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EVOLUTIONARY-DERIVED ANATOMICAL CHARACTERISTICS AND UNIVERSAL ATTRACTIVENESS[1]

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Summary.—Hominid fossils illustrate how modern humans have evolved anatomically. Included in the fossils are traits no longer phenotypically prevalent in humans (primitive) and phenotypic traits that have become increasingly prevalent (derived). In this study, published paleontological information about the anatomical evolution of humans was used to create line drawings of human form. Survey data were accumulated by having 759 individuals evaluate more than 40 anatomical traits. Each anatomical trait was presented as a panel of three line drawings intended to express the trait in a primitive, intermediate, and derived form. For each panel of three drawings, subjects were instructed to select the drawing they considered most attractive and then select the drawing they considered least attractive. The survey data indicate that males and females of diverse ages, races, cultures, and from varied geographical regions show commonality in their judgements of beauty of human form. The individuals surveyed appeared to have a strong aversion to primitive traits, preferring proportions and characteristics that are intermediate or more derived. In many instances, the evaluators preferred drawings that were exaggeratedly derived. The data may have relevance to the ongoing debate of whether averageness or atypicality is the essence of human beauty. Also, there was high agreement in judging the attractiveness of shapes and proportions in line drawings that were not immediately recognized to be representations of human form. These data could indicate that our general aesthetic sense for art, architecture, and fashion may be based on a subliminal reference to derived anatomical shapes and proportions. Over-all, the data support the hypothesis that derived traits that are universally shared by anatomically modern humans may be the standard for our innate sense of beauty of human form.

It has been proposed that "averageness" is the essence of human beauty (Symons, 1979). The proposal rests on the finding that average faces created by composite photographs (Galton, 1878) or computer-generated digital composites (Langlois & Roggman, 1990) are consistently judged as more attractive than almost any of the individual faces comprising the composite. The averageness proposal has generated commentary (Etcoff, 1994) and debate (Alley & Cunningham, 1991; Langlois, Roggman, & Musselman, 1994; Perrett, May & Yoshikawa, 1994). Contrary to the proposal of averageness, it has been reported that digitally averaged composite faces can be made more attractive by slightly deviating from the sample mean (Perrett, *et al.*, 1994). For example, the face shape judged most attractive had larger eyes,

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higher cheek bones, and a shorter distance between the nose and mouth than the so-called average face. This has been referred to as atypicality. The same study (Perrett, *et al.*, 1994) also illustrated that average composite faces constructed from subsets of attractive faces are preferred over the average face of the total population.

Other models about our perceptions of facial attractiveness have been proposed. The study by Cunningham (1986) provided data indicating that the most attractive faces are those with a combination of features which include neoteny, expressiveness, and sexual maturity. Further evidence for multiple motives as a model of perceived attractiveness was provided by the cross-cultural study of Cunningham, Barbee, and Pike (1990). The combination of factors that may affect our perceptions of physical beauty were formulated into a multiple fitness model (Cunningham, Roberts, Barbee, Druen, & Wu, 1995). This model is an inclusive approach to our perceptions of physical beauty and considers both the facial and bodily features of the target. Except for neoteny, the multiple fitness model has some commonality with the adaptationist model which views age, hormonal status, parity, and fecundity as the most important aspects of female sexual attractiveness (Lott, 1979; Symons, 1995). With regard to neoteny, the study by Jones (1995) provided cross-cultural evidence that there is a connection between facial neoteny and the perception by males of females' facial attractiveness. The study reports that drawings of female faces artificially transformed to make them more or less neotenous are perceived as correspondingly more or less attractive by males from diverse cultures. Jones (1995) further proposed that the neotenous model of physical attractiveness has implications for the sexual selection of human morphology. The sexual selection aspects of facial neoteny, as they relate to the evolution of human form, are controversial and have been questioned (Shea, 1989; Brace, 1995a).

An additional proposal considers bilateral symmetry and indicators of parasite resistance as important features of facial attractiveness (Thornhill & Gangestad, 1993). The study reports that human faces judged to be attractive possess the features of averageness and symmetry and suggests that average features indicate a heterozygosity that correlates positively with parasite resistance (Grammar & Thornhill, 1994), thereby making average features adaptively attractive.

It has been proposed recently that our sense of beauty of human form is linked to how the shapes and proportions of humans have evolved (Magro, 1997). Magro indicated that traits no longer phenotypically prevalent in humans (primitive) are perceived as unattractive while phenotypic traits that have become increasingly prevalent (derived) are perceived as attractive.

