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This volume is dedicated to Dr. Rainer Zangerl

The Stature and Weight of Sterkfontein 14, a Gracile Australopithecine from Transvaal, As Determined from the Innominate Bone

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With the first announcement of *Australopithecus,* a new genus of hominoid primate from South Africa, by Raymond Dart in 1925 speculation began concerning the size (height and weight) of the individual. These speculations increased after Robert Broom discovered additional examples of the genus in the 1930's and after. With the distinguishing of two populations, one of presumably smaller individuals (gracile) and the other of presumably larger individuals (robust) by Broom in the 1930's and 1940's (Broom, 1950) and by many paleo-anthropologists since, and with the increasing certainty that the australopithecines were members of the human family, Hominidae, the question of size has persisted. Of the two components of "size" (height and weight), that of height is primary and most research on the topic has focused on this aspect.

The remains of australopithecines have been found in eastern and southern Africa dating between 5,500,000 and 1,000,000 years ago, but are usually scattered and mostly broken; predation by large carnivores seems to have been the major cause of death. Intact

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skeletons are unknown, and indeed the long bones of the appendages are almost always broken and with parts missing. Thus the known relationships between the lengths of the long bones in a modern individual and the stature of that individual (Trotter and Gleser, 1952, 1958) cannot be used directly on australopithecines. Typically, various means of estimating the lengths of broken long bones have been attempted, and then the height of the individual calculated, or a measure of a width of some surviving part of a long bone has been determined, and a ratio established on modern skeletons between this width and the length of the bone has been used to determine the probable length of the fossil bone, from which datum the stature of the individual has been estimated, within a probable range. The latest, most complete, and most satisfactory effort of this kind has been accomplished by McHenry (1974), whose publication can be consulted for descriptions of techniques and a review of previous investigations.

One of the specimens used variously by several investigators in their attempts to determine heights of australopithecines is a broken femur, missing the whole of the distal end as well as the head and part of the neck, of a partial skeleton (Sts 14) collected at Sterkfontein, Transvaal, South Africa, by Broom and Robinson (1947). Sts 14, a gracile australopithecine,[1] consists (in addition to the partial femur) of parts of the vertebral column and ribs, and of a nearly intact right innominate and some fragments of the left one. This pelvis, reconstructed mostly from the near-intact right half, has been studied extensively with regard to problems of locomotion in the gracile australopithecines (Robinson, 1972) but seemingly no one has attempted to use it to determine the height of the living individual who existed in South Africa some two or three million years ago.[2]

[1]The taxon of the gracile australopithecine hominids is usually considered to be *Australopithecus africanus* Dart 1925, but Robinson (1967, 1972), thinking in terms of clades and arguing that these gracile forms were directly ancestral to *Homo erectus* and thus to living humans, has called them *Homo africanus*, a practice followed by only a minority of anthropologists. We shall here avoid the taxonomic problem by simply calling them gracile australopithecines.

[2]No absolute dates are available for any of the five sites in southern Africa from which australopithecines have been collected. For Sterkfontein, estimates of the time of deposit of the faunal remains (including hominids) has ranged from 3,000,000 to 800,000 years ago (see Tobias, 1973, and Sampson, 1974, for discussions); the present conclusion seems to be that 2,500,000 may be the best estimate for Sterkfontein, although deposition may well have continued for 100,000 years or more (Tobias, 1973, p. 318).

The present study is based upon the casts (pl. I) of right innominates of Sts 14 and of a female Mbuti pygmy (MMC 18) from the osteological collection of the Makerere Medical College, Uganda, as made by the Wenner-Gren Foundation for Anthropological Research. The errors inherent in reaching conclusions based on measurements taken from casts have been emphasized recently, particularly by Clarke and Howell (1972), but the casts made by the Wenner-Gren Foundation have been produced in a hard plastic with extreme care with respect to similarity to the original, for the particular purpose of use by the majority of paleo-anthropologists to whom the original specimens in Africa are not available. While measurements on such small objects as teeth might yield an unduly high percentage of error between cast and original, we do not believe that errors in measurements on as gross an object as an innominate and its cast will be sufficient to change the final conclusions, as based upon a technique which unavoidably incorporates other, and probably greater, chances of error.

