bone was recognized early on to be more advanced than australopithecines and was found to group morphologically with *Homo*[7], a surprising conclusion because the Kanapoi deposits are not only much older than any deposits containing fossils of early *Homo* but are also older than many australopithecine sites. The present discoveries reinforce that conclusion, however, for a partial tibia found at the same level as the humerus also shows some *Homo*-like characters[3], particularly in its overall length (estimated because the midshaft is missing).

Body-size estimates based on the sizes of the two ends of the tibia indicate a range of 46–55 kg for this individual, larger than the contemporaneous hominine *Australopithecus afarensis*. The new species is larger also than *Ardipithecus ramidus*, which retains chimpanzee-like postcrania[1]. The latter is also distinguished by its thinner tooth enamel, which may be ancestral or derived depending on how thickness polarity is determined. Several other differences are also noted in the species diagnosis, probably justifying the distinction from *A. ramidus*, but there is only limited overlap in body parts preserved in common in the two hominids. Unfortunately, there are no postcrania from the lower level at Kanapoi to compare either with *Ardipithecus* or with upper level Kanapoi. A summary of the apparent morphologies of Pliocene hominines is shown in the table.

Aramis	Thin-enamelled hominine with australopithecine-like postcrania
Lower Kanapoi	Thick-enamelled hominine with jaws like fossil apes, unknown postcrania
Upper Kanapoi and Allia Bay	Hominine with *Homo*-like postcrania
Laetoli	Thick-enamelled hominine with possible *Homo* affinities and bipedal gait
Hadar	Thick-enamelled hominine with australopithecene-like postcrania

There are several issues that arise from these new discoveries from Kanapoi and Allia Bay. One concerns the linking of the upper Kanapoi postcranial material with the dental specimens which come from the lower Kanapoi deposits. If the dating is correct, and if there is just one species represented at Kanapoi, it results in the remarkable combination of advanced *Homo*-like features of the postcrania (that is, the humerus and tibia from the later deposits) with primitive jaws and teeth similar to those of Miocene apes. This combination is at odds with the more usual australopithecine pattern, and as the mandible from the upper level has no teeth in place, and there are no postcrania from the lower level, additional material will be needed to support this allocation.

Comparisons of Pliocene hominines are generally made with other, later, hominine species. At this early stage of human evolution, however, it is to be expected that there will be many similarities with fossil apes, and whether one works forward from the apes or back from humans, it is important that, like the channel tunnel, the two approaches should meet in the middle. Rather than questioning which hominid lineage the Kanapoi species may be on, therefore, I would like to raise the question of how it differs from fossil apes. Could it, for instance, belong to a bipedal ape not on the hominine lineage? Based on the association of the *Homo*-like postcrania, could it belong to a hominine lineage separate from the australopithecines but more directly intermediate between fossil apes and *Homo*? If the upper and lower Kanapoi specimens prove to be taxonomically distinct, there is even the possibility that one group may be related to humans and the other to apes.

In addition to these phylogenetic questions, there is the issue of the environment and life history of the Pliocene hominines. There are increasing indications that some of the early hominines are associated with closed woodland/forest environments, and it has also been shown that, although they had bipedal adaptations, hominines like *A. afarensis* retained some adaptations to an arboreal way of life[8]. The recent description of four articulating footbones from 3–3.5 Myr deposits in the South African cave site of Sterkfontein supports this for, although primarily adapted for bipedalism, the divergent big toe indicates some degree of prehensile grasping as in apes[9]. Developmental patterns were also more ape-like than human[10]. Whether they were phylogenetically hominines or not, it seems to me that ecologically they may still be considered as apes. □

Peter Andrews is in the Department of Palaeontology, Natural History Museum, Cromwell Road, London SW7 5BD, UK.

1. White, T., Suwa, G. & Asfaw, B. *Nature* **371**, 306–312 (1994).
2. White, T., Suwa, G. & Asfaw, B. *Nature* **375**, 88 (1995).
3. Leakey, M. G., Feibel, C. S., McDougall, I. & Walker, A. *Nature* **376**, 565–571 (1995).
4. WoldeGabriel, G. *et al. Nature* **371**, 330–333 (1994).
5. Alpagut, B., Andrews, P. & Martin, L. *J. hum. Evol.* **19**, 397–422 (1990).
6. Patterson, B. & Howells, W. W. *Science* **156**, 64–66 (1967).
7. McHenry, H. M. & Corruccini, R. S. *Folia Primatol.* **23**, 227–244 (1975).
8. Stern, J. T. & Susman, R. L. *Am. J. phys. Anthrop.* **60**, 279–317 (1983).
9. Clarke, R. & Tobias, P. V. *Science* **269**, 521–524 (1995).
10. Bromage, T. & Dean, M. C. *Nature* **317**, 525–527 (1985).

DAEDALUS

Social conscience

IMPRISONING criminals is an expensive way of preventing crime. A cheaper scheme is to fit each offender with a radio 'tag' to report suspicious movements. So far, this has not worked very well.

The old-fashioned way of preventing crime was to equip all citizens with an internal inhibitor called a 'conscience'. It was routinely established at an early age. You waited till the child did something you didn't like, and then you shouted at it or hit it. At all other times you were kind to it. This simple procedure worked well, and is still used with great success on domestic animals. It depends on standard conditioning theory, which requires the punishment to follow the crime so swiftly that the subject instinctively learns to associate the two.

Modern enlightenment has abandoned such barbarity. Punishment can now be meted out, if at all, only after slow and complex routines of authorization — by which time the offender has long since forgotten its connection with the crime. Unwarned and undeterred, he goes on to commit more serious crimes. Daedalus is now devising an electronic tag which applies its own instant conditioning.

His 'smart tag' records a lot more about its wearer than his mere position. Sensors against his skin register his temperature, blood pressure and pulse rate; a microphone records his speech and the sounds around him; a set of accelerometers senses his pattern of movement. After a little experience, the tag's neural-net processor can instantly deduce what he is up to. The physiological and kinetic signatures of (say) burglary, or mugging, or breaking into a car, or spraying graffiti, are highly individual and easily recognized. When it spots such activity, the smart tag ceases to be a mere passive observer of its wearer. It transmits a signal to the police; more to the point, it also emits a startling high-pitched scream and delivers an instant, painful electric shock.

Even the dimmest criminal will rapidly learn, by direct association, that crime does not pay. Daedalus's 'electronic conscience', with its minor but instant and certain punishment, will prevent crime far more efficiently than the law, with its drastic, expensive, but highly uncertain and always long-delayed retribution. Even better, the tag's steady conditioning will gradually establish an old-style conscience in the wearer. In due course he will be so well conditioned against crime that his electronic conscience can be removed; his newly acquired internal one will do the job. Only sociopaths and hopeless recidivists, incapable of reliable learning, will need to wear it permanently. David Jones