In the present study, paleontological information about the anatomical evolution of humans was used to create figures designed to survey the comparative attractiveness of primitive and derived traits. The most dramatic anatomical changes that have evolved (derived traits) over the last 3 or 4 million years are related primarily to an increased dependence on visual acuity, bipedal locomotion (Lovejoy, 1974; Stern & Susman, 1983), development of an omnivorous diet (Walker, 1981; Schaller & Lowther, 1969; Blumenschine & Cavallo, 1992), enhanced manual dexterity (Leakey, 1966; Musgrave, 1971; Trinkaus, 1986), reduced sexual dimorphism (Brace, 1973; McHenry, 1991), and a greater reliance on intelligence (Holloway, 1970; Falk, 1985; Tobias, 1987). Some of the anatomical changes associated with the development of bipedalism are longer legs (Jungers, 1982), an over-all increase in height (McHenry, 1986; Johanson, Masao, Eck, White, *et al.*, 1987), thigh bones that angle toward the knee from the socket of the pelvis (slightly knock-kneed rather than bow-legged), overstepping toward the stationary foot while walking, an appearance of plantar flexion while walking and shifting weight to the ball of the foot (toe lower than the heel), less curvature of the toes, and more muscled and pronounced calves and buttocks (Lovejoy, 1974; Stern & Susman, 1983). Becoming less arboreal also has resulted in other anatomical changes that include a thorax that is less cone-shaped, less sloping shoulders (Hunt, 1991), a longer neck, and less curvature of the fingers (Ricklan, 1987). Anatomical changes associated with becoming more omnivorous include a smaller and narrower upper and lower jaw, a defined chin, teeth becoming closer together, and a loss of the spaces between the canines and lateral incisors, reduced width of the molars, incisors, and canines that are more spatulate, a less rounded abdomen and a slimmer waistline (V-shaped torso), smaller chewing muscles, loss of a cranial sagittal crest, a more triangular or oval-shaped face, a shorter distance between the nose and the lips, and a mouth that does not jut out beyond the nose (orthognathic rather than prognathic) (LeGros Clark, 1950; Robinson, 1954; Walker, 1981; Smith, 1986; Bilsborough & Wood, 1988). Changes in the hand include a longer thumb, shorter palm, and straighter fingers (Ricklan, 1987). A greater dependence on vision has resulted in large, deep-set eyes. Changes associated with decreased differences between the sexes include less difference in body size and the development of similar teeth, particularly less difference in the size of the canines (Harvey, Kavanagh, & Clutton-Brock, 1978; Brace & Ryan, 1980; Lieberman, Pilbeam, & Wood, 1988). Changes relative to an increased dependence on intelligence are increased cranial capacity, higher and less sloping forehead, and more vaulted bones of the temple area resulting in a higher and more dome-shaped cranium (Leaky, Tobias, & Napier, 1964; Holloway, 1970; Falk, 1985; Tobias, 1987). The drawings utilized in this survey made use of the paleontological information as outlined above and the excellent overviews provided by the writings of Johanson and Edey (1982/1990), Howells (1993), and Brace (1995b).

Evolutionary anatomical traits that are universally shared by anatomically modern humans were emphasized in the drawings. Numerous individuals of each sex from diverse races, cultures, ages, and geographical locations were surveyed to test the comparative attractiveness of primitive and derived traits. The cross-cultural data were accumulated to test the hypothesis that derived traits that are generally shared by anatomically modern humans could be the standard of our innate sense of beauty. The attractiveness of primitive forms, as compared with those exaggeratedly derived, could further our understanding of why both averaged features and atypical features are perceived as attractive. A resolution of the debate between averageness and atypicality has implications for furthering a better understanding of the possible innateness, universality, and functional significance of our sense of beauty of human form.

Method

Drawings

Each anatomical trait is presented as a panel consisting of a set of three drawings intended to present the trait in primitive, intermediate, and derived forms. As previously referenced, the three comparative forms of each panel were based on how the anatomical proportions of humans are thought to have evolved. The three drawings within a panel are identified by the letters A, B, or C. Each of the 18 panels within the three figures are identified by a Roman numeral and are numbered consecutively, I–XVIII. The A, B, or C position of the primitive, intermediate, and derived drawings within each panel were varied so that there would not be an order effect due to the position of the drawings. For the survey, the questions for the panels were numbered consecutively and each question was identified by a specific number. The evaluators recorded their selections (A, B, or C) at the appropriate number on a Scantron sheet. The 18 panels of drawings in the three figures shown here are a fair representation of the 42 panels used in the survey. The drawings were presented to the evaluators as a handout consisting of a series of $8^1/_2$- × 11-in. pages with three panels of drawings on each page.

Subjects

The test population consisted of 759 individuals which was a happenstance sum of the individuals surveyed. Individuals were surveyed in Westville and Lafayette, Indiana; Fairmont and Bridgeport, West Virginia; Albany, New York; and Sierra Leone, Africa. Individuals from Taipei, Taiwan, were surveyed as visitors to Taiwanese organizations located in Albany, New York, and Bridgeport, West Virginia. The surveys were administered by Dr. Leone Elliott, Dr. Norman Chen, Dr. Robert Shan, and the author. The evaluators were instructed to judge the relative attractiveness of the drawings and that it was not necessary to consider the selected drawings absolutely attractive or unattractive. Explicit instructions regarding how to complete the Scantron sheet were included within the first two pages of the handout. Also included in the first two pages was a questionnaire about the sex, age, race, and national origin of the evaluator. The categories of each question regarding the status of the evaluator were identified by a corresponding letter on the Scantron sheet (e.g., Female–A, Male–B). The race categories were grouped as Black–Negro, White–Euro-American, Yellow–Oriental, and Other. The age categories (11–20 years, 21–40 years, greater than 40 years) were based on the tested population which included students from middle schools, high schools, and colleges. Also, groups of adults as members of organizations and individuals residing in retirement homes were surveyed. Following those surveys administered in a classroom setting, there was a verbal inquiry of the evaluators by the author as to what they thought the drawings represented. It is the author's impression that the abstract line drawings and incomplete drawings were not always recognized by the evaluators as anatomical representations. The geographical origin of the individuals were grouped as Asian, African, and North American. Individuals from the combined categories of Yellow/Asian, Black/African, and White/North American were used in this study. Providing vitae was optional and not every evaluator responded to every question. The vitae that the evaluators did provide enabled the construction of a variety of subpopulations for this report. These included females (391 individuals) and males (374 individuals); White Euro-Americans (496 individuals), Yellow Asians from Taiwan (77 individuals), Black Africans from Sierra Leone (92 individuals); and the age groups of 11–20 years (415 individuals), 21–40 years (202 individuals), and more than 40 years (59 individuals).