The pubis, particularly, but also the inferior ramus of the ischium of Sts 14 (pl. I) are in part broken and perhaps somewhat warped, so that measurements involving length or breadth of these parts of the innominate cannot be regarded as trustworthy. The top of the acetabulum at the anterior inferior iliac spine is also indefinite and the anterior superior iliac spine and the adjacent part of the ilium are missing in the original, as is a minor part of the iliac crest, so that good comparable measurements, insofar as we can determine from inspection of the casts of the two innominates, are limited to two, marked AB and AC on the outline drawing (fig. 1).

TABLE 1. Measurements (in cm.), and ratios of measurements, on right innominates of MMC 18 and Sts 14.

	AB	AC	Ratio AC/AB
Mbuti pygmy MMC 18	12.13	7.20	59.36%
Gracile australopithecine Sts 14	12.09	7.42	61.37%
Ratio, STS 14/MMC 18	99.67%	103%	

The remarkable similarity in size[1] between the innominates of the

[1]This similarity was first noted by Professor Alexander Galloway when he was teaching at the Medical College of Makerere, Uganda. In 1950 he showed MMC 18 to Raymond Dart, who then took the innominates with him on a visit to the U.S.A. Thus the choice by the Wenner Gren Foundation of the innominate of MMC 18 as a model from which to make a cast for comparison with the innominate of Sts 14 was purposeful, not fortuitous, based upon the remarkable similarity of the two, a similarity first noted by Galloway.

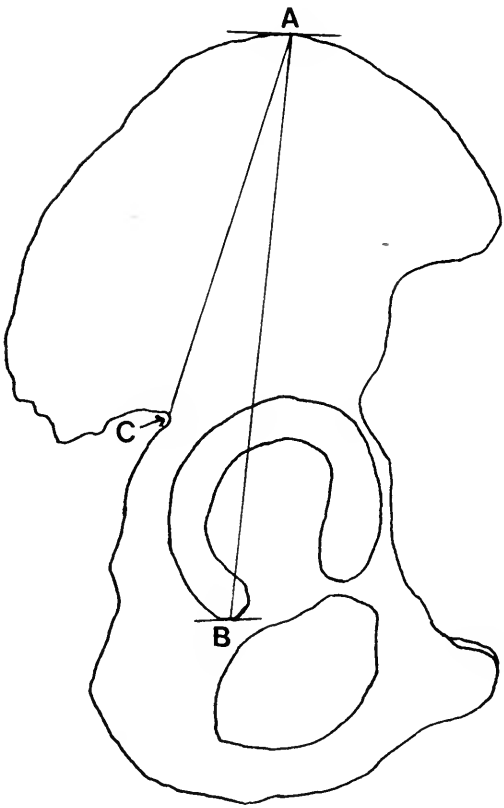

FIG. 1. Outline drawing of a right innominate, human, showing the measurements AB and AC used in comparing Sts 14 and MMC 18.

Mbuti pygmy and Sts 14 is apparent from the near-identity of the measured lengths and ratios recorded in the first two columns of Table 1. The third column, the ratio AC/AB, is introduced as further evidence of the similarity of the relationship between measurements of AB and AC in the two specimens.

Several investigators have previously noted the similarity of size between the innominate of the Mbuti pygmy and that of Sts 14, without presenting the measurements and ratios of Table 1, but seemingly no one has thought to use this similarity, particularly of the ilium, as a basis for comparison of stature, probably because the height of the Mbuti pygmy has remained unknown. It was our inquiry on this point to the Wenner-Gren Foundation that led to our learning that the cast was based on skeleton no. 18, in the anatomical collection of the Makerere Medical College (MMC), Kampala,

PLATE I. Photographs of right innominate bones, that of a gracile australopithecine (Sts 14) to the right, that of a modern pygmy (MMC 18) to the left. Both photographs are of casts produced by the Wenner-Gren Foundation for Anthropological Research.

Uganda. A second letter from us, directed to that institution, included drawings of a femur and tibia, with indications on the drawings of maximum and bicondylar lengths of the femur and of maximum length of tibia. Dr. J. M. Kiggundu very kindly made the measurements on the original skeleton and returned our drawings to us, with the measurements (table 2) and the additional information that the specimen had been a female no less than 20 years old,[1] but that the stature was not recorded.

TABLE 2. Measurements of femur and tibia of female pygmy, MMC 18 (cm.), as made by Dr. J. M. Kiggundu.

