Lessons from orangutans: Upright walking may have begun in trees

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By obÂ-servÂ-ing wild orangÂ-uÂ-tans, reÂ-searchÂ-ers have conÂ-cludÂ-ed that our upÂ-right walkÂ-ing style may have first arisÂ-en in relÂ-aÂ-tively anÂ-cient, tree-dwelling apes. The theÂ-oÂ-ry chalÂ-lenges curÂ-rent thinkÂ-ing, which sugÂ-gests two-legged walkÂ-ing emerged in more reÂ-cent huÂ-man anÂ-cesÂ-tors that had alÂ-ready deÂ-scended to flat lands. The new proÂ-poÂ-sal apÂ-pears in the June 1 isÂ-sue of the reÂ-search jourÂ-nal SciÂ-ence.

UpÂ-right walkÂ-ing, or biÂ-peÂ-dalÂ-ism, has long been conÂ-sidÂ-ered a deÂ-finÂ-ing feaÂ-ture of huÂ-mans and our closÂ-est anÂ-cesÂ-tors. One of the leadÂ-ing exÂ-planaÂ-tÂ-ions, known as the saÂ-vanÂ-nah hyÂ-pothÂ-eÂ-sis, sugÂ-gests that the anÂ-cesÂ-tors of chimps, goÂ-rilÂ-las and huÂ-mans deÂ-scended from the trees and beÂ-gan walkÂ-ing on on all fours. An adult feÂ-male SuÂ-maÂ-tran OrangÂ-uÂ-tan and her inÂ-fant in the GuÂ-nung Leuser NaÂ-tionÂ-al Park, InÂ-doÂ-neÂ-sia. (CourÂ-teÂ-sy SKS Thorpe)

Over time, this four-legÂ-ged gait would have evolved inÂ-to the â€œknuckle-walkÂ-ingâ€• that chimps and goÂ-rilÂ-las still use toÂ-day; upÂ-right, two-legged walkÂ-ing would have been the next stage.PaÂ-leÂ-onÂ-tolÂ-oÂ-gists have conÂ-venÂ-tionÂ-ally used signs of biÂ-peÂ-dalÂ-ism as key criÂ-teÂ-ria for disÂ-tinÂ-guishÂ-ing early huÂ-man, or â€œhoÂ-minÂ-in,â€• fosÂ-sils from those of othÂ-er apes. But this disÂ-tincÂ-tion is comÂ-pliÂ-catÂ-ed by reÂ-cent fosÂ-sil evÂ-iÂ-dence that some early hoÂ-minins, inÂ-cludÂ-ing the creaÂ-ture dubbed â€œLucyâ€• (AusÂ-traÂ-loÂ-pithÂ-eÂ-cus afarenÂ-sis), lived in woodÂ-lands. Still earÂ-liÂ-er forms seem to have lived in the forÂ-est canÂ-oÂ-py and moved on two legs.â€œOur findÂ-ings blur the picÂ-ture even furÂ-ther,â€• said RobÂ-in CrompÂ-ton of the UnÂ-iversÂ-ity of LivÂ-erÂ-pool, U.K., one of the studyâ€™s auÂ-thors. â€œIf weâ€™re right, it means you canâ€™t rely on biÂ-peÂ-dalÂ-ism to tell whethÂ-er youâ€™re lookÂ-ing at a huÂ-man or othÂ-er ape anÂ-cesÂ-tor. Itâ€™s been getÂ-ting more and more difÂ-fiÂ-cult for us to say whatâ€™s a huÂ-man and whatâ€™s an ape, and our work makes that much more the case.â€•CrompÂ-ton and colÂ-leagues at the UnÂ-iversÂ-ity of BirÂ-mingÂ-ham in BirÂ-mingÂ-ham, U.K., drew their conÂ-cluÂ-sions by watchÂ-ing wild orangÂ-uÂ-tans in SuÂ-maÂ-tra, InÂ-doÂ-neÂ-sia. Orangutans spend alÂ-most their whole lives in trees, makÂ-ing them useÂ-ful modÂ-els for how our anÂ-cesÂ-tors moved around sevÂ-erÂ-al milÂ-lion years ago, CrompÂ-ton and colÂ-leagues said.To colÂ-lect the daÂ-ta, the UnÂ-iversÂ-ity of BirÂ-mingÂ-hamâ€™s SuÂ-sanÂ-nah Thorpe spent a year in the SuÂ-maÂ-tran rainforÂ-est reÂ-cordÂ-ing virÂ-tuÂ-ally eveÂ-ry move the orangÂ-uÂ-tans made. Then, she and her colÂ-leagues used these obÂ-servaÂ-tÂ-ions to test the hyÂ-pothÂ-eÂ-sis that biÂ-peÂ-dalÂ-ism would have benÂ-eÂ-fitÂ-ed tree-dwelling ape anÂ-cesÂ-tors.BeÂ-cause these anÂ-cesÂ-tors were probably fruit-eaters, as orangÂ-uÂ-tans are, they would have needed a way to navÂ-iÂ-gate the thin, flexÂ-iÂ-ble branches at the treeâ€™s peÂ-riphÂ-ery, where the fruit typÂ-icÂ-ally is. MovÂ-ing on two legs and usÂ-ing their arms priÂ-marily for balÂ-ance, or â€œhand-asÂ-sisted biÂ-peÂ-dalÂ-ism,â€• may have helped them travÂ-el on these branches, the reÂ-searchÂ-ers said.They anÂ-aÂ-lyzed nearly 3,000 exÂ-amÂ-ples of orangÂ-uÂ-tan moveÂ-ment, and found that the orangÂ-uÂ-tans were more likely to use hand-assisted biÂ-peÂ-dalÂ-ism when they were on the thinnest branches. When biÂ-peÂ-dal, the anÂ-iÂ-mals alÂ-so tended to grip mulÂ-tiÂ-ple branches with their long toes.On meÂ-diÂ-um-sized branches, the orangÂ-uÂ-tans used their arms more to supÂ-port their weight, changÂ-ing their movÂ-ing style to inÂ-corÂ-poÂ-rate hangÂ-ing. They only tended to walk on all fours when navÂ-iÂ-gatÂ-ing the largÂ-est branches, the reÂ-searchÂ-ers found.Hand-assisted biÂ-peÂ-dalÂ-ism may have ofÂ-fered sevÂ-erÂ-al adÂ-vanÂ-tages that alÂ-lowed our tree-dwelÂ-ling anÂ-cesÂ-tors to venÂ-ture onÂ-to thin branches, CrompÂ-ton and colÂ-leagues argued. The aniÂ-mals could have gripped mulÂ-tiÂ-ple branches with their toes and disÂ-tribÂ-utÂ-ed their cenÂ-ter of graÂ-vity more efÂ-fecÂ-tiveÂ-ly, while keepÂ-ing one or both of their long arms free to reach for fruits and othÂ-er supÂ-ports. Orangutans alÂ-so keep their legs straight while standÂ-ing on bendÂ-ing branches, the auÂ-thors reÂ-ported. The benÂ-eÂ-fit of the straight legs is unÂ-clear, but when huÂ-mans run on springy surÂ-faces, we alÂ-so keep our weight-bearing legs straighter, so this may have an enÂ-erÂ-gy-related adÂ-vanÂ-tage.â€œOur reÂ-sults sugÂ-gest that biÂ-peÂ-dalÂ-ism is used to navÂ-iÂ-gate the smallÂ-est

