

stage usually hypothesized in the mammalian female embryo, representation of the favoured allele should be relatively uniform in all derived tissues, unless cell selection in particular organs had also occurred. Since *X* inactivation is thought to occur at about the blastocyst stage⁷, before observable organ differentiation, it seems unlikely that preferential inactivation has occurred just in the cell precursors of particular organs. It seems more probable that *X*-linked alleles of the donkey and horse have had different effects during development and maturation, with a relative selective advantage for cells with an active horse *X* chromosome in organs such as the parotid gland. But preferential expression of the horse *X* chromosome in these latter organs did not occur in all animals studied, indicating that the observed phenomenon represents a trend rather than a uniform developmental event in the female mule. Thus discrepancies between studies such as those of Hamerton *et al.* and Mukherjee *et al.* seem likely to reflect sampling differences in animals studied.

An alternative explanation for the observed distribution should be mentioned. Unknown organ specific factors may have differentially suppressed (or enhanced) expression of a particular parental G6PD phenotype (for example, perhaps inhibiting expression of the donkey band in cervical cord, pancreas and so on). Although this seems unlikely, it cannot be completely excluded. But when samples of pancreas with horse phenotype were mixed with samples of other organs which expressed the donkey phenotype, there was no evidence for an inhibiting factor.

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New Determination of Australopithecine Height

AN estimation of the body height of two robust australopithecines (Sk 82 and Sk 97) is attempted here on the basis of a ratio between femoral head diameter and body height in modern *Homo sapiens*. Coon, using the fibula and tibia from the "Zinjanthropus" living floor at Olduvai, has estimated¹ three different heights for this creature or creatures: 144.5 cm (4 feet 8 inches); 136 cm (4 feet 6 inches); and 152.4 cm (5 feet). Lovejoy and Heiple, using specimens from Sterkfontein (STS 14, STS 34 and TM 1513), have reconstructed² a height for the gracile australopithecines at 106.7 cm–109.2 cm (3 feet 6 inches–3 feet 7 inches). An estimation has never been made, however, for the height of an undisputed robust australopithecine.

Because australopithecines were fully erect and bipedal³ it is possible to apply postcranial information derived from modern *Homo sapiens* to australopithecines; the mechanical relations which hold true for modern bipedal *Homo sapiens* will also apply therefore to bipedal australopithecines. I selected fifty specimens (thirty males and twenty females) at random from the Hamann-Todd Collection of modern *Homo sapiens* in the Cleveland Museum of Natural History. I defined terms and measurements as follows. Femoral head maximum diameter: the diameter of the femoral head taken in the horizontal plane with the femur resting on the condyles and trochanter. Femoral head minimum diameter: the diameter of the femoral head taken at right angles to the plane of maximum diameter. I took care to avoid measuring non-weight bearing surfaces or protrusions. Circumference: the circumference of the femoral head taken at the greatest measurement of weight bearing area on the head. Calculated area: the head of the femur was considered as a half sphere. I used the formula, $\text{area} = 2\pi r^2$ (r , radius), half the value of the surface sphere.

The specimen files of the Hamann-Todd Collection provided body heights. All measurements are in centimetres or, in the case of areas, in centimetres², and were taken with a Vernier calliper accurate to a hundredth of a millimetre and a cloth tape accurate to one millimetre. Rechecking occasional specimens for all measurements showed that the values obtained originally were at least 98% accurate.

Determinations were made to indicate which measurement, area or diameter would relate best with body height. By correlation analysis, I found that the average diameter of the head (midpoint between maximum and minimum) correlated better than the surface area (a correlation of 0.648 as opposed to 0.627) and I used it in all further calculations and considerations.

Using a least mean squares two variable regression I then calculated the line of best fit for the data. The equation of this line is

$$\text{body height} = 13.29 \times + 108.59$$

The average distance of actual body height from this line is 3.2%, or 5.4 cm. I calculated absolute range of error using the body heights furthest removed from the line of best fit even though these heights may be anomalous. This range of absolute error is +8.2%, -7.4%. I then used this formula to predict the body height of Sk 82 as 151 cm (4 feet 11.5 inches) and Sk 97 as 157 cm (5 feet 1.5 inches). Taking average range of error into account, the range of probable heights for these specimens is

Sk 82 146–156 cm
Sk 97 152–161 cm

I see no reason why this method and formula cannot be used to estimate the height of any bipedal, erect hominid within the average range of error.

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