important predictor of occupancy for four species: the greater dwarf lemur (*Cheirogaleus major*; occupancy=0.40±0.11), red-bellied lemur *(Eulemur rubriventer*; occ.=0.15±0.11*)*, red-fronted lemur *(E. rufifrons*; occ.=0.52±0.15) and Jolly's mouse lemur (*Microcebus jollyae*; occ.=0.11±0.09). Edge density was an important predictor of occupancy for *C. major*, *E. rubriventer*, *M. jollyae*, and the black-and-white ruffed lemur (*Varecia variegata*; occ.=0.15±0.07). LDI was an important predictor of occupancy for all species. We also found species responded to landscape variables at differing scales, though home range size did not significantly predict scale of response. Our results suggest that forest composition and configuration strongly predict occupancy across lemur species. Further, our findings highlight the importance of measuring species-habitat associations at the appropriate scale.

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Facial growth and development in subadult hominoids and fossil hominins

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Stw 183, a partial subadult face attributed to *Australopithecus africanus*, is pivotal in assessing early hominin taxonomic variation since it has morphological attributes of both *A. africanus* and *Paranthropus robustus*. The number of species within Sterkfontein Member (SM) 4, from which Stw 183 derives, is a highly contentious issue. Our project assesses the likelihood that four features of the zygomaticomaxillary region, relevant to Stw 183's taxonomic attribution, express the adult phenotype. Previous research demonstrates that some facial features in *A. africanus* undergo age-related changes during the latter stages of ontogeny, i.e., the growth interval spanning M2-M3 emergence, calling into question whether subadults should be included alongside adults in comparative analyses. We evaluate the ontogenetic stability of facial anatomy in a comparative sample of extant hominoids (n=71) using coordinate data derived from 3D surface scans. Chimpanzee and human subadults experience age-related changes in the zygomaticomaxillary region, including a significant increase in anterior-posterior thickness of the zygomatic root (t-test; p<0.001), while gorillas do not. Morphology that distinguishes *A. africanus* from *P. robustus* – relative position of the infraorbital foramen and degree of zygomaticoalveolar crest curvature – remains constant throughout later ontogeny, suggesting that these two features can be utilized with confidence in analyses that include both subadults and adults. On the whole, aspects of hominoid zygomaticomaxillary form in subadults are sufficiently similar to adults and warrant their inclusion in comparative analyses. Caution should be taken, however, when including positional and metric data on zygomatic roots as these features exhibit measurable ontogenetic changes.

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Gut microbial diversity predicts brain immune gene regulation in a model nonhuman primate

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Gut microbiota can modulate host physiology, metabolism, and immune function via the gut-brain axis (GBA), and potentially influence social behaviors. Yet much of what we know about this link comes from studies of lab-reared rodents, and we have limited knowledge of how this translates to humans and other primates – key data for assessing the evolutionary importance of the GBA as well as identifying its role in the etiology of human health and disease. Here, we probed associations between gut microbial diversity and brain gene expression in 35 free-ranging rhesus macaques (*Macaca mulatta*) from Cayo Santiago. We sequenced 16S amplicons from rectal swabs and quantified microbial alpha diversity. For the same individuals (19 females, 16 males), we generated RNA-seq data for 15 brain regions. To investigate the relationship between gut microbial diversity and brain gene expression, we modeled gene expression within each brain region as a function of sex, age, number of social partners, and microbiome alpha diversity, controlling for genetic relatedness and technical covariates. We then applied multivariate adaptive shrinkage to increase the precision of our effect estimates, and identified 1213 (9.6%) genes whose expression was significantly correlated with (lfsr<0.05) microbial diversity. These genes were associated with multiple pathways involved in response to or production of type I interferon, suggesting that the gut microbiome may modulate immune responses in the brain. These findings provide the first evidence of GBA links in a nonhuman primate and thus have important implications for understanding human health and disease.

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Substrate-related variation in limb joint kinematics in wild primates

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Arboreal locomotion is precarious and places multiple challenges upon stability when moving over narrow, compliant, angled, and disparate supports. Previous research has shown that captive primates often respond to narrower and steeper supports by flexing limb joints (thereby lowering the center of mass) and adopting a compliant gait, marked by increased proximal joint excursions and increased yield at distal joints (thereby flattening the center of mass trajectory). We tested if these strategies are also adopted by wild howler monkeys (*Alouatta palliata*) freely ranging over a variety of supports in their natural habitat at La Suerte Biological Field Station, Costa Rica. We used ImageJ to measure the angular kinematics of forelimb and hindlimb joints from high-speed videos of quadrupedal locomotion on a variety of arboreal supports.

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Spearman rank order correlations were used to test for associations between joint posture and support diameter/inclination (measured using a forestry-grade rangefinder). Our results partially confirmed previous kinematic studies of captive primates. Wild howlers increased knee flexion, elbow yield and shoulder/hip excursion as supports became increasingly steeper but did not significantly adjust joint kinematics to variation in support diameter. These results suggest that variation in support orientation, rather than diameter per se, may exert a stronger influence on quadrupedal gait kinematics in primates moving in natural environments.