	Right	Left
Femur, maximum length	35.10	35.10
Femur, bicondylar length	34.75	34.65
Tibia, maximum length	31.20	30.65

The difference between the measured lengths of the right and left tibiae have led us to place less reliance on these measurements than on those of the femora; furthermore, since calculations of stature on the bases of femoral maximum length and bicondylar length yield results not significantly different (Trotter and Gleser, 1958), we present below only our conclusions concerning the stature of the Mbuti pygmy as determined on the basis of the femoral maximum length.[2]

When we determined the height of MMC 18 from our estimate of her femoral length by use of the standard formula of Trotter and Gleser (1952, table 13, and table 13, Appendix 4) for American Nègro females, we derived a mean figure of 140.8 cm. (4 ft. 7⅜ in.). Such a stature, as calculated, is presumably too great, as the regression formula (2.28 × Maximum Femoral Length +59.76 ±3.41 cm) used by Trotter and Gleser (1952) for derivation of height from femoral length is based on individuals of normal size and yields

[1]Dr. Kubet Luchterhand of Roosevelt University, Chicago, who made the mold from which the cast of MMC 18 was produced, has told Reed (personal communication) that, at the time he was working with the original innominate, it was examined by Prof. Adolph Schultz, then of John Hopkins University, who estimated the age of the individual to have been 19 years.

[2]After we had arrived at this stage in our investigations, we discovered that skeleton MMC 18 had already been the object of an osteometric study (Toerien, 1954). The published figure of 34.9 cm. for maximum length of the (presumably) right femur is in excellent agreement with that of 35.1 cm. determined for us by Dr. Kiggundu. We split the difference and for the purposes of this paper assume that the maximum length of the femur of MMC 18 was 35.0 cm.

erroneously high results for extremely short individuals such as pygmies. This is due in minor part to the disproportionate value of the added constant relative to the short stature but in major part simply to the use of an equation based on a normal population to obtain an estimate for an individual from an inappropriate population—i.e., an African pygmy whose height (see below, next paragraph) is within the middle range for that population (Schebesta, 1938, p. 231, graph 1). In any case, we think that Robinson (1972, pp. 231-232) was misled by the tables in Trotter and Gleser (1952) into thinking that he could validly use their regression formula for an estimate of the height of an individual as short as Sts 14, as based upon his estimate of her femoral length. Indeed, there are extensive discussions in the literature on the error of using a regression equation based on one population to estimate the height of an individual, as based on the lengths of the latter's long bones, when that individual is from another population. We mention Allbrook (1961), with his useful bibliography, as one example of such a discussion.

Approaching this problem from another viewpoint, we note for the 177 American black females in the Terry Collection that the mean length for all femora is 27.2 per cent of the mean stature of those individuals (Trotter and Gleser, 1952, table 5), and also find that in the Mbuti female for which there exists a published figure (Flower, 1888)[1] for both stature (123.1 cm. = 4 ft. ½ in.) and femoral length (33.4 cm.), the ratio is 27.1 per cent. This delightful agreement of femoral-statural ratios, derived from two such disparate sources, led to our calculation of the height of MMC 18 as close to 128.9 cm. (4 ft. 2¾ in.), as based on her femoral length of 35.0 cm.[2]

[1]Flower wrote only of the Akka (more usually spelled Aka). The Aka, however, with the Efé and the Basúa, comprise the pygmies of the Ituri forest, otherwise known collectively under the names of Mambuti, Mbuti, Bambuti, or Eastern Twiden.

[2]If, for the sake of completeness, we use the more involved method of Pearson (1899, p. 230 and Pl. 3), we derive a height for MMC 18 of 130.9 cm. (4 ft. 3½ in.), which is in close agreement with our first determination but may not be quite as accurate since Pearson's technique demands reading from a graph, and the regression lines on his graph were based upon a general study of several populations of Old World pygmies. However, for the Mbuti he had data only on the two skeletons studied by Flower (1888), and of these the male is quite fragmentary.

