

See also 7/10

effectance motivation of. Pleasure action

B.G. Campbell: Human Evolution, Aldine Pub. Co.
Chicago, 1966 p.49

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Behavior has been described as both innate and learned (see 1.5), and we have seen that learned behavior assumes great importance among mammals. The intimate relationship between different generations brings the possibility of building up quite complex behavior patterns by imitation, without the need to learn by trial and error in each generation. Such learning is confined to animals (birds and mammals) in which parental care has evolved.

But mammals also depend on learning by trial and error, which must always be the original source of learned behavior. While in most animals activity and learning result from the need to satisfy the primary drives of hunger, sex, and self-preservation, a new determinant of behavior is found among mammals that does not satisfy these immediate needs. This new factor is a drive to investigate and explore the environment without the immediate object of satisfying

one of the three prime biological needs mentioned above, and has been termed effectance motivation.

1. White, R.W. 1959 Motivation reconsidered: the concept of competence. Psych. Rev. 66: 297-333

B.G. Campbell: Human Evolution, Aldine Pub. Co.
Chicago, 1966 p.50

Effectance motivation is seen in the playful and exploratory activity of young mammals with the parts of the environment that provide changing and interesting feedback in connection with effort expended. Such activity leads individuals to discover how the environment can be changed and what consequences flow from the changes. Such moderate but persistent activity is possible only under the protection of parents, because its value to the individual and the species is not immediate, as are the primary drives, but is of a long-term nature. This type of behavior forms part of the process whereby the young animal learns to interact effectively with the environment and builds up its perception of its surroundings (see 10.2)



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The value of a computer in the solution of a very complex problem depends not only on the computer's size and complexity but also on the amount of data that is fed into it. For reliable results, a large input is a prerequisite. It is equally necessary in the evolution of the brain as a mechanism for prediction and problem-solving, for complex problem-solving depends on sufficient input data, and this need explains the evolution of effectance motivation. The motor exploratory activity that results in the satisfaction of the primary drives of hunger, sex, and self-preservation was supplemented by the increased input that was derived from effectance activity and is an essential correlate of the evolution of mammals into organisms with brains much larger (in relation to body size), much more complicated, and much more efficient than had been known before in the organic world.

There were two developments within the brain itself concomitant with the increased input. The first was the evolution of a greatly expanded memory store (that is, an unconscious record of experience); the second was the evolution of an expanded "computer," that is, the part of the brain that actually makes predictions and solves problems.



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It is clear that the total morphological pattern of the Hominidae is associated primarily with bipedalism. If the interpretation of this pattern that has been placed upon the fossils of Ramapithecus is correct, we must suppose that Ramapithecus may have moved bipedally more often than living apes do, though clearly the associated adaptations of the pelvis and hindlimbs would be less striking in this animal than those we see in Australopithecus. If Ramapithecus was bipedal, which hominid status implies, he was most probably living in fairly open country, since bipedalism is not a very useful adaptation in the tropical rain forest, with its dense ground cover. For the present, therefore, it is reasonable to suppose that the Hominidae first became established in open country in the Miocene (15-20 million years ago), though just why it happened is not known.

B.G. Campbell: Human Evolution, Aldine Pub. Co.
Chicago, 1966, p.335

We need not think, therefore, of a descent from the trees as involving a sudden and revolutionary adaptation resulting, perhaps, from some startling mutation. Nothing so drastic is involved. Evolution is the slow unfolding of new forms. Semi-brachiation is preadaptive to bipedalism; its advantages can have been realized only in fairly open or scattered woodland. Bipedalism is preadaptive to plains living; our hominid ancestors had some startling advantages for plains life, in terms of their sensory acuity, powers of prediction, and manipulative ability. The opportunistic nature of the evolutionary process allowed the exploitation of an ecological situation with great possibilities. Early hominids no longer used their eyes mostly for locomotion, as they had done in the forest; they could now use them largely for the more productive activities of food-finding, defense, and intra-

specific communication.



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Chicago, 1966 p.332/3

We do not have to postulate a sudden climatic change to account for a new adaptive radiation, though there is some evidence of a reduction in the total area of forest in central Africa soon after that time as the result of a more arid climate. By Pliocene times many plains-living forms, such as the giraffes, gazelles, and baboons, were evolving under new selection pressures.

