THE EVOLUTION OF HAIRLESSNESS IN MAN

The virtual hairlessness of *Homo sapiens* is one of the outstanding morphological characteristics of the species. Overall reduction of hair cover and, in some populations, hair number, clearly distinguish man from other primates in which hair reduction is more localized as well as from other terrestrial mammals in his size range, most of which are well covered with hair. Because man's hairlessness is rather noticeable, a number of theories have been advanced to account for its existence, but none of these has gained general acceptance. Here I attempt to outline a synthetic view of the evolution of hairlessness in man.

One of the most divergent of the theories postulates an aquatic phase in man's evolution, wherein an aquatic human ancestor was subjected to selective pressures similar to those that have resulted in the near hairlessness of some contemporary aquatic mammals (Napier 1970). Certainly supporting evidence for the proposal seems slim (Morris 1967). In a similar vein are ideas such as hair loss being caused by an iodine-deficient diet (Marett 1936). An early proposal that hairlessness enabled man to reduce ectoparasite load was rejected by Darwin (1871). Drawin's general view was that hairlessness was thermally disadvantageous, although remnant hair patches were important in sexual selection. Other theories (Darwin 1871; Keith 1912; Morris 1967; Guthrie 1970) postulated that hairlessness evolved to aid in species identification, sexual signaling (especially in females), social appeasement, as a correlate of an increasing ability of the brain to interpret sensual messages from the skin, as a by-product of neotenuous growth patterns, or as an aid in thermoregulation.

It is most often proposed that the evolution of human hairlessness was somehow associated with temperature regulation in a tropical environment. This basic concept has several permutations. Campbell (1966) proposed that hairlessness may be an adaptation for rapid heat loss made necessary because of man's unusual diurnal hunting regime. Morris (1967) also advocated the hypothesis that hairlessness prevented overheating during hunting chases. He thought that such hairlessness was necessary because hunting chases were activities for which early man was otherwise poorly adapted physically. Leakey and Lewin (1977) suggested simply that hair loss allowed man to elaborate an efficient cooling system. Glass (1966), taking the opposite approach, suggested that the use of clothing made hairlessness inconsequential and that hair reduction provided no intrinsic advantage. Theories proposing that thermoregulation is the major evolutionary correlate have failed to counter an objection first posed by Darwin (1871) that such theories must explain why man alone among the many tropical, terrestrial, plains, and woodland mammals is hairless. Thus a theory accounting for hair reduction in primitive man must also take into account the continued furriness of his sympatric mammalian associates.

Nonetheless, it would seem that thermoregulation remains the most reasonable

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basis for explaining hairlessness in man. Like other endothermic animals, man must regulate body temperature during activity, and hyperthermia from strenuous sustained activity is known to limit man's physical performance (MacDougall et al. 1974). Heinrich (1977) distinguished two important ways in which selection could increase endurance performance: through improvement in insulation to reduce heat gain or through development of mechanisms to increase heat dissipation. Human evolution appears to have followed the latter path in that heat-dissipation was improved by the increase and elaboration of sweat-producing eccrine glands on surfaces with reduced hair coverage. The alternative strategy of improving insulation, using hair, to reduce heat gain would have conflicted with the elaboration of hairless evaporative surfaces to increase heat dissipation. Moreover, Heinrich (1977) has shown that insulation most commonly serves not to reduce heat gain when activity is high but to retard heat loss during periods when activity is low. This is a critical consideration, since saving energy during inactivity must have been as important a problem in human evolution as was increasing heat loss during activity. Ancestral hominids were confronted with the dilemma of maximizing heat loss during strenuous activity, especially during diurnal hunting, while minimizing heat loss at other times.

I suggest that heat loss in man was increased during activity by the elaboration of evaporative cooling on surfaces with reduced hair cover and decreased at other times through man's evolving intellectual and innovative ability that led to the use of artificial body covering, as well as use of fire and shelters. The first clothing therefore probably developed as artificial insulation, rather than the proverbial fig leaf as suggested by Morris (1967) and implied by depictions (perhaps of the publisher's choosing) in even the most recent treatments of human evolution (Leakey and Lewin 1977, pp. 85, 130). Man's characteristic dermal layer of fat may have developed concurrently, probably functioning to reduce heat loss during periods of moderate temperature, to protect core temperatures from rapid shifts of skin temperatures during cooling, and to supply long-term energy reserves.

With the coevolution of hair reduction and removable insulation, the way was open for simultaneous development of some other components of man's evolutionary mosaic. This mosaic links many of the divergent views of the evolution of hairlessness. As proposed by others, hair reduction could have been brought about, at least partially, by neotenous development. Hair was retained where it served functions such as protection from overheating. In the normal mammalian pattern, it remained associated with apocrine glands serving attractant, appeasement, or threat functions (Morris 1967; Guthrie 1970); and in the primate pattern it remained associated with structures such as eyebrows and the beard, serving display functions. Exposure allowed skin to serve species-signaling and sexual-signaling functions. Tactile sensitivity helpful in pairbonding then could have increased.

Thus as a synthetic theory, hair reduction evolved to increase heat dissipation during activity and was made possible by the use of artificial body covering, as well as fire and shelter, to insulate against heat loss during periods of little physical activity. This in turn made possible the employment of remnant hair patches and exposed skin areas for other functions, primarily social in nature. None of this would have been possible without development of the intellectual capacity for fabricating artificial insulation at a rather early stage in hominid evolution. The rudiments of such innovation may be apparent in the manipulation of their environment shown by great apes. Species associated with early man failed to develop the necessary manipulative capacity and retained less efficient, doubly functioning permanent insulation. Thus this proposal counters the long-standing objection to an association between thermal regulation and hairlessness, namely that ". . . other members of the order of primates . . . although inhabiting various hot regions, are well clothed with hair" (Darwin 1871).

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