A further problem is that at the time Pearson was devising his procedures for determining statures from the lengths of various long bones, he had no adequate

To gain perspective on the stature of MMC 18 as compared to other Mbuti pygmies, we have summarized (table 3) the researches of Schebesta (1938) and Gusinde (1956) on this topic, adding also their determinations of weights on smaller series. Schebesta's publication we found to be of particular use since he evaluated the results of prior investigators and, from his own experiences, discounted some of them on the basis either that they were measuring populations which contained in part genes from taller neighbors or by contrast had chosen to measure only the shorter individuals, even from groups all of whom were definitely pygmies. Excluding such questionable cases, but including several other acceptable series in addition to his own data, Schebesta published summaries (range and mean) on the stature of 1,346 pygmies (table 3). Gusinde (1956) then gave mean only, for an additional 896. The means of the two series agree within a half-inch for the males and a quarter-inch for the females.[1]

Until additional postcranial material of gracile australopithecines produces evidence to the contrary, we will assume that the bodily proportions, as based on the great similarity of the innominates, are similar to those of the Mbuti pygmies, even though we note that Robinson (1972, p. 231) believed that the pelvis of Sts 14 was some-

(Footnote 2 continued from p. 429)

series of female skeletons of pygmies with which to work, so all of his formulae and regression-lines applied to males only. For a female pygmy, thus, he had to convert the length of a long bone into the length of the masculine equivalent, find the stature of that hypothetical male, and then reconvert that stature to a female's equivalent. Additionally, Pearson had determined to his own satisfaction that Old World pygmies in general usually have longer femora relative to stature than do populations of more normal size, and he thus drew a different regression line for this relationship in pygmies than for taller populations. However, we have shown that the Mbuti (Aka) female described by Flower (1888) did not have such a relatively longer femur, and both Gusinde (1956, p. 119) and Turnbull (1965a) have mentioned their subjective impressions that in the Mbuti the legs are short and the arms long relative to the length of the trunk. Thus, at least for the Mbuti, Pearson's formula will generate a determination of stature somewhat greater than it should be, but the discrepancy is not as great as that produced by the use of the technique of Trotter and Gleser (1952).

[1]Even within the Mbuti, stature varies between groups. Thus the Efé, as measured by Schebesta (1938, p. 228) have the males averaging 2 cm. shorter than the males of the Basúa and the mean height of the Efé females was nearly 3 cm. less than that of Basúa females. Consequently, the ranges and means for stature reported by different investigators have varied somewhat depending upon what numbers of different groups were measured.

Table 3. Data on stature and weight of Mbuti pygmies as derived from Schebesta (1938) and Gusinde (1956).

		STATURE				
		MALES			FEMALES	
Reference	n	Range	Mean	n	Range	Mean
Schebesta, 1938	896	125-157 cm. (4 ft. 13/16 in. — 5 ft. 1 13/16 in.)	142.7 cm. (4 ft. 8 3/16 in.)	450	119-155 cm. (3 ft. 10 7/8 in. — 5 ft. 1 in.)	136 cm. (4 ft. 5 9/16 in.)
Gusinde, 1956	514		144 cm. (4 ft. 8 11/16 in.)	382		137 cm. (4 ft. 6 in.)
		WEIGHT				
Schebesta, 1938	91	29-50 kg. (63 lb. 15 oz. — 110 lb. 3 oz.)	38.7 kg. (85 lb. 5 oz.)	49	25-48 kg. (55 lb. 2 oz. — 105 lb. 13 oz.)	37 kg. (81 lb. 9 oz.)
Gusinde, 1956	?		39.8 kg. (87 lb. 12 oz.)	?		35.5 kg. (78 lb. 4 oz.)

what large for the remainder of her skeleton. On the basis, then, of the data here presented, we suggest that the stature of Sts 14 was most probably close to 129 cm. (4 ft. 2¾ in.).

Robinson (1972, pp. 121-125) estimated the bicondylar length of the left femur of Sts 14 as being between 30.0 and 32.0 cm., with a most probable length of 31.0 cm., as based on a study of the existing piece of shaft and neck, of the impressions of parts of the neck and head in the original matrix, and of two pieces of distal femur from Sterkfontein (pieces which would seemingly have conformed in general size and proportions to the proximal piece of Sts 14). As noted above, the estimate of total femoral length of Sts 14 reached by us is 35.0 cm. Since bicondylar length and total length vary from each other by less than 1 per cent, the difference is insignificant under the present circumstances for an estimated femoral length of 30.0-32.0 cm., as determined by Robinson, and we will ignore this particular factor and treat his bicondylar estimate as if it were total length.