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Chicago, 1966 p.333

It seems correspondingly clear that the early hominids must have evolved a degree of bipedalism in the forest; this improbable suggestion is acceptable only in the face of the evidence we have of semi-brachiation in hominid ancestry. Interestingly enough, the great paleontologist W. K. Gregory postulated in 1928 that some brachiating would have been essential for the hominid ancestors of man before they could have become habitual bipeds. We would much less readily accept the suggestion of possibility of a change in adaptation from quadruped to biped. The present evidence for semibrachiation gives us a happy solution to the problem of the origin of bipedalism, since it involves an erect posture and the direct vertical transmission of weight from body to feet. It is well known that chimpanzees, gorillas, and especially gibbons can walk for some distance on two legs. Although their posture is stooping rather

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than man-like, the possibility of bipedalism is present and is due to adaptation to the changing mechanics of body weight and stress that result from regular brachiation.

1. Napier, J.R. 1964 The evolution of bipedal walking in the hominids. Arch. Biol. (Liège) 75 (suppl.): 673-708

B.G. Campbell: Human Evolution, Aldine Pub. Co.
Chicago, 1966, p.333/4

We can suppose, then, that in the early Miocene (or earlier) there were some dryopithecine apes already evolved as semibrachiators; their arms were lengthening, their spine was stiffening, and their feet showed adaptation to standing upon branches (see Fig. 5.18, p.132). Perhaps some of them were already occupying more open country, such as that occupied by the (mainly terrestrial) mountain gorilla today. But, unlike the mountain gorilla, they were small, light creatures, perhaps no more than four feet high, so an upright posture presented fewer mechanical problems. At the same time, in the bamboo-covered mountainsides inhabited by the mountain gorilla today, visibility is very limited, and standing up does not improve the view. But in more open country standing erect would have afforded a good view, and bipedalism would also have had other striking advantages. Sometimes a modern baboon



(or a patas monkey) will stand erect to get a view over the grasslands, and the protection against predators thus offered to an animal with already excellent sight must be very considerable.

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One other adaptation, however, seems necessary as a postulate. Baboons have survived in open country to a great extent as a result of their highly evolved social structure. If early hominids were not fully preadapted in this respect, they almost certainly were partially preadapted. At any rate, it seems that plains life for such a defenseless creature as a primate necessitates the rapid evolution of a means of cooperative defense and a binding social structure. This social structure made possible the remarkable changes we see in the Pleistocene phase of human evolution.

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Chicago, 1966, p.335/6

Apart from Ramapithecus, the earliest hominid fossils of which we know the age with any certainty are those of Australopithecus, found at Olduvai, Tanzania. They are now believed to date from about 1.5 million years ago¹. In the lowest levels at this site (Bed I) we find remains not only of Australopithecus robustus (previously known as Zinjanthropus) but also of an advanced form of A. africanus (originally named Homo habilis). The interpretation of these important fossil remains has recently been discussed by Tobias and others² and the interpretation placed upon them in these pages is approximately in line with the published views of Clark Howell and Robinson³. These two species of Australopithecus have already been discussed, and we have distinguished the heavy-jawed, probably herbivorous A. robustus from the light-jawed, omnivorous A. africanus (chapter 7).

1. Evernden, J.F., and Curtis, G.H. 1965 The potassium-argon dating of late Cenozoic rocks in East Africa and Italy. Curr. Anthropol. 6: 343-85.
2. Tobias, P.V. et al. 1965 New discoveries in Tanganyika: their bearing on hominid evolution. Curr. Anthropol. 6: 391-411
3. Howell in Tobias et. al. 1965 Robinson, J.T. 1965. Homo "habilis" and the australopithecines. Nature, London 205: 121-24.

B.G. Campbell: Human Evolution, Aldine Pub. Co. Chicago, 1966, p.338

Somewhere, we have to admit, an Australopithecus gave birth to a Homo, and they were, from our point of view, indistinguishable.

