

Infectious diseases, parasitic worms or poor nutrition in developing countries (R. Nokes, Univ. Oxford) do not always significantly affect test scores or educational attainment. The only environmental factor that seems to have a reasonably large and long-lasting effect on children's IQ scores is adoption into a nice, middle-class family.

Of course, adoptive homes represent a rather restricted set of environments: criminals or drunkards are not normally eligible to adopt children, and some people who choose to adopt may be more committed parents than others who, so to speak, have children thrust upon them. Thus it is significant that even within this restricted range, the social class of the adoptive home shows a modest correlation with the adopted child's IQ — although there are no longitudinal data establishing that adoption exerts a long-term effect on children's test scores.

One contentious claim is that various groups differ in average IQ — recently extended to include the two sexes. Francis Galton, like many men of his generation, had no doubt that women were the intellectual inferiors of men. But IQ tests have usually been considered to lend little support to male chauvinism, and the undoubted fact that women tend to have smaller brains than men was attributed to a difference in average body size. More recent examination of this evidence has suggested that this is not true: even when the comparison is between men and women of the same size, women tend to have smaller brains. This, coupled with recent evidence of a significant correlation between brain size and IQ, has revived the suggestion that there must be a sex difference in intelligence¹. Whether there really is such a difference may never be answered, for the fact is that while men outscore women on some IQ tests, women outscore men on others, and on some there are no reliable differences worth speaking of. It is obvious enough that different tests must be measuring rather different things. But which is the true measure of intelligence?

One answer, of course, is that there is no single true measure of intelligence because there is no single thing called intelligence — only a number of separate, independent abilities^{2,3}. Most IQ testers acknowledge that there are distinctions between tests of verbal and spatial ability, abstract reasoning and speed of information processing, but point out, quite correctly, that these tests all correlate positively with one another. It is, therefore, at best misleading to say that these tests measure wholly independent abilities. More plausibly, they measure a set of overlapping processes whose importance varies from one kind of test to another. Whether there is a single, underlying

process of general intelligence that is more important than the others is simply not known, and dogmatic pronouncements from critics and supporters alike are misplaced.

There is no dispute that some groups differ substantially in average scores on virtually all kinds of IQ test — the most widely publicized example being that between blacks and whites in the United States. Those who study such differences, and have argued that they are probably in part genetically mediated, have sought to defend themselves against a charge of racism by insisting that, in a just society where people are judged as individuals rather than as members of a group, differences in average IQ between groups would be of no consequence. A forceful counter-argument (J. Flynn, Univ. Otago) is that people do, and are virtually bound to, judge others as members of groups: car insurance companies and police officers take a different view of young males and of middle-aged, respectable females, and if the young male is black, their view will be even more jaundiced. Of course this leads to much injustice but it is also understandable and perhaps even rational: the fact of the matter is that young male drivers are relatively bad insurance risks, and young male blacks commit more crimes than some other sections of society. Viewed from one perspective, therefore, affirmative action is no more than society's recompense for other, well-nigh inevitable injustices.

One of the theses of *The Bell Curve*⁴ was that affirmative action should be abandoned. But the central argument of that widely denounced book was simply that IQ scores matter: whatever IQ tests measure, whether or not they capture everything that everyone might mean by intelligence, IQ does predict educational and occupational success (and much else besides), rather better than the popular alternatives of social class or family background. There is probably a fair measure of truth in this observation. *The Bell Curve* may be criticized for oversimplification, in particular for frequently falling into the trap of assuming that prediction or correlation implies causation. But the sociology of IQ testing will not achieve the maturity now evident in the behaviour genetics of IQ until social scientists start seeking to understand this correlation rather than continuing to wish it away. □

Nicholas J. Mackintosh is in the Department of Experimental Psychology, University of Cambridge, Downing Street, Cambridge CB2 3EB, UK.

1. Lynn, R. *Person. Indiv. Diff.* **17**, 257–271 (1994).
2. Gould, S. J. *The Mismeasure of Man* (Norton, New York, 1981).
3. Gardner, H. *Frames of Mind: A Theory of Multiple Intelligence* (Basic Books, New York, 1983).
4. Herrnstein, R. J. & Murray, C. *The Bell Curve* (Free Press, New York, 1994).

Travelling wave

In the popular sport of surf-riding, the rider stands on an exposed board which slides down the face of an advancing wave as fast as the wave itself travels. Much skill is needed to maintain the board's position on the wave, as it is always in unstable equilibrium. Daedalus once proposed a inverse form of the sport, 'inverted surfing'. This required a buoyant but submerged board, positioned under the water surface at the back face of the moving wave. It kept pace with the wave from behind, by constantly tending to float up to its crest. It too would be unstable; much skill would be needed to keep it in position. For consistency, felt Daedalus, it should be ridden from beneath by a rider suspended upside down from it and wearing an aqualung.

Not surprisingly, inverted surfing never rivalled the conventional variety. But Daedalus now plans to combine the two. A normal surfboard on the front face of a wave, coupled to a inverted board on the back face, should be quite stable. The combination would straddle the wave like a pitched roof, and travel with it dependably, with no need for human skill.

Surfers may sneer at such an unsporting craft; but the invention is not aimed at them. Daedalus sees it as an unmanned ocean research vehicle. Without the drag and loading imposed by a human cargo, it could ride not merely the steepened breakers of a shelving beach, but the broader, shallower ocean waves themselves. Daedalus's 'straddle-surfer' oceanographic platform will be carried out to sea on a boat, and launched onto a selected wave. It will ride away on it at the typical wave speed of 20–80 km hr⁻¹, sharing its path and fate. It could relay its position, together with the local temperature, salinity, wind and so on, by satellite radio. When the wave reached shore, maybe thousands of kilometres away, the straddle-surfer would be cast up on the beach. A public-spirited finder might even deliver it to the local coastguards for return to the sender.

Straddle-surfers would be so cheap that dozens could be launched together on successive waves as a sort of convoy. The distance between them (measured perhaps by on-board radar or satellite geodesy) would usefully give the wavelength of the swell. A few might lose lock on their waves and be left wallowing, but the rest would travel on. A regular traffic of straddle-surfers might even become a new oceanic resource. Sea-birds could take to riding them, as a more restful form of migration. And those wistful souls who send messages in bottles might turn to small, fast-running straddle-surfers as a form of express post.

David Jones