George Didden