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B.G. Campbell: Human Evolution, Aldine Pub. Co. Chicago, 1966, p.337

In the early Pleistocene, therefore, we can recognize these two species of Australopithecus, well established in eastern and southern Africa and clearly distinct. As we have seen, that called A. africanus is the more Homo-like, and at Olduvai it approaches very closely the early forms of Homo erectus.

1. Tobias, P.V., and von Koenigswald, G.H.R. 1964 A comparison between the Olduvai hominines and those of Java and some implications for hominid phylogeny. Nature, London 204: 515-18.

B.G. Campbell: Human Evolution, Aldine Pub. Co. Chicago, 1966, p.348

TABLE 11.1 SUBSPECIES OF HOMO ERECTUS

Approx. Time-span (Years B.P.)	Europe	N.Africa	E. and S. Africa	E.Asia
350,000- 550,000	-	mauritanicus	leakeyi	erectus and pekinensis
900,000	heidelbergensis	-	habilis*	modjoker- tensis

* Specimens from Tanzania (Olduvai, lower Bed II) and South Africa (Swartkrans)



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Such behavior may be unusual for baboons, but it does suggest that the difference between cooperative defense and cooperative offense is not very great. Many primates use signals for troop control: what is interesting here is that the baboons show the sort of discipline that we associate with dogs, when they act as cooperative hunters. It appears that primates are sufficiently versatile in their behavior to develop this particular pattern when it proves to be adaptive.

B.G. Campbell: Human Evolution, Aldine Pub. Co. Chicago, 1966, p.341/2

The evolution of manipulation and the evolution of speech seem to have gone hand in hand, and they appear to involve extensive cross-connections in the cerebral cortex between the different sensory receiving areas (visual, somesthetic, and auditory cortexes) and the motor cortex. It is these corticocortical connections that are such a striking character of the human brain and that are a necessary correlate of manipulation and speech.

B.G. Campbell: Human Evolution, Aldine Pub. Co. Chicago, 1966, p.344

It should be added that we have no reliable absolute dates for the Asian fossils though the range 700,000-500,000 years B.P. is a likely approximation. In Africa, the earliest forms that might be attributed to Homo erectus come from Olduvai Bed II and may date from nearly 1 million years B.P.

1. Tobias, P.V. et al. 1965 New discoveries in Tanganyika: their bearing on hominid evolution. Curr. Anthropol. 6: 391-411.

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* Specimens from Tanzania (Olduvai, lower Bed II) and South Africa (Swartkrans).



B.G. Campbell: Human Evolution, Aldine Pub. Co. Chicago, 1966, p.349/50

What reduction had occurred, however, was not a world-wide phenomenon, for the Steinheim-Swanscombe population in Europe was replaced, after a period of extreme climatic conditions accompanied by glaciation, by another population, which, although it had an equally large cranial capacity, had at the same time retained a heavy masticatory apparatus only slightly smaller than that of Homo erectus. This large-jawed population, with its heavy supraorbital torus and large nuchal area, is known by the name of Neandertal, where the first fossil human skull to be so described was found in 1858. This Neandertal population, so much more primitive in appearance than its predecessor, remained in western Europe until the final glaciation of the Pleistocene, when it was replaced by a modern population, some 35,000-50,000 years ago (see Figs. 3.12, N and M, p. 81).

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TABLE 14.2 SUBSPECIES OF HOMO SAPIENS

Approx. Time-span (Years B.P.)	Europe	Asia	Africa	S.A.Asia
0-35,000	Modern subspecies of <u>Homo sapiens</u> *			
35,000-100,000	neanderthalensis	palestinus	rhodesiensis	soloensis
100,000 - 200,000	steinheimensis	-	+	-

* Modern man probably entered Australia and America about 20,000 years B.P.

+ Undescribed fossils from Olduvai may fill this gap.

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But much has happened in these most recent phases of human evolution. Since the appearance of man indistinguishable from ourselves, which is recorded in the fossil record in France (Cro-Magnon) and other sites (Fig. 3.12, M, p.81), in Kenya (Kanjera), and in south-eastern Asia (Niah in Sarawak), about 40,000-50,000 years ago, he has spread throughout the land masses of the Old and the New World and now occupies a vast range of environments.

