

ARBOREAL ORIGIN OF BIPEDALISM REEXAMINED - COMPARATIVE DYNAMICS -

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The present report concerns the reexamination of scenarios which have been proposed by us on the origin of human bipedalism from arboreal locomotion through dynamic comparative analyses of extant primates including humans (Ishida et al. 1975, Kimura et al. 1979, Kimura and Yaguramaki 2009). *Ardipithecus ramidus* was reported to practice mixed arboreal locomotion and terrestrial upright walking (Lovejoy et al. 2009). Whether the fossil of 4.4 million years ago was our direct ancestor or not, it was well grounded that the bipedal locomotion can be acquired in the arboreal situation. Since living nonhuman primates are not our ancestors, the model from a single extant species cannot completely explain the locomotion of human ancestors before bipedality. Animal dynamics are, however, not comprehensible only from the static fossils. Our experimental results exhibited many features connected with the bipedal origin in plural arboreal primates. A mosaic model should be reasonable (Kimura 1990). The pre-bipedal ancestors could easily start and continue bipedal locomotion when the following characteristics were present: relatively extended lower limb joints during stance phase; relatively upright trunk; steady steps with small variance; high potential energy during the single stance phase; high muscle activity of kick-off; relatively large accelerating force; and relatively small body size compared to the muscle force of lower limb. *Ardipithecus ramidus* was said to live in the forest and to possess many of above characteristics, such as extended hind limb joints, and an upright trunk, but a relatively large body size. Why these characteristics developed in the arboreal life is the problem to be discussed.

Keywords: bipedality, arboreal locomotion, human ancestor, *Ardipithecus*