

what an academic zoologist might write about aye-ayes, tree frogs, or honey badgers—except that these giants have been extinct for 65 million years. Here you will find a family tree of the roughly twenty-five known *Tyrannosaur* species, tracing bloodlines from the first appearance of the species *Proceratosaurus* around 167 million years ago, to the great extinction at the end of the Cretaceous period, a remarkable 100 million years later. During this period, Tyrannosaurs showed not only impressive staying power, but also astonishing growth in size—the earliest species measured under fifteen feet in length; the later species were upward of twice that.

If most of what you know about Tyrannosaurs is based on old Japanese movies or the *Jurassic Park* franchise, there will be many surprises. You'll learn that, although the big beasts may have had scales on some parts of their bodies, feathers were probably present, as befits the ancestors of modern birds. They walked erect, not crouched over in a threatening pose, but nonetheless could move rapidly to chase prey. Once they caught that prey, however, they had a problem: the later species' arms were tiny, with only two fingers on each hand. Smaller animals could have been dispatched in a single bite, but it seems that larger prey were stopped cold by strategic chomps to the most exposed part of a fleeing animal: the tail. Indeed, two fossil hadrosaurs have been found with tyrannosaur bites in their derrieres.

Many gaps in the picture remain, of course. Fossil skeletons are invariably incomplete, and for many of the species described here, only a single individual or a few bones have so far been recovered. Fossilized evidence of behavior—preserved tracks, bite marks, and the like—are even harder to come by. So though *The Tyrannosaur Chronicles* is a welcome touchstone volume for lovers of the terrible lizards, further discoveries and surprises are doubtless in store.



Listening to a
Continent Sing: *Birdsong
by Bicycle from the Atlantic to the
Pacific* by Donald Kroodsmas,
Princeton University Press,
2016; 344 pages; \$24.95

Birdsong maven Donald Kroodsmas' travel journal is a welcome addition to the cycling-road-trip genre that began, over a century ago, with Thomas Stevens' *Around the World on a Bicycle*, which chronicled a globe-girdling solo journey by high-wheel penny-farthing across the U.S., Europe, and Asia in the 1880s. Cycling has improved over the years: Kroodsmas' bike is far lighter and has twenty-six more gears than Stevens' direct-crank behemoth; roads are now paved (Stevens had to follow railway rights-of-way over the Rockies and dirt or gravel most of the rest of his journey); and cross-country touring maps guide Kroodsmas and his son David along scenic byways with strategically spaced campgrounds, hostels, and motels. This is no tale of path-breaking hardship or endurance.

There is a bit of human drama, to be sure, but only a little bit. Kroodsmas is a morning person, eager to get on the road and listen to the songbirds' dawn chorus; David is laid back and likes to sleep in. Father and son are at opposite ends of their professional arcs—David is fresh out of college, unsure of what he wants to do next; Donald, exasperated with the petty politics of an academic career three decades after graduate school, is correspondingly unsure of what he wants to do next. It's the sort of existential backdrop that, in 1974, propelled

to best-seller status Robert Pirsig's father-son, cross-country travelogue, *Zen and the Art of Motorcycle Maintenance*. To underscore the similarity, son David carries Pirsig's book along for trailside reading, and Kroodsmas refers to it from time to time.

It's the author's knowledge of birdsong, however, that makes this book so delightful. Where other birders tick off entries in their life lists sighting-by-sighting, Kroodsmas does it listening-by-listening, a particular advantage since many observations on this trip are made long before the crack of dawn. Page after page is filled with such exuberant identifications as "Yes, rock wren! I know well the wren's buzzy, ringing call, an isolated *pdzee*. . .and a robin's *qui-qui-qui* calls, then *tut-tut tut-tut-tut-tut*. . .western wood pee-wee."

The most appealing feature of this book is that on virtually every page there are QR codes (for the un-smart-phoned, those little squares with dots) that link directly to one of 381 recordings of songbirds (and sometimes humans) referred to in the text. You can scan the code with your phone and start listening along with the author (or visit <http://listeningtoac-continentssing.com/> for a state-by-state list of linked sounds).

Despite Kroodsmas' considerable descriptive skills, reading his writing without playing the accompanying audio would be like taking a tour of the Louvre while blindfolded. Since I stopped every few paragraphs to call up a virtuoso songbird—often with ambient sounds of wind, rain, or running water that made me feel I was traveling with him—it took me much longer than usual to read the book. But, after all, it's a bicycle trip.

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