Statistical Treatment of the Data

Data for the total test population were analyzed using the chi square goodness of fit test. The null hypothesis assumed a theoretical population proportion equally distributed among drawings A, B, and C. For each set of three drawings, the number of individuals selecting drawings A, B, or C produced a sum (A + B + C) that represented the number of respondents for each question. A chi square goodness of fit test statistic was obtained by comparing the observed frequencies of selecting A, B, or C to the calculated theoretical frequencies. If the test statistic produced a significant rejection of the null hypothesis ($p < .01$), it was then concluded that the tested population perceived a difference in the attractiveness of the three drawings.

The data for each subpopulation (race, sex, and age) were analyzed by the use of chi square contingency tables. The null hypothesis assumed that the row and column variables of the contingency table were independent; p

values for sex were calculated by a 3 × 2 contingency table comparing males' and females' choices of the three drawings (A, B, and C). p values for race were calculated by a 3 × 3 contingency table comparing the Euro-American, African, and Asian samples' choices of the three drawings. p values for age were calculated by a 3 × 3 contingency table by comparing the 11- to 20-yr.-olds', 21- to 40-yr.-olds', and more than 40-yr.-olds' responses to the survey. The null hypothesis of independence of columns and rows was rejected for p values $< .01$. The primary purpose of the study was to assess a possible statistical difference in the actual choices of the subpopulations (sex, race, age, national origin) and not necessarily a statistical difference in the number of evaluators selecting the same choice. To avoid a Type II error when there was a difference in choice among the subpopulations, the null hypothesis of independence of columns and rows was rejected for p values $< .05$.

Results and Discussion

Tables of Results for Total Population

Shown in the following Figs. 1–3 are 18 examples from the drawings as presented in the survey. The results from surveying the total population of 759 individuals are shown in Tables 1, 2, and 3. Table 1 lists the results for the drawings of Fig. 1, Table 2 those for Fig. 2, and Table 3 those for Fig. 3. Each panel of three drawings produced two sets of data, one for each of

TABLE 1
TOTAL POPULATION SURVEY DATA OF COMPARISONS OF DRAWINGS SHOWN IN FIG. 1

Panel	Trait	Population Responses: Attractive*				Drawing Description
			A	B	C	
I	Shoulder/Torso	Most	359	116	283	A: Most Derived (torso in)
		Least	170	475	113	B: Most Primitive (torso out)
II	Thickness of Lips	Most	344	349	64	A: Most Derived (thick lips)
		Least	182	58	515	C: Most Primitive (thin lips)
III	Neck Length	Most	281	341	127	B: Most Derived (long neck)
		Least	148	145	441	C: Most Primitive (short neck)
IV	Strong/Weak Chin	Most	544	130	63	A: Most Derived (strong chin)
		Least	80	52	587	C: Most Primitive (weak chin)
V	Shin/Thigh Ratio	Most	300	99	332	C: Most Derived (long shin)
		Least	84	563	79	B: Most Primitive (short shin)
VI	Length of Maxilla	Most	78	383	291	B: Most Derived (short maxilla)
		Least	571	52	126	A: Most Primitive (long maxilla)

*p values for rejecting the null hypothesis which assumes a population proportion that is equally distributed among drawings A, B, and C, calculated by the chi square goodness of fit test. All $p < .0001$. Numbers in the Most Attractive row indicate the number of individuals who selected drawing A, B, or C as most attractive. Numbers in the Least Attractive row indicate the number of individuals who selected drawing A, B, or C as least attractive. The sum A + B + C is the total number of individuals surveyed.

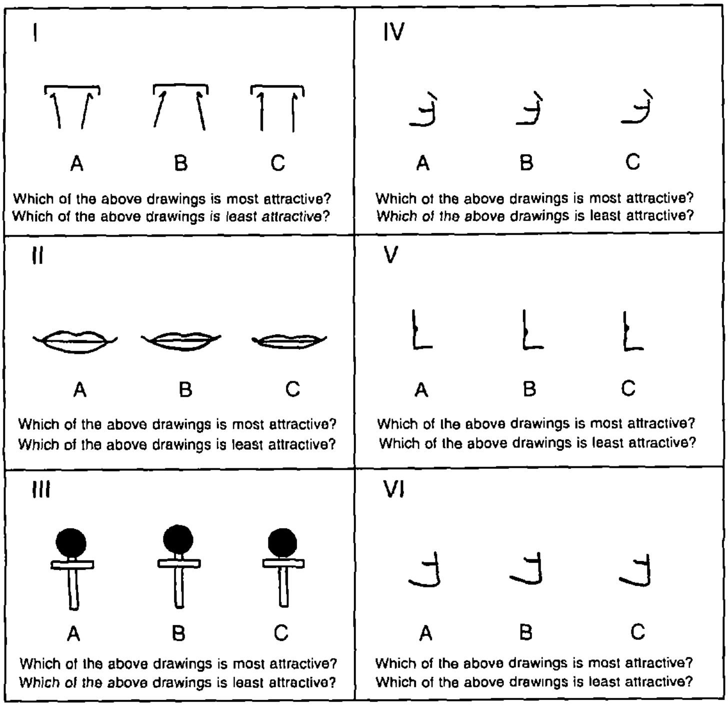

FIG. 1. The figure is a composite of six panels (I–VI), each of three drawings of an anatomical trait portrayed in a primitive, intermediate, and more derived form. Each drawing is designated by the letter A, B, or C. The positions of the primitive, intermediate, and more derived forms were varied to avoid an order effect due to the position of the drawings. The results for Fig. 1, obtained from surveying the total test population, are shown in Table 1.