branches where the tastiÂ-est fruits are, and alÂ-so to reach furÂ-ther to help cross gaps beÂ-tween trees,â€• said Thorpe.The auÂ-thors proÂ-pose an evÂ-oÂ-luÂ-tionÂ-ary sceÂ-narÂ-iÂ-o that beÂ-gins as othÂ-er reÂ-searchÂ-ers have enÂ-viÂ-sioned. SomeÂ-where toÂ-ward the end of the MiÂ-oÂ-cene era, 24 to 5 milÂ-lion years ago, cliÂ-mate in East and CenÂ-tral AfÂ-riÂ-ca beÂ-came alÂ-terÂ-nately wetÂ-ter and driÂ-er, and the rainforÂ-est inÂ-creasÂ-ingly patchy. Apes livÂ-ing in the forÂ-est canÂ-oÂ-py would have beÂ-gun to enÂ-counÂ-ter gaps beÂ-tween trees that they couldnâ€™t cross through the high canÂ-oÂ-py.

HuÂ-man anÂ-cesÂ-tors would thus have abanÂ-doned the high canÂ-oÂ-py for the forÂ-est floor, where they reÂ-mained biÂ-peÂ-dal and beÂ-gan eatÂ-ing food from the ground or smaller trees. The anÂ-cesÂ-tors of chimps and goÂ-rilÂ-las, on the othÂ-er hand, beÂ-came more speÂ-cialÂ-ized for verÂ-tiÂ-cal climbÂ-ing beÂ-tween the high canÂ-oÂ-py and the ground. They thus would have deÂ-velÂ-oped knuckle-walkÂ-ing for crossÂ-ing from one tree to anothÂ-er on the ground.The upright style, called â€œarÂ-borÂ-eÂ-al biÂ-peÂ-dalÂ-ism, had very strong adapÂ-tive benÂ-eÂ-fits. So, we donâ€™t need to exÂ-plain how our anÂ-cesÂ-tors could have gone from beÂ-ing quadÂ-ruÂ-peÂ-dal to beÂ-ing biÂ-peÂ-dal,â€• Thorpe said. ObÂ-servaÂ-tÂ-ions of orangÂ-uÂ-tan moveÂ-ment should be useÂ-ful for conÂ-servaÂ-tÂ-ion efÂ-forts, acÂ-cordÂ-ing to Thorpe. These anÂ-iÂ-mals are seÂ-riÂ-ously enÂ-danÂ-gered, mainly beÂ-cause of habÂ-iÂ-tat deÂ-strucÂ-tion. â€œIf you can unÂ-derÂ-stand how they cross gaps in the forÂ-est, you can learn about efÂ-fects that livÂ-ing in logged or deÂ-gradÂ-ed habÂ-iÂ-tat would have on their loÂ-coÂ-moÂ-tion. These could afÂ-fect enÂ-erÂ-gy levÂ-els, for exÂ-amÂ-ple, if they have to go to the ground, which is inÂ-credibly risky beÂ-cause the SuÂ-maÂ-tran tiÂ-ger is down there lickÂ-ing its lips. The SuÂ-maÂ-tran orangÂ-uÂ-tan populaÂ-tÂ-ion is preÂ-dicted to be exÂ-tinct in the next decÂ-ade if habÂ-iÂ-tat deÂ-gradaÂ-tÂ-ion conÂ-tinÂ-ues. Our reÂ-search furÂ-ther highÂ-lights the need for proÂ-tectÂ-ing these anÂ-iÂ-mals,â€• she said.

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