Figure 1 Absolute ages of the archaeological sites described in the text, and of the hominid species extant in East Africa 3.5–1.5 million years ago (Myr). Dashed lines show probable evolutionary relationships. Olduvai, site FLKNN1; Hadar, site AL666. (Modified from ref. 16). New fossils from Ethiopia¹⁷ may provide the missing link at the roots of the genus *Homo*, and date from 2.5 Myr.

Figure 2 'Refit' from Lokalalei 2C. Roche *et al.*⁵ reconstructed the arrangement of sharp-edged flakes, used as tools, that were struck from a core stone. Scale bar is 10 cm long.

mation from other sites, predating the two-million year mark, that have both stone tools and tool-marked bones, before reaching any firmer conclusions.

Meanwhile, no one is certain who wielded these tools. Using electromyography, Marzke and colleagues¹¹ identified the hand muscles crucial in the experimental manufacture of Oldowan tools. Habitual tool making would be reflected in the bones of the hand regions stressed by these muscles, and in joints whose configurations affect these muscles' biomechanical efficiency. The findings of Roche *et al.*⁵ will prompt a renewed examination of fossil evidence for the evolution of hominid hands.

Manual dexterity in primates is also correlated with specific aspects of brain organization^{12,13}. So far, the best quantitative measures of early-hominid brain organization relate to cranial capacity. This is a crude measure, but not useless¹³. The average cra-

nial capacities of adult great apes range from 393 to 465 cm³ (ref. 14). Hominid species living 2.5–2.3 Myr ago included early robust australopithecines (*Paranthropus aethiopicus*, cranial capacity about 410 cm³), and the earliest *Homo* (with affinities to *H. habilis*, 500–650 cm³, and/or *H. rudolfensis*, 600–800 cm³; ref. 15). Thirty-five years on, can we emulate Leakey *et al.*¹, and place the tools at Lokalalei into the hand of *Homo*, using an argument from design?

The new findings⁵ will not resolve this issue. But they bring such a resolution closer with hard evidence of the considerable technical skill of at least some late-Pliocene hominids. □

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Daedalus

Adhesive antibodies

Many alternative medicines are said to 'boost the immune system'. Few orthodox drugs can make this claim. (One possible exception, the veterinary anti-helminthic Ivermectin, has discouraging side-effects). Daedalus has been pondering the matter.

Our immune system responds to an invading antigen by raising antibodies, which bind selectively to the antigen molecules. The bound molecules usually couple together in their turn to give a big, stable immunocomplex particle, easily recognized and swallowed by the body's scavenging macrophage cells. By contrast, the antibodies of a poor immune system may bind only loosely to the antigen, or fail to couple further. The resulting small or fragile agglomerations are far harder to mop up, and may cause trouble of their own. So Daedalus aims to tighten the binding, with some sort of selective molecular glue.

Chemists will immediately recognize this concept. Many substances crystallize only with 'water of crystallization'. The water molecules fill awkward gaps in the crystal lattice, giving a tightly packed and stable solid. Other small molecules can also work. With the aid of the right glue molecule, even the feeblest antibody might bind firmly to an invading antigen.

DREADCO's biochemists are finding this idea rather a challenge. Antibody–antigen binding is almost impossible to predict; furthermore, different species, or even different strains of the same species, can raise quite different antibodies to a given antigen. Indeed, says Daedalus, many quirky nostrums or remedies may occasionally work only because they contain some small glue-molecule that happens to fit the patient's individual antibodies. So his team is devising a 'cocktail' of small, polar molecules, to be injected into the body like a charge of shotgun pellets. With luck, one or more of them will act as glue molecules for the current antibodies.

Urea, DMSO, alcohol and acetone are obvious candidates, as are the more polar fluorohydrocarbons. Heavy water can influence protein folding; it, and deuterio-versions of the other molecules, will also be included. In particular, Daedalus has high hopes of deuteriohydrogen, HD. Its small size will let it sneak into tiny gaps in the binding, and its asymmetry will give it a bit of useful polarity. A deuteriohydrogen breathing chamber could do wonders for an overburdened immune system. Sadly, the mixture with oxygen will be devastatingly explosive.

David Jones