the questions, Which is most attractive? and Which is least attractive? Within the three tables, in brackets below each of the letters A, B, and C, the number of evaluators who selected one of the drawings as most attractive and then selected another drawing as least attractive is given. The sum of A + B + C is the total population surveyed for each question. The total population (A + B + C) varied as much as 6%, indicating that some of the evaluators did not respond to every question. Also listed within the three tables are the p values, calculated by the chi square goodness of fit test, for rejecting the null hypothesis. At $p < .01$ it was assumed that the tested population perceived a difference in attractiveness among the three drawings. The representation of shoulder/torso (Fig. 1, Panel I), the neck length (Fig. 1, Panel III), and the shin/thigh ratio (Fig. 1, Panel V) were not always recognized by the evaluators as abstractions of anatomical traits. Likewise, the shin/thigh ratio (Fig. 2, Panel VII) and the leg/torso ratio (Fig. 2, Panel XI)

TABLE 2
TOTAL POPULATION SURVEY DATA OF COMPARISONS OF DRAWINGS SHOWN IN FIG. 2

Panel	Trait	Population Responses: Attractive*				Drawing Description
			A	B	C	
VII	Shin/Thigh Ratio	Most	117	452	188	C: Most Derived (long shin)
		Least	473	115	163	A: Most Primitive (short shin)
VIII	Dorsi/Plantar Flexion	Most	472	135	144	A: Most Derived (plantar flexion)
		Least	125	443	182	B: Most Primitive (dorsiflexion)
IX	Stature	Most	350	135	257	C: Most Derived (tall stature)
		Least	71	383	283	B: Most Primitive (short stature)
X	Zygomatic Bone/ Chin Ratio	Most	75	383	297	B: Most Derived (narrow chin)
		Least	470	183	96	A: Most Primitive (wide chin)
XI	Leg/Torso Ratio	Most	408	102	235	A: Most Derived (long legs)
		Least	158	491	106	B: Most Primitive (short legs)
XII	Teeth	Most	677	71	19	B: Most Derived (overlapping teeth)
		Least	35	259	472	C: Most Primitive (spaced teeth)

*p values for rejecting the null hypothesis which assumes a population proportion that is equally distributed among drawings A, B, and C, calculated by the chi square goodness of fit test. All $p < .0001$. Numbers in the Most Attractive row indicate the number of individuals who selected drawing A, B, or C as most attractive. Numbers in the Least Attractive row indicate the number of individuals who selected drawing A, B, or C as least attractive. The sum A + B + C is the total number of individuals surveyed.

along with the cranial outline (Fig. 3, Panel XIII) were not always recognized by the evaluators as being representations of anatomical traits. Despite this, the total tested population selected either the intermediate or derived portrayal as most attractive and always selected the primitive portrayal as least attractive to a high level of significance ($p < .0001$). The same results were obtained for all 42 panels presented in the survey, only 18 of which are shown here. The maxilla length representation (Fig. 1, Panel VI) and the extent of orthognathism/prognathism (Fig. 3, Panel XV) were not always recognized as incomplete drawings of anatomic traits. Again, for these panels and all of the remaining panels which are readily recognizable as representations of anatomical traits, the total tested population selected either the intermediate or derived portrayal as most attractive and always significantly selected the most primitive portrayal as least attractive ($p < .001$).

Panel VII of Fig. 2 is a comparison of the length of the shin to the thigh. This set of drawings is redundant with Panel V of Fig. 1. Both portrayals are abstractions. For both panels, the evaluators considered the short shin least attractive. However, for Panel V of Fig. 1, the evaluators considered the derived portrayal (long shin) most attractive, while for Panel VII of Fig. 2 the evaluators considered the intermediate shin length most attractive. Panel XIV of Fig. 3 is a comparison of leg length to torso. This set of drawings is redundant with Panel XI of Fig. 2. In both sets of drawings, the

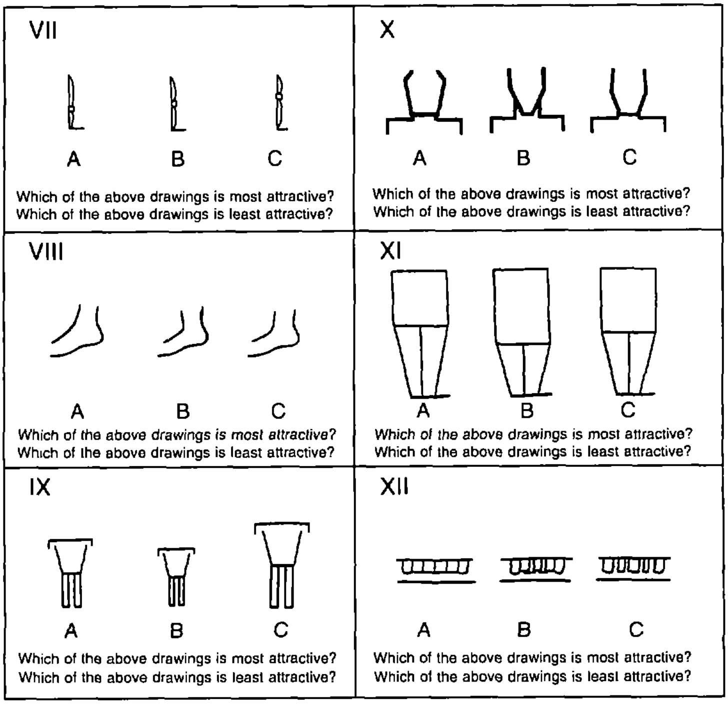

FIG. 2. The figure is a composite of six panels (VII–XII), each of three drawings of an anatomical trait portrayed in a primitive, intermediate, and more derived form. Each drawing is designated by the letter A, B, or C. The positions of the primitive, intermediate, and more derived forms were varied to avoid an order effect due to the position of the drawings. The results for Fig. 2, obtained from surveying the total test population, are shown in Table 2.

evaluators considered the derived portrayal (long legs and short torso) most attractive and considered the primitive portrayal (short legs and long torso) least attractive. All of the redundancies in the survey, wherein an anatomical trait was depicted in separate drawings but not shown here, were also in general agreement with each other.

