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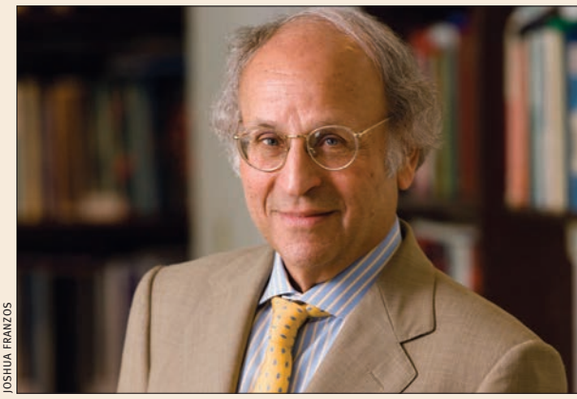
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JOSHUA FRANZOS

I learned from a book that crawdads don't really sing; I learned from my mother that if you go far enough into the wilderness you will hear them anyway. —Delia Owens

At Stone Harbor this August, I took time to consider, as Longfellow put it, how *waves, with their soft white hands, efface the footprints in the sands.* That ebb and flow has been a constant for eons. For now, I swim at low tide and jump the waves at high. (Maybe I'm influenced by the gravitational pull of the moon?) It's not surprising that creatures who live in coastal regions operate in 12-hour rhythms in sync with the tides. Pitt's Bokai Zhu has discovered that this clock, independent of our better characterized circadian clock, is still ingrained in us long after our slippery ancestors wriggled out of the sea foam. He began this work as a postdoc with the renowned cell biologist and Pitt Med alumnus Bert O'Malley. Using an algorithm that identified superimposed oscillations, Bokai found that the 12-hour rhythms of gene expression operating in the tissues of sea creatures are evolutionarily conserved in us. We have co-opted this ancient circatidal clock to benefit our terrestrial lives. For example, we've been able to increase the production of certain hormones related to metabolism during the "rush hours" of gene expression for these hormones. Those high-traffic times align with our dawn and dusk and our fasting and sleeping schedules—perhaps changing slightly throughout the month, though certainly not to the extent that tides do.

It's clear to me that serious study of evolutionary biology belongs in a medical school. We likely have much to learn about our own behavior and physiology from our sea ancestors. In fact, we've recently created a Center for Evolutionary Biology and Medicine to further catalyze such inquiries. Are there morbidities consequent to 12-hour clock deregulation, and if so, can we therapeutically reset the clock? Links between healthy limpets and sick humans may seem incongruous, but evolutionary biologists must live with the tension of contradictory observations. For example, the sickle cell mutation causes a very painful, sometimes lethal, disease. So why didn't we shed this mutation during evolution? Probably because sickle cells are not readily infected by the malarial parasite, malaria being a greater cause of mortality than sickle cell anemia. Nonhuman primates don't tend to get atherosclerosis, nor heart attacks; at some time in evolution, we lost the function of a gene (*cmah*) that protects our cousins. How did we benefit? We're better at long distance running! At least in mice, *cmah* loss increases running endurance and decreases muscle fatigue; if translatable to humans, this would have been an evolutionary advantage as we moved from the forest to the open savannah and had to hunt quickly over long distances.

Medicine is sprinkled with such apparent incongruities: We give stimulants for hyperactivity and nitroglycerin, an explosive, for angina. In fact, the ability to sit comfortably with competing ideas is our fount of creativity.

At the shore, between the swimming and the jumping, I relished the debut novel of Delia Owens, *Where the Crawdads Sing*. Owens is an acclaimed wildlife scientist, intrigued with how humans mirror and can learn from ancient animal behaviors. With extraordinary power and poetry, she writes now of Kya Clark, a very young fictional child who has been abandoned by her severely dysfunctional family and left alone in the only home she knows, a dense Carolina coastal marsh. She grows in isolation and learns from the gulls, the ferns, the insects, and the tides how to assess time, season, nature's rhythms, what to eat, and how to survive. She is shaped to an exceptional adulthood by the beautiful and violent secrets, often incongruities, that nature keeps and imposes on our own evolution.

We should go far enough into the wilderness to hear the crawdads sing, as Bokai Zhu has done!

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