Robinson (1972, pp. 231-232) has discussed the height of Sts 14, as based on a study of various of the bones, but considered a calculation based on his estimate of femoral length of 31 cm. to be the most accurate. Using Trotter and Gleser's (1952) formula for American black and white females together, he arrived at a figure of 4 ft. 3 in. Our duplication of this calculation yielded instead 4 ft. 3⅜ in.; we assume that Robinson probably rounded this off to the nearest inch. The difference is not great enough to fuss over the arithmetic, but both figures are erroneous since, as mentioned before, the regression formula of Trotter and Gleser produces answers which are too high for pygmies or small australopithecines. If we recalculate the stature of Sts 14, using Robinson's estimated length of 31 cm. for the femur, on the basis that the femur was 27.15 per cent of the height, we get a stature of only 114.2 cm. (3 ft. 9 in.); doing the same with Pearson's formula for living pygmies, we get 114.4 cm. (3 ft. 9$^{1}/_{16}$ in.). If Robinson's estimate of a femoral length, 31.0 cm. for Sts 14, is accurate, then these latter figures for stature are, we believe, more probable than anything in the range of 4 ft. 3 in. to 4 ft. 4 in. However, if our estimate of femoral length of approximately 35 cm. is accurate, as we believe, and if we consider the femoral length to have been 27.15 per cent of the total height, then a stature near 130 cm. (approximately 4 ft. 3 in.) is most probably correct. In other words, Robinson got the right answer, but for a couple of wrong reasons; we think his estimate of femoral length

TABLE 4. Comparisons of ratios of measurements on innominate bones and femoral lengths of Sts 14, MMC 18, and a group of modern human skeletons (σ = standard deviation; V = coefficient of variation). See p. 436 for discussion.

AB/Fem m

Specimens	n	Range	Mean	σ	V	Range of Mean $\pm 1\sigma$	Range of Mean $\pm 2\sigma$
Skeletons, Department of Anthropology, UICC	11	38.2-34.0%	35.6%	1.23%	3.5	37.2-34.7%	38.4-33.5%
Pygmy MMC 18	1	34.7%					
Gracile australopithecine Sts 14	1	34.5%					

AC/Fem m

Specimens	n	Range	Mean	σ	V	Range of Mean $\pm 1\sigma$	Range of Mean $\pm 2\sigma$
Skeletons, Department of Anthropology, UICC	11	21.9-18.9%	20.55%	0.925%	4.4	21.5-19.6%	22.5-18.7%
Pygmy MMC 18	1	20.6%					
Gracile australopithecine Sts 14	1	21.4%					

was too short, but then he used a formula which, for pygmies, compensated by producing an erroneously high answer.

We can ourselves simply consider the maximum length of the femur of Sts 14 as having been identical to that of MMC 18, at 35.0 cm., in which case her stature would have been the same as, or closely similar to, that of the pygmy, 128.9 cm. (4 ft. 2¾ in.).[1]

[1]The details of this paper would have been much simpler, and the conclusions undoubtedly sounder, if the stature of each individual Mbuti pygmy from which a skeleton has been derived had been determined before maceration. Such skeletons for which we have seen data number 10: two by Flower (1888), five by Matiegka (1938; the measurements of four of these five skeletons were separately published by Matiegka and Maly, 1938), and one each by Shrubsall (1902), Broek (1940), and Toerian (1954). Of these 10, only that of the female Aka has had the stature published, and that was determined by Flower from the skeleton alone. This important omission of lack of recorded stature is particularly difficult to understand in the case of Shrubsall's study, since a photograph of the particular pygmy was taken before his death and published with the study; presumably the subsequent history of skeletonization was not planned at the time of the photography.

TABLE 5. Summary of estimates on the stature of Sts 14.