Subpopulation Chi Square Contingency Tables

Tables 4–9 show *p* values in the chi squared contingency table for the subpopulations of sex, race, and age. Values of $p < .01$ indicate that the rows and columns of the contingency table are not independent, which implies that the subpopulations perceive differences in what is most and least attractive when evaluating the drawings. In examining the data in Tables 4–9, it can be seen that there is very good agreement within the subpopulations as to what is perceived as most and least attractive. When the choices of males and females were compared for chi squared contingency tables, there was a

TABLE 3
TOTAL POPULATION SURVEY DATA OF COMPARISONS OF DRAWINGS SHOWN IN FIG. 3

Panel	Trait	Population Responses: Attractive*	A	B	C	Drawing Description
XIII	Cranial Outline	Most	148	286	286	B: Most Derived (vaulted cranium)
		Least	454	96	166	A: Most Primitive (sloped cranium)
XIV	Leg/Torso Ratio	Most	308	395	53	B: Most Derived (long legs)
		Least	73	99	580	C: Most Primitive (short legs)
XV	Orthognathic/ Prognathic	Most	82	155	514	C: Most Derived (orthognathic)
		Least	451	208	88	A: Most Primitive (prognathic)
XVI	Curvature of Lips	Most	212	415	134	A: Most Derived (most curved)
		Least	240	75	443	C: Most Primitive (least curved)
XVII	Forehead Height	Most	185	324	245	C: Most Derived (high forehead)
		Least	343	108	293	A: Most Primitive (low forehead)
XVIII	Neck Length	Most	52	301	394	B: Most Derived (long neck)
		Least	591	127	39	A: Most Primitive (short neck)

*p values for rejecting the null hypothesis which assumes a population proportion that is equally distributed between drawings A, B, and C, calculated by the chi square goodness of fit test. All $p < .00001$. Numbers in the Most Attractive row indicate the number of individuals who selected drawing A, B, or C as most attractive. Numbers in the Least Attractive row indicate the number of individuals who selected drawing A, B, or C as least attractive. The sum A + B + C is the total number of individuals surveyed.

significant difference in only one instance. In evaluating Panel II of Fig. 1 (see Table 4), females perceived thick lips most attractive, whereas males perceived the intermediate thickness of lips most attractive ($p < .002$); however, both males and females considered the primitive representation of thin lips least attractive. When the choices of Africans, Asians, and Euro-Americans were compared, there were significant differences in three instances. In evaluating Panel I of Fig. 1 (see Table 4), the African population perceived the straight torso as most attractive, while the Euro-American and Asian populations perceived the angled-in torso most attractive ($p < .002$). In evaluating Panel XVII of Fig. 3 (see Table 9), the African population perceived the high forehead most attractive, while the Euro-American and Asian populations perceived the intermediate height forehead most attractive ($p < .001$). In evaluating Panel XVIII of Fig. 3 (see Table 9), Euro-Americans perceived the intermediate neck length as most attractive while Africans and Asians perceived the long neck as most attractive. In all of the above examples, the Africans, Asians, and Euro-Americans considered the primitive representations least attractive.

In comparing the choices of the various age groups, there were two instances of significant differences. In evaluating Panel XVII of Fig. 3 (see Table 9), the evaluators who were less than 20 years old perceived the high forehead least attractive, while the evaluators older than 20 years perceived the low forehead least attractive ($p < .001$). This was the only instance of dis-

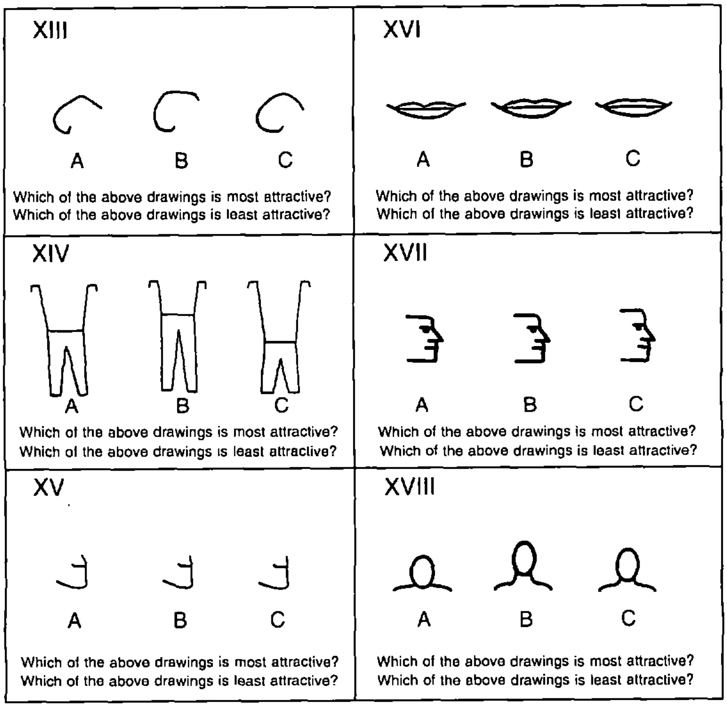

FIG. 3. The figure is a composite of six panels (XIII–XVIII), each of three drawings of an anatomical trait portrayed in a primitive, intermediate, and more derived form. Each drawing is designated by the letter A, B, or C. The positions of the primitive, intermediate, and more derived forms were varied to avoid an order effect due to the position of the drawings. The results for Fig. 3, obtained from surveying the total test population, are shown in Table 3.

agreement in a selection of least attractive for the entire survey. In evaluating Panel XVIII of Fig. 3 (see Table 9), the group older than 20 years perceived the long neck as most attractive, while the group less than 20 years old perceived the intermediate neck most attractive ($p < .001$). All other differences within the subpopulations involved a higher or lower number of individuals making the same choice as what they perceived as most and least attractive.

