in ultraviolet and infrared images. Studying the brilliant light shows at the planet's poles, the team observed particles falling into the planet's atmosphere, similar to what happens on Earth. But, unlike on Earth, beams of electrons shoot out of Jupiter's atmosphere. The finding suggests the gas giant interacts very differently with the solar wind, the team writes.

Another oddity, described by Bolton's team, is how ammonia wells up from the depths of Jupiter's atmosphere (see Page 32). The upwelling resembles a feature on Earth called a Hadley cell, where warm air at the equator rises and creates trade winds, hurricanes and other weather. Jupiter's ammonia cycling looks similar. But because Jupiter lacks a solid surface, the upwelling probably works in a different way. Figuring out how the phenomenon occurs on Jupiter may help scientists better understand the atmospheres of other planets.

"What we learn about Jupiter will impact our understanding of all giant planets," Bolton says. Most planetary systems have Jupiter-like planets. By helping reveal how the one in our solar system formed and operates, the new data could give clues to how other planetary systems evolved as well. ■

GWAS account for only about 5 percent of individual differences in intelligence, the authors estimate. Those genes are "accounting for so little of the variance that they're not telling us much of anything," says differential developmental psychologist Wendy Johnson of the University of Edinburgh.

Still, understanding the genetics of intelligence might one day point out ways to enhance it for people at both the high and low ends of the curve. "If we understand what goes wrong in the brain, we might be able to intervene," Haier says.

But ethical and technical concerns exist. Brain biology is incredibly intricate, so changing one gene might have many unanticipated effects. Scientists would need to know everything about the genetics of intelligence before they could change it, Posthuma says. ■

LIFE & EVOLUTION

Flamingos' bones favor one-leg stance

Bird balancing act needs little muscular effort, study suggests

BY SUSAN MILIUS

A question flamingo researchers get asked all the time — why the birds stand on one leg — may need rethinking. The bigger puzzle may be why flamingos bother standing on two.

Balance aids built into the birds' basic anatomy allow for a one-legged stance that demands little muscular effort, tests find. This stance is so stable that a bird sways less to keep itself upright when it appears to be dozing than when it's alert with eyes open, two Atlanta neuromechanists report May 24 in *Biology Letters*.

"Most of us aren't aware that we're moving around all the time," says Lena Ting of Emory University, who measures postural sway in standing people as well as in animals. Just keeping the human body vertical demands constant sensing and muscular correction for wavering. Even standing robots expend "quite a bit of energy," she says. That could have been the case for flamingos, she points out, since effort isn't always visible.

Ting and Young-Hui Chang of the Georgia Institute of Technology tested balance in young Chilean flamingos on a platform attached to a device to measure how much they sway. Keepers at Zoo Atlanta hand-rearing the test subjects let researchers visit after feeding time in hopes of catching youngsters inclined toward a nap — on one leg on a machine.

As a flamingo standing on one foot shifted to preen a feather or joust with a neighbor, the instrument tracked wobbles in the foot's center of pressure, where the bird's weight was focused. When a bird tucked its head onto its pillowy back and shut its eyes, the center of pressure made smaller adjustments (within a radius of 3.2 millimeters on average, compared with 5.1 millimeters when active).

Museum bones revealed features of the skeleton that might enhance stability, but bones alone didn't tell the researchers enough. Deceased Caribbean flamingos donated to science gave a better view. "The 'ah-ha!' moment was when I said, 'Wait, let's look at it in a vertical position,'" Ting remembers. All of a sudden, the bird specimen settled naturally into one-legged lollipop alignment.

The bird's distribution of weight looked just right for one-footed balance. The flamingo's center of gravity was close to the inner knee where bones started to form the long column to the ground, giving the precarious-looking position remarkable stability. The specimen's body wasn't as stable on two legs, the researchers found.

Reinhold Necker of Ruhr University in Bochum, Germany, doesn't see this study as evidence that a one-legged stance saves energy overall. "The authors do not consider the retracted leg," says Necker, who has studied flamingos. Keeping that leg retracted could take some energy.

A young flamingo sets one foot on an instrument that tracks posture. The smallest shifts (red squiggles, right) in the foot's center of pressure, where weight is focused, occur when the bird is quiescent. For active birds, shifts are bigger.

ROB FELT/GEORGIA TECH (PHOTO); Y-H CHANG AND L.H. TING/*BIOLOGY LETTERS* 2017

The new study is a step toward understanding how flamingos stand on one leg but doesn't explain why, says comparative psychologist Matthew Anderson of St. Joseph's University in Philadelphia. He's found that more flamingos rest one-legged when temperatures drop, so thermoregulation might have something to do with it. ■