Here and in the following chapter we shall be concerned with the adoption of stone tool-making by human ancestors. The purpose of this chapter will be to explore the nature and significance of tools in the context of the known pattern of hominid evolution. In particular we shall consider who the tool-makers may have been and what processes may have initiated this novel practice. Finally the new mode of adaptation initiated by *Homo*, one of foraging for meat and plant food which relied upon stone tools, will be examined.

**ANIMALS AND TOOLS**

It was noted in Chapter 4 that chimpanzees learned to make and use tools. Until observers in the field revealed this, these activities were considered to be an exclusive and defining characteristic of our own species (Goodall 1971, 1986). Chimpanzees are now known to use and modify more objects for more purposes than any animal except humans. Twig probes are used to fish for termites, ants and honey. Leaf sponges are made for drinking water, soaking up juices in the carcasses of prey species and for cleaning the body. Modified branches, leaves and sticks are used as toothpicks, for brushes during grooming, as fly whisks, toys and as containers. Sticks, stones and foliage are used as missiles for defensive and aggressive purposes and during play. Stone hammers are used to open nuts and to remove shells from fruit. Objects may be used as a means of making the user appear larger or more dangerous in a charging display which intimidates rivals
and re-establishes supremacy in the dominance hierarchy. Baboons and pigs are often attacked by chimpanzees using sticks and rocks. However, in fighting, these tools are ancillary and are not true weapons, which means that selection pressures favouring large canine teeth remain. But the degree to which tools are relied upon in foraging may be greater than was at first thought. Up to 20 per cent of feeding time is spent on termite fishing and this food, like nuts and fruit with thick husks, would be unavailable without tools (Goodall 1986). The adaptation and modification of objects to make them suitable for a particular purpose or to solve a new problem shows once again that chimpanzees possess cognitive processes which echo human abilities. Clearly the ability to abstract from raw material the pattern and form of a tool which will be used at a future time and in a distant location is found in this ape.

The full extent to which primates use and manufacture tools has been catalogued by Beck (1975). He shows that all the apes and even some monkey species can be included here. But this behaviour is a far more developed part of the chimpanzee repertoire and provides us with a model for hominids.

There are also extensive examples of tool-use, but not tool-making, by non-primate animals. The burrowing wasp *Ammophila urnaria* uses small pebbles as a hammer to pound soil over its nest; the Galapagos woodpecker finch uses a cactus spine to dig for grubs in tree bark; certain crabs use living sea anemones as a defensive aid; sea otters are thought to use stones to open mollusc shells, and polar bears to hurl blocks of ice on the heads of sleeping walruses (Wilson 1975). In all these cases tool-use occurs because extraneous, extra-corporeal equipment is applied to the environment to extend the user's efficiency. The tool-user category cannot be applied when an animal uses or modifies natural materials as an end in itself, in for instance nest construction or in the breaking of shells by gulls and thrushes by dropping them onto rocks. Nor can the indiscriminate manipulation of objects, such as the pulling down of a vine, be seen as tool-use. But dropping rocks onto eggs or pounding fruit with another object does count as tool-use. Tool-use occurs therefore when an animal directly controls objects which it has separated from the environment, by holding or carrying, and employs these for specific results for which it is responsible (Hall 1963).

However in non-primate tool-using animals no indication of specially intelligent behavioural adaptability is present. These