Paleontological research has provided an extensive fossil record dating back 3 to 4 million years that documents hominid evolution. Interpretations of fossil hominids have been directed primarily toward the elucidation of hominid taxonomy (Dart, 1925; Leakey, 1959; Leakey, Tobias, & Napier, 1964; Johanson, White, & Coppens, 1978; Brown, Harris, Leakey, & Walker, 1985; Walker, Leakey, Harris, & Brown, 1986) and the phylogeny of *Homo sapiens* (Johanson & Edey, 1982/1990; Thorne & Wolpoff, 1981; Tattersall, 1986; Stringer & Andrews, 1988; Simons, 1989; Howells, 1993; Brace,

TABLE 4
SUBPOPULATION CHI-SQUARED CONTINGENCY TABLE p VALUES
FOR DRAWING PANELS I–III SHOWN IN FIG. 1

Panel	Trait	Attrac-tiveness	p Value Sex	Race	Age	Comment
I	Shoulder/Torso	Most	ns	.02*	ns	*Africans perceived straight torso as most attractive. The Euro-Americans and Asians perceived the angle in torso most attractive.
		Least	ns	.005*	ns	*Fewer Africans perceived angled-out torso least attractive as compared to the Euro-Americans and Asians.
II	Thickness of Lips	Most	.002*	ns	ns	*Females perceived thick lips most attractive; males perceived intermediate thickness most attractive.
		Least	<.001*	ns	ns	*More females than males perceived thin lips least attractive.
III	Neck Length	Most	ns	ns	ns	All tested populations perceived long to intermediate neck length most attractive.
		Least	ns	ns	ns	All tested populations perceived a short neck length least attractive.

Note.—p values of Sex column calculated by a 3 × 2 chi-squared contingency table comparing males' and females' choices of 3 drawings. p values of Race column calculated by a 3 × 3 chi-squared contingency table comparing Euro-Americans', Africans', and Asians' choices of 3 drawings. p values of Age column calculated by a 3 × 3 chi-squared contingency table comparing 11- to 20-yr.-olds', 21- to 40-yr.-olds', and more than 40-yr.-olds' choices of 3 drawings.

1995b). Included in the fossils are ancestral anatomical traits no longer phenotypically prevalent in humans (primitive) and phenotypic traits that have become increasingly prevalent (derived). Consequently, the fossils indicate how the dental, gnathic, facial, cranial, and skeletal shapes and proportions of hominids have evolved.

The data presented here support an earlier study by Magro (1997) who proposed that derived anatomical characteristics are perceived as attractive while primitive anatomical characteristics are perceived as unattractive. In this earlier study, the population surveyed was more homogeneous than in the present survey and consisted mostly of Euro-Americans primarily between the ages of 19 and 30 years. Also, the study used photographs and drawings that were full representations of human forms and completely recognizable. The drawings used in the present study were line drawings that in some instances were incomplete or abstracted. They were intuitive and qualitative and intended to illicit an innate impression of shapes and proportions presented in a primitive, intermediate, and derived form. The intermediate form was not an average or a norm but rather a portrayal somewhere between the most primitive and most derived representations. When the data were analyzed in their entirety, they appeared to provide strong evidence that there is an over-all agreement among males and females of diverse ages, races, and cultures as to what is perceived as more or less attractive when judging primitive and derived traits. In addition, the intent of the survey was limited to assessing whether there was agreement among the individuals of the total population and within the subpopulations. Although the few differences within the subpopulations were noted in the data tables, it was not an intent to quantify or further define subtleties in the differences in the perceptions of the subpopulations.

TABLE 5
SUBPOPULATION CHI-SQUARED CONTINGENCY TABLE *p* VALUES FOR DRAWING PANELS IV–VI SHOWN IN FIG. 1

Panel	Trait	Attractiveness	*p* Value			Comment
			Sex	Race	Age	
IV	Strong/Weak Chin	Most	.03	ns	.003*	*Fewer of >40-yr.-olds perceived the strong chin most attractive as compared to <40-yr.-olds.
		Least	.02	ns	ns	All tested populations perceived the weak chin least attractive.
V	Shin/Thigh Ratio	Most	ns	ns	.002*	*More of the >40-yr.-olds perceived the intermediate shin length most attractive as compared to the <40-yr.-olds.
		Least	ns	ns	.01*	*Fewer of the 11- to 20-yr.-olds perceived the short shin least attractive compared to the >20-yr.-olds.
VI	Length of Maxilla	Most	ns	.04	ns	All tested populations perceived the short maxilla most attractive.
		Least	ns	ns	ns	All tested populations perceived the long maxilla least attractive.

Note.—*p* values of Sex column calculated by a 3 × 2 chi squared contingency table comparing males' and females' choices of 3 drawings. *p* values of Race column calculated by a 3 × 3 chi squared contingency table comparing Euro-Americans', Africans', and Asians' choices of 3 drawings. *p* values of Age column calculated by a 3 × 3 chi squared contingency table comparing 11- to 20-yr.-olds', 21- to 40-yr.-olds', and more than 40-yr.-olds' choices of 3 drawings.