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Evolved to be special: Portmann's concept of human uniqueness

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From a philosophical perspective, the problem of anthropological difference is focused on the following question: Is there any fundamental difference between humans and animals that is prior to all other differences? In his attempt to solve this problem, Portmann (1941, 1942) famously classified human species as "secondarily altricial" and provided a metaphor of a "social womb": human children are born premature in comparison with other primates, and they find a second womb in a social environment nurturing their healthy development.

Though Portmann's findings have a solid empirical basis, they are also significantly framed by the general program of philosophical anthropology (Scheler, Plessner): to find a qualitative difference between humans and non-human animals. In this tradition, the cognitive faculties of non-human species are seen as intrinsically linked to their species-specific life-world (*Umwelt*). In contrast, humans, due to their faculty of language, are able to detach from their immediate life-world through cultural representations.

Although one has to agree that cultural processes form the human species to an unmatched extent, it remains an open question if the conceptual distinction between organic inheritance and cultural evolution is unique to our species. The last decades boast numerous studies on animal cultures, mainly in the case of apes (cf. Laland and Galef 2009). I suggest that the idea of the social womb might be extended to non-human species linking the existence and transfer of group traditions to a sensitive period of early postnatal development.

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Imaging soft biological structures using micro computed microtomography (µCT)

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Visualizing myological variation in different primates facilitates evaluation of adaptive features in their musculoskeletal systems. High resolution computed tomography (µCT) is advantageous for visualizing structural details of low-density soft tissue structures, such as muscles, in a non-destructive manner, but it requires the application of contrast to be successful. Improving existing staining methods and/or developing new ones can greatly aid investigations of muscle structure with µCT imaging. Binding high-atomic number elements to the components of these soft tissue structures of interest takes advantage of osmotic differences that attract high electron density material. Here, we present novel results using a ratio of Phosphate-buffered saline (PBS) and Phosphotungstic acid (PTA) (PBS/PTA) in a staining solution applied in contrast-enhanced CT of soft tissue. Each specimen was placed in a size-matched tube to permit freedom of movement of the sample. The tube was filled with 3% PBS/PTA solution and placed on a rocking table for a minimum of 3 days to ensure the staining solution was absorbed by the sample. Afterwards, specimens were checked for stain progression with a quality control µCT scans. Solution concentration was gradually increased until suitable enhancement in X-ray images was achieved. Final scans were performed once a well-defined peak was available in the gray scale histogram corresponding to the soft tissue structure of interest. This approach has the potential to improve visualization of soft tissue structure through augmented image definition based on gray scale histogram values.

Sleeping less is related to higher levels of estradiol in women of reproductive age

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Sleep duration and pattern are related to many aspects of human physiology and health. In many non-human species, circadian rhythms strongly influence reproductive function, but it is not clear if similar relations are present in human females. The link between the physiology of menstrual cycles and the hormone melatonin, levels of which change in relation to sleep, is well established. Thus, we hypothesized that women who differed in sleep patterns would show a corresponding variation in their reproductive physiology.

Forty seven Polish, healthy, regularly menstruating women, aged 22 to 37 provided daily saliva samples for estradiol (E2) and progesterone (P) analyses. Data on their physical activity and sleep were recorded continuously using Fitbit Alta HR activity tracker for one entire menstrual cycle. Women who, on the average, slept less than 7 hours per day had 24% higher levels of E2 than women who slept longer ($\beta = .44$, $p = .001$), when controlling for age and BMI. The length of sleep did not predict mean P levels or E2/P.

These results provide new insights about relations between sleep, reproductive physiology, and women's health. While results from our study do not point to the direction of the observed relationship between sleep and E2 levels they do support the current understanding of bi-directional crosstalk between melatonin and sex hormones. The evolutionary and health significance of higher levels of E2 of women with shorter sleep should be discussed in the areas of human reproductive ecology and disease prevention.

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A moonlit dinner: Comparative gum feeding ecology of two sympatric galagos (*Otolemur crassicaudatus and the Galago moholi*) living in an afromontane temperate environment

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Temperate environments are rarely inhabited by primates, are challenging, and are especially difficult for smaller-bodied nocturnal species. Due to cold temperatures, high humidity, often higher altitude, and seasonal changes in food availability feeding can be complicated. We explored gum feeding behavior in two sympatric nocturnal, strepsirrhine primates, *Otolemur crassicaudatus* (1090g), and *Galago moholi* (150g), living in a temperate high-altitude (>1200 meters) habitat at the Lajuma Research Centre in northern South Africa. Using camera trap analyses, data was collected from January 2017-June 2018. Results from 13,161 camera trap images document the two species utilize acacia gum as a monthly valuable food resource. *O. crassicaudatus* used gums more during the hot season than the cold season

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