based on ImageJ software was used to digitize images of Nissl-stained material. Minicolumns were compared for spacing distance, neuropil space, and gray level index (GLI) across species.

We found that minicolumns in BA44 and BA45 in apes were generally as large as in the human brain, except in left BA45, where they were significantly larger in the human. The same region in the human (BA45) displayed lateralization in the form of larger minicolumns and lower GLI in the left hemisphere.

Our previous studies reported larger minicolumns in humans than apes, but were based on the left hemisphere. The current study and our previous examination of posterior BA22 (Tpt), which examined both hemispheres, found larger minicolumns in humans only in association with an asymmetry, raising the possibility that minicolumn size is similar in apes and humans except in regions with lateralization. This suggests that lateralization of minicolumns in human brains results from an enlargement of minicolumns in one hemisphere rather than a diminution in the other.

Lateralization in BA22 corresponds to increased spacing between interconnected cell clusters in a modular network in left BA22 in humans (Galuske et al., 2000). The extent to which this also occurs in Broca's area requires further investigation. We have yet to detect left-right differences in minicolumn spacing in a non-human primate brain.

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**How pathological is the Nariokotome boy KNM-WT 15'000 (*Homo erectus*)?**

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KNM-WT 15'000 is the most complete skeleton of a *Homo erectus* and generally of an early hominid and is therefore a key fossil for understanding human evolution. It belongs to an 11-15-year-old boy who lived 1.5 million years ago in area of Nariokotome at the shore of Lake Turkana (Kenya). Recently, a number of pathologies have been recognized, such as kyphoscoliosis and associated pelvic, rib and clavicular asymmetries, spina bifida, diminutive and platyspondylic vertebrae, condylus tertius, and neural canal stenosis. Based on these observations Latimer & Ohman (2001) suspected an axial dysplasia. The presence of such a severe congenital pathology would challenge current knowledge of the biology and behaviour of *Homo erectus* that is founded on this important skeleton.

In the present study, the fossil is compared to the normal variation of subadult modern humans as well as to scoliotic spines in order to analyse whether the skeleton of KNM-WT 15'000 is in fact pathological. Critical is the distinction of normal and pathological morphology, particularly in view of the juvenile age of KNM-WT 15'000. We show that the diagnosis of a congenital dysplasia is not justifiable. Indeed, most of the above features of the Nariokotome boy fall within the normal human variation. There are, however, indications of a possible disc herniation at the lower lumbar spine.

**A comparative study of the growth and morphology of the Singapore Macaques (*Macaca fascicularis*)**

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Although the variability in macaque morphology has been well described in the primatological literature, to date, little research has been published on variability in growth patterns in a single species of macaque. The purpose of the present study is to investigate differences in growth and adult morphology in two geographically distinct wild populations of crab-eating macaques (*Macaca fascicularis*) from Singapore (N=76) and Thailand (N=49). The results of our comparison of these populations indicate there are profound differences between these two populations in male and female growth patterns resulting in statistically significant differences in adult body weight for both males ($t=7.956$, $P<0.001$), and females ($t=8.393$, $P<0.001$). Significant differences in adult body length, cranial length and breadth are also found for both males and females, with the Singapore macaques exhibiting smaller dimensions. Interestingly, although the Singapore adult male macaques exhibit lower mean testicular volume than the Thai adult males ($t=1.883$, $P=0.089$), the Singapore males exhibit significantly greater testicular volume relative to body weight ($t=2.586$, $P=0.027$). The observed difference in relative testicular size may reflect differences between these two populations in levels of male-male competition, or some other aspect of social organization. This study is significant because it demonstrates there can be considerable variation in growth and adult morphology within a single species, suggesting statistical significance may not be a meaningful indicator of taxonomic differences. This research was funded in part by the University of Toronto's Connaught Fund.

**Proportions of fiber types in intrinsic shoulder muscles of small primates and non-primate mammals related to forelimb protraction and loading.**

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Primates protract their forelimbs to a greater degree during locomotion than other mammals. In order to balance the demands of increased mobility but required stability in the glenohumeral joint, many primates shift most of their body weight onto hindlimbs and thus, reduce forelimb's loading.

Differences in glenohumeral joint excursion and forelimb loading should be reflected by the percentage of fatigue resistant slow-twitch (SO) muscle fibers in shoulder muscles, which are responsible for the stabilization of the joint. To test this hypothesis, serial sections of the shoulders of tamarins, squirrel monkeys, slender loris, tree-shrews, and common squirrels were treated by enzymehistochemistry to differentiate muscle fiber types. Muscle fibers were counted on cross-sections of the shoulder muscles on six proximo-distal-levels from scapula to humerus midshaft.

In non-primate mammals, only supraspinatus muscles contained a distinct region of SO-fibers. In primates, most shoulder muscles showed an inhomogeneous fiber type distribution. In the infraspinatus muscle, the percentage of SO-fibers amounts up to 50 percent related to the muscle's role in preventing the hyperextension of the shoulder during forelimb's protraction. The overall highest percentage of SO-fibers was observed in the slender loris that showed the greatest amount of forelimb protraction and loading. The lowest percentage was found in the squirrel monkeys, which shift most of their weight onto the hindlimbs. Squirrel monkeys are the only species under study in which the humerus moves outside the scapular plane. This finding demonstrates the importance of the weight shift for the mobility and stability of the shoulder in primates.