As already noted, Langlois and Roggman (1990) presented findings that computer-generated, digital composites of faces were consistently judged as more attractive than any of the individual faces used to make up the composite. This has been accepted as evidence that averageness is the essence of human beauty. Langlois, Roggman, and Musselman (1994) popularized the term "average" to denote the mathematical mean of the digitized proportions of a population of faces. Although digitized and formed as a portrait image by a computer, the approach was similar to that used by Galton (1878), who used a photographic process involving a stereoscope to generate composite portraits from a population of faces. Perrett, *et al.* (1994) presented findings that digitally averaged composite faces can be made more attractive by slightly deviating from the sample mean. These points of view have generated an ongoing debate that is centered on whether averageness or atypicality is the essence of human beauty. Based on the findings presented herein, one could propose that both averageness and atypicality contribute to the understanding of human beauty. The findings of Langlois and Roggman (1990) and Perrett, *et al.* (1994) are not necessarily contradictory. When considered phenotypically in terms of their countenance and proportions, most individuals have a preponderance of derived traits. Consequently, averaged human forms are attractive because they are essentially devoid of primitive traits. Concurrently averaged human forms can be made more attractive and atypical by slightly exaggerating characteristics that are derived. This was mentioned over 100 years ago by Galton (1878), who in judging composite photographs stated that

> All composites are better looking than their components because the average portrait of many persons is free from the irregularities that variously blemish the looks of each of them.

From the earliest writings on the subject of beauty, over 2,000 years ago, up to the present day it has been repeatedly proposed that our sense of beauty is innate and universal. Upon viewing an object, the classical Greeks conceived of beauty as an intrinsic property of the object. Hutcheson (1725/1971) who wrote the first modern treatise on the subject of beauty

TABLE 6
SUBPOPULATION CHI-SQUARED CONTINGENCY TABLE p VALUES FOR DRAWING PANELS VII–IX SHOWN IN FIG. 2

Panel	Trait	Attrac-tiveness	p Value			Comment
			Sex	Race	Age	
VII	Shin/Thigh Ratio	Most	ns	.03	ns	All tested populations perceived the intermediate shin length most attractive.
		Least	ns	.02	ns	All tested populations perceived the short shin least attractive.
VIII	Dorsi/Plantar Flexion	Most	ns	ns	.02	All tested populations perceived the plantar foot flexion most attractive.
		Least	ns	ns	.002*	*Fewer of the >40-yr.-olds perceived the dorsi flexion least attractive as compared to the <40-yr.-olds.
IX	Stature	Most	ns	ns	ns	All tested populations perceived the intermediate stature most attractive.
		Least	ns	ns	ns	All tested populations perceived the short stature least attractive.

Note.—p values of Sex column calculated by a 3×2 chi squared contingency table comparing males' and females' choices of 3 drawings. p values of Race column calculated by a 3×3 chi squared contingency table comparing Euro-Americans', Africans', and Asians' choices of 3 drawings. p values of Age column calculated by a 3×3 chi squared contingency table comparing 11- to 20-yr.-olds', 21- to 40-yr.-olds', and more than 40-yr.-olds' choices of 3 drawings.

TABLE 7
SUBPOPULATION CHI-SQUARED CONTINGENCY TABLE p VALUES FOR DRAWING PANELS X–XII SHOWN IN FIG. 2

Panel	Trait	Attractiveness	p Value Sex	Race	Age	Comment
X	Zygomatic Bone/ Chin Profile	Most	.03	.01*	.02	*More of the Africans perceived the narrow chin most attractive as compared to Euro-Americans and Asians.
		Least	.02	ns	ns	All tested populations perceived the wide chin least attractive.
XI	Leg/Torso Ratio	Most	ns	<.001*	ns	*More of the Asians perceived long legs most attractive as compared to the Euro-Americans and Africans.
		Least	ns	.001*	<.001†	*More of the Asians perceived short legs least attractive as compared to the Euro-Americans and Africans. †More <20-yr.-olds perceived short legs least attractive as compared to >20-yr.-olds.
XII	Teeth	Most	ns	ns	ns	All tested populations perceived the straight teeth with no spaces most attractive.
		Least	ns	.004*	ns	*Fewer of the Africans perceived spaces between teeth as least attractive as compared to the Euro-Americans and Asians.

Note.—p values of Sex column calculated by a 3×2 chi squared contingency table comparing males' and females' choices of 3 drawings. p values of Race column calculated by a 3×3 chi squared contingency table comparing Euro-Americans', Africans', and Asians' choices of 3 drawings. p values of Age column calculated by a 3×3 chi squared contingency table comparing 11- to 20-yr.-olds', 21- to 40-yr.-olds', and more than 40-yr.-olds' choices of 3 drawings.

was a proponent of universality and recast the idea of beauty as an innate process involving an inner sense. Contemporary studies have provided evidence for the innateness (Sussman, Mueser, Grau, & Yarnold, 1983; Samuels & Ewy, 1985; Langlois, Roggman, Casey, Ritter, Rieser-Danner, & Jenkins, 1987) and universality (Lott, 1979; Thakerar & Iwawaki, 1979; Horvath, 1981; Maret, 1983; Maret & Harling, 1985; Cunningham, 1986) of our perception of attractiveness. Still, the question remains as to what might be the universal standard of beauty of human form. The data presented in this paper call attention to the hypothesis that primitive anatomical shapes and proportions are universally perceived as unattractive. Line drawings and abstractions were used to focus on evolutionary rather than culturally derived characteristics of attractiveness. When these drawings were judged, people of diverse races, ages, and cultures perceived as attractive those evolutionary-derived characteristics that are universally shared by anatomically modern humans. In this light, derived anatomical traits that are universally shared by anatomically modern humans may be the standard of our innate sense of

TABLE 8
SUBPOPULATION CHI-SQUARED CONTINGENCY TABLE *p* VALUES FOR DRAWING PANELS XIII–XV SHOWN IN FIG. 3

Panel	Trait	Attractiveness	*p* Value Sex	*p* Value Race	*p* Value Age	Comment
XIII	Cranial Outline	Most	ns	ns	ns	All populations tested perceived vaulted or intermediate cranial outline most attractive.
		Least	ns	ns	ns	All populations tested perceived sloped cranial outline least attractive.
XIV	Leg/Torso Ratio	Most	.01	<.001*	<.001†	*More Asians perceived long legs most attractive as compared to Euro-Americans and Africans. †Fewer of the <20-yr.-olds considered long legs most attractive as compared to the >20-yr.-olds.
		Least	.003*	.005†	.004‡	*More females than males perceived short legs least attractive. †More Asians than Euro-Americans and Africans perceived short legs least attractive. ‡Fewer of the <20-yr.-olds perceived short legs least attractive as compared to the >20-yr.-olds.
XV	Orthognathic/ Prognathic	Most	ns	<.001*	ns	*Fewer of the Africans perceived orthognathic most attractive as compared to Euro-Americans and Asians.
		Least	ns	ns	ns	All populations tested perceived prognathic as least attractive.