Basis for Estimation of Stature	Estimated Stature	Reference	Comments
1. Sts 14, left femur; length estimated at 31.0 cm.	(no estimate)	Broom and Robinson, 1950, p. 63.	Length of femur was estimated by Broom, according to Robinson (1972, p. 123), but no one now knows how he did it.
2. Sts 14, left femur; length estimated to be between 21.0 and 33.0 cm.; preferred length, 27.6 cm.	"... as small as 42-43 inches" (106.7-109.2 cm.)	Lovejoy and Heiple, 1970.	Several authors have criticized this study, the most recent being Robinson (1972, p. 125), and McHenry (1974, p. 333). Both the estimated length of the femur and the stature determined therefrom are certainly too low.
3. Sts 14, various calculations based on femoral length and lengths of lumbar vertebral bodies.	4 ft. 0 in.-4 ft. 6 in. (121.9-137.2 cm.)	Robinson, 1972, p. 231.	These were preliminary estimates, presented without detail; the true value certainly lies within the stated range of 6 in.
4. Sts 14, left femur; length estimated at 30.0-32.0 cm., with preferred length of 31.0 cm.	4 ft. 3 in. (129.5 cm.)	Robinson, 1972, pp. 121-125, 231-232.	As discussed by the present authors in this article, we think that a femoral length of 31.0 cm. is too short, but that the final estimate of stature is correct due to compensating errors in the use of the formula of Trotter and Gleser (1952).
5. Sts 14, left femur; Robinson's preferred length of 31.0 cm.	114.0 cm. (3 ft. 9 in.)	This paper	Based on the determination that femoral length is 27.2% of stature in American black females and 27.1% in a female Mbuti pygmy.
6. Sts 14, left femur; Robinson's preferred length of 31.0 cm.	114.4 cm. (3 ft. 9 1/16 in.)	This paper	Calculated by use of Pearson's formula.

TABLE 5. Summary of estimates on the stature of Sts 14 (continued).

Basis for Estimation of Stature	Estimated Stature	Reference	Comments
7. Sts 14, left femur; Robinson's preferred length of 31.0 cm.	130.6 cm. (4 ft. 3 in.)	McHenry, 1974, p. 336.	Copied from Robinson, 1972.
8. Femur of Sts 14; estimated length of 35.0 cm., based on comparison of size of innominates of Sts 14 and Mbuti pygmy MMC 18, which has a femoral length of 35.0 cm.	140.8 cm. (4 ft. 7⅜ in.)	This paper	Determined by using Trotter and Gleser's (1952) formula of stature in American black females as derived from femoral lengths. We think the result is erroneously high; the formula should not be used for a population different than the one upon which it was based.
9. Femur of Sts 14; estimated length of 35.0 cm., based on comparison of size of innominates of Sts 14 and Mbuti pygmy MMC 18, which has a femoral length of 35.0 cm.	130.9 cm. (4 ft. 3½ in.)	This paper	Use of Pearson's formula.
10. Femur of Sts 14; estimated length of 35.0 cm., based on comparison of size of innominates of Sts 14 and Mbuti pygmy MMC 18, which has a femoral length of 35.0 cm.	128.9 cm. (4 ft. 2¾ in.)	This paper	Based on the determination that femoral length is 27.2% of stature in American black females and 27.1% in a female Mbuti pygmy. This determination, we think, is the most accurate yet published.

Such a simplistic approach does not, however, allow for possible individual variation within a population, so we have attempted to determine such variability by measuring the distances AB, AC, and the maximum femoral length (hereafter abbreviated to Fem_m) on each of 11 disarticulated modern human skeletons in the Department of Anthropology, University of Illinois at Chicago Circle. For these skeletons, the ratios $_{AB}/Fem_m$ and $_{AC}/Fem_m$ were then calculated, and in Table 4 the results are presented in comparison with the same ratios for MMC 18 and Sts 14.

For MMC 18 and Sts 14, both ratios ($_{AB}/Fem_m$ and $_{AC}/Fem_m$) fall within the range, or immediately at the border of one side of that range, of the mean $\pm$ 1σ. Thus, for both pygmy and Sts 18, the ratios of the proportions of the pelvis (as measured) to the maximum length of the femur (as known for the pygmy and as assumed therefrom for Sts 18) are in no way disproportionate to those of modern skeletons, and we assert with confidence, thus, that the femoral length of Sts 18 was at, or very close to, 35.0 cm., and that her height was at, or very close to, 4 ft. 2¾ in. The relatively small values of the Coefficients of Variation (V) of the ratios $_{AB}/Fem_m$ and $_{AC}/Fem_m$ for the modern skeletons (table 4) strengthen the implications of our conclusions.[1]

As McHenry (1974) has stated, the weight of an individual is a difficult factor to evaluate, given only a few broken bones. To help with an understanding of the relationship between height and weight, some comparisons with Mbuti pygmies (table 3) and with non-pygmoid populations may be useful, even though not, of course, conclusive.