**Scaling of brain and body weight within modern and fossil hominids: implications for the Flores specimen**

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The recently discovered hominid from Flores has a cranial capacity and body size approximating fossil australopith-

ecines. It has been argued that it is not pathological, but instead may represent some form of a *Homo erectus* endemic dwarf relic. While no modern analogs for endemic dwarfism exist in modern human populations, there does exist quite a large range of variation in brain/body sizes in populations that have presumably experienced a wide range of ecological environments selecting for varying brain and body sizes. Using Beals' cranial capacity and body weight estimates for 37 modern human populations, as well as Kappleman's (1996) estimates for a number of fossil hominids, the relationship between encephalization quotient (EQ) and body weight is found to be consistently negative within all hominid species (for which there were more than 2 data points). Within modern humans the correlation is r=-.74 (p<.0001, N=37); recent *Homo sapiens* fossil specimens r=-.95 (p<.0001, N=12), archaic *Homo sapiens* r=-.55 (p=.10, N=10); *Homo erectus* r=-.54 (p=.27, N=6); *Australopithecus boisei* r=-.998 (p<.05). These negative relationships indicate that brain size tends to decrease more slowly than body weight across specimens/populations. Flores brain/body values are not predicted by the relationships demonstrated for modern human populations, nor any of the fossil populations except the australopithecines. This suggests either that Flores underwent a wholly different kind of selection regime than any of the populations studied here, or it is pathological. The difficulties with uncritically using EQ as a measure of behavioral complexity will also be addressed.

**Comparative morphometrics of chimpanzees and bonobos**.

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Of the two closely related *Pan* species, the bonobo (*P. paniscus*) is typically described as being more gracile than the chimpanzee (*P. troglodytes*), and thereby a better potential "model" for early hominins. However, quantitative morphometric data to demonstrate this are scarce. Therefore, we set out to enlarge the existing morphometric dataset for chimpanzees and we add new comparative data of bonobos.

We collected morphometric data for 64 anaesthetised subjects (53 chimpanzees and 11 bonobos). Using a morphometric model (cfr. Crompton *et al.,* 1996) we obtained lengths and inertial properties (mass, position of the centre of mass, moments of inertia) for the upper and lower limb segments, the trunk and the head.
In chimpanzees, the head was proportionally larger than in bonobos. When considering the segments important for locomotion (i.e. fore- and hindlimb segments), our preliminary findings suggest that differences in absolute or relative segment lengths, masses and positions of the centre of mass between chimpanzees and bonobos are subtle.

Although our bonobo dataset comprised 11 individuals, a more extensive dataset is required to draw firm conclusions. Yet, this study demonstrates that differences between both species are more subtle than previously described.

**The distribution of a Native American-specific allele.**

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Because the evolutionary history of a population is the realization of several independent gene genealogies, it rarely can be reconstructed with data from a single locus. However, if a population event is accompanied by a genetic event, the locus of the genetic event affords a powerful resolution of the population event. Here we provide further evidence that a short tandem repeat polymorphism, identified by Zhivotovsky et al. (2003) as Native American-specific, is unique to and ubiquitous in Native Americans. We demonstrate that this Native American-specific polymorphism occurs at high frequencies in diverse populations and language groups throughout the Americas and discuss its implications for the peopling of the New World.

**Characterization of a murder victim using stable isotopic analyses**.

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In May, 2003 a semi-skeletonized body was found in a remote area of Mammoth Lakes, California, which had been partially disinterred from a shallow grave by bears. A coroner's examination showed that this was a 30 to 40 year old female murder victim who had been buried 6-9 months before discovery. A preliminary report suggested that she was a person of Southeast Asian ancestry based on her small stature (137 ± 5 cm) and dental morphology.

Isotopic analyses of her hair, teeth and bone were used to further characterize her cultural background and place of origin. Strands of hair 20 cm long representing about 1.4 years of growth gave δ13C values (base and end) of -14.3 ± 0.3 ‰, about 2 ‰ higher than the average for North Americans, indicating a maize-rich diet. Apatite of a premolar tooth (formed at ~ 6 years) gave δ13C = -4.6 ‰, indicating a diet extremely rich in maize; both values suggest a Mexican or Mesoamerican cultural background, not Asian. Oxygen isotope analyses of apatite should reflect δ18O of local drinking water which varies geographically. δ18O of the premolar tooth is consistent with a childhood in Southern California or Arizona, while δ18O of a rib (average of last 10 years of life) was 4 ‰ higher, consistent with S. Mexican or Guatemalan origin. These data indicate an origin in Southern Mexico or Mesoamerica that is consistent with independent craniometric and DNA evidence.

**Across the ecological divide: Dental developmental diversity in Madagascar's giant lemurs.**

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We summarize our research on the dental microstructure of subfossil Malagasy lemurs. By combining microstructural analyses of teeth with analyses of somatic growth and dental development, we are able to address questions never before asked of extinct lemurs: How dentally precocious were they at birth? When did M1 erupt? How long was gestation?

Standard histological sections (n>50) were prepared from teeth representing living indriids (*Propithecus, Indri*), lemurids (*Varecia, Lemur*) and the fossil species *Megaladapis edwardsi*, *Palaeopropithecus ingens*, and *Archaeolemur majori*. M1s initiate early in *Palaeopropithecus* (187 days prior to birth), as in indriids (94 days in *Propithecus*), and erupt at 2-6 months of age. M1 crowns are also accelerated, though not to the same degree, in *Megaladapis*, starting 132 days prior to birth and erupting ca. 9-13 months postnatally. *Archaeolemur* initiates and erupts its M1 relatively late (85 days before birth, and at ca. 15-19 months, respectively). Reconstructed gestation lengths are not short: 9-11 months for *Palaeopropithecus*, 8-9 months for *Megaladapis*, and 5-6 months for *Archaeolemur*. Our data underscore a remarkable diversity of developmental patterns in subfossil lemurs. Development in *Palaeopropithecus* is like that of indriids: slow somatic growth and fast teeth. *Megaladapis* also shows rapid dental development, but is less precocious at birth. Developmental schedules in *Archaeolemur* are reminis-