Note.—*p* values of Sex column calculated by a 3 × 2 chi squared contingency table comparing males' and females' choices of 3 drawings. *p* values of Race column calculated by a 3 × 3 chi squared contingency table comparing Euro-Americans', Africans', and Asians' choices of 3 drawings. *p* values of Age column calculated by a 3 × 3 chi squared contingency table comparing 11- to 20-yr.-olds', 21- to 40-yr.-olds', and more than 40-yr.-olds' choices of 3 drawings.

beauty of human form. The high agreement in judging unrecognizable, abstracted human forms also raises the interesting question of whether general aesthetic sense for art, architecture, and fashion is based on a subliminal reference to anatomical shapes and proportions.

An additional focus of the beauty debate is whether evolutionary theory and the various theories of beauty are compatible. The averageness theory has been justified by the biological advantages of stability selection (Langlois & Roggman, 1990), whereas atypicality has been presented in the context of directional selection (Alley & Cunningham, 1991; Perrett, *et al.*, 1994). At first glance, these positions appear at odds. The fossil record indicates that throughout much of its evolution the genus *Homo* was contemporaneous with other bipedal hominids and closely related quadrupedal pongids. The genus *Homo* is the only surviving hominid. Of the family Pongidae, the chimpanzees are likely to be our nearest living relatives. Chimpanzees and

TABLE 9
SUBPOPULATION CHI-SQUARED CONTINGENCY TABLE *p* VALUES
FOR DRAWING PANELS XVI–XVIII SHOWN IN FIG. 3

Panel	Trait	Attractiveness	*p* Value			Comment
			Sex	Race	Age	
XVI	Curvature of Lips	Most	ns	ns	ns	All populations tested perceived the intermediate curvature of lips most attractive.
		Least	.02	.01	ns	All populations tested perceived the least curved lips least attractive.
XVII	Forehead Height	Most	ns	<.001*	<.001†	*Africans perceived high forehead most attractive while Euro-Americans and Asians perceived intermediate height of forehead most attractive. †More of <20-yr.-olds perceived intermediate height of forehead most attractive as compared to >20-yr.-olds.
		Least	.02	.001*	<.001†	Fewer Euro-Americans perceived low forehead as least attractive as compared to Africans and Asians. †<20-yr.-olds perceived the high forehead least attractive. >20-yr.-olds perceived the low forehead least attractive.
XVIII	Neck Length	Most	ns	<.001*	<.001†	*Euro-Americans perceived the intermediate neck length most attractive. Africans and Asians perceived the long neck as most attractive. †>20-yr.-olds perceived the long neck as most attractive. <20-yr.-olds perceived the intermediate neck length as most attractive.
		Least	.002*	.03	.004†	*More females than males perceived the short neck least attractive. †More >20-yr.-olds perceived the short neck least attractive as compared to the <20-yr.-olds.

Note.—*p* values of Sex column calculated by a 3 × 2 chi squared contingency table comparing males' and females' choices of 3 drawings. *p* values of Race column calculated by a 3 × 3 chi squared contingency table comparing Euro-Americans', Africans', and Asians' choices of 3 drawings. *p* values of Age column calculated by a 3 × 3 chi squared contingency table comparing 11- to 20-yr.-olds', 21- to 40-yr.-olds', and more than 40-yr.-olds' choices of 3 drawings.

hominids probably separated from a common ancestor some 5 to 7 million years ago. Chimpanzees have a preponderance of anatomical traits that are ancestral and thus are considered primitive. Primitive traits that chimpanzees possess, presented here as abstractions or line drawings, include straight-waisted torso, short shins, short legs, long torso, spaces between the teeth, rounded chin, dorsi foot flexion, a longer distance between the nose and lips, short stature, prognathism, thin straight lips, sloped and low cranium, and a short neck.

Operating on the assumption that changes in selective forces will produce changes in organisms previously in a state of adaptive equilibrium, it could be assumed that the universality and innateness of our sense of attractiveness for primitive and derived anatomical traits have some evolutionary significance. Most evolutionary-based theories of human mate selection regard physical attractiveness as a cue for assessing the reproductive value of a mate within the same species (Symons, 1979; Cunningham, 1986; Buss, 1989; Townsend, 1989; Moller, 1990; Singh, 1993). Whether the genus *Homo* initially developed allopatrically while contemporaneously existing with other Hominidae or Pongidae is not known. Whether the genus *Homo* arose by a speciation event rather than by progression while coexisting with other bipedal hominids and quadrupedal pongids is also not known. Nevertheless, a strong aversion to primitive anatomical traits (or preferring averageness over primitive) would be a major selection pressure in maintaining separateness of species. Concurrently, preferences for slightly exaggerated, derived characteristics could exert a directional selection pressure away from the mean toward advanced phenotypes. The data here indicate that the rejection of primitive traits is more pronounced than the preference for exaggerated, derived traits. Maintaining separateness of species and thus avoiding the risk of sterile offspring could have been the original functional significance of our innate sense of beauty of human form.

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