At 128.9 cm. (= approximately 130 cm., or 4 ft. 3 in.), MCC 18 was among the shorter females of her group, and we estimate her weight to have been between 60 and 68 lbs. We cannot transfer this estimate of weight directly to Sts 14, however, since the latter's skeleton has a small acetabulum (pl. I) and a correspondingly small femoral head, as well as a slender femoral shaft, delicate sacro-iliac articulation, and small lumbar vertebrae (Robinson, 1972, p. 232). By all evidence, however, she was adult at time of death. Hopefully,

[1]We are not indulging ourselves in a completely circular argument. True, we originally guessed that the femoral length of Sts 14 would be close to that of the pygmy MMC 18, but then checked this opinion against innominate/femoral ratios of a series of modern normal-sized skeletons and found our original conclusion to be sustained. There does exist a logic behind the concept of the total morphologic pattern.

comparison with modern growing girls of the same height will yield more useful data.

Kark (1953) published on the height and weight of 338 Bantu-speaking (mostly Zulu) girls aged 8-15 living in Durban, South Africa. These girls were better-fed, heavier, and taller in general than were girls of matched ages from a rural area near Durban. Most of the girls in the urban group attained a height of 129 cm. (our estimate for the stature of Sts 14) during their tenth to eleventh years (ages 9-10), at which time their mean weight was 29.5 kg. (65 lb. 1 oz.). Presumably the girls from the country, even though older when attaining 129 cm., would have been lighter in weight.

A somewhat similar study of girls of African descent from poorer families in Jamaica (Ashcroft et al., 1966) showed that a height of 129 cm. was typically achieved during the ninth or tenth year of life (ages 8-9), at which time the median weight was 25.5 kg. (56 lb. 3 oz.). Girls of similar ancestry but from more affluent families reached the same height about a year younger but weighed 26.6 kg. (58 lb. 10 oz.) at the time.

Sts 14 was not a growing child but was a young adult, and thus presumably equivalent in maturation to a modern girl in her early twenties; Sts 14 may, thus, have added a touch of fat to her frame, but at the same time, with her delicate skeleton, was presumably more lightly built than modern girls of her height. With all of these indeterminate variables an exact weight for Sts 14 cannot be calculated; Robinson (1972, p. 232) guessed 40-60 lb. (18.2-27.3 kg.) as the weight for a female gracile australopithecine with a height of 129 cm.; considering the weights of living girls of that height, as well as our estimate (60-68 lb.) of the weight of a female pygmy of the same height, we suggest a figure within the upper half of Robinson's range, possibly at about 24-25 kg. (approximately 53-55 lbs.)

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ADDENDUM

When writing this report, we overlooked a publication by Walker (1973), in which he stated that the femoral fragment of Sts 14 was so thoroughly fragmented and that the head had been so completely rebuilt in plaster that he " . . . . . could see no way of reasonably estimating any measurements or angles and, short of gaining the impression that this is the smallest known femur of *Australopithecus*, very few useful points of comparison can be made." Additionally, Walker determined that the two distal femoral fragments from Sterkfontein were from distincly larger individuals than Sts 14, which fact casts doubt on those prior estimates which had depended upon the use of those distal fragments for determining the length of the femur of Sts 14.

However, Walker then concluded (in spite of his own statements regarding the lack of evidence to be derived from a study of the femoral fragment of Sts 14), that if intact that femur may have measured no more than 25 cm. in length, which is even less than the "preferred length" of 27.6 cm. of Lovejoy and Heiple (1970). Both of these estimates, as we have indicated in the present publication, seem to us to be too short, considering the size of the associated innominate.

In a more recent publication, McHenry (1976) has compared the two surviving vertebrae of Sts 14 with their counterparts in 43 nonobese specimens from the Terry Collection of modern human skeletons, for which body weights are known, and derived an estimate of 27.6 kg. (61 lb.) for the weight of Sts 14. This estimate is approximately 13 per cent higher than ours, but, considering the different methods used, and the possible errors in each method, the agreement is relatively good. However, the sample of specimens used from the Terry Collection was half males, which could be assumed to average heavier than females of the same height, and the sample included individuals from 18 to 50 years of age, which probably resulted in a higher ratio of weight to height than if a sample of young adult females had been available. Considering these factors, perhaps McHenry's estimate of 27.6 kg. is a bit high.

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