limestone sites; Jean-Philippe Rigaud, an expert on the Palaeolithic rockshelters and stone-tool industries of southwest France; Jean Chavaillon, an Africanist and expert on archaic stone tools; and Danièle Lavallée, a specialist in Andean prehistory. All six were convinced by Parenti's data, even though some (notably Lavallée) admitted to having had strong doubts about Pedra Furada in the past, and some were familiar with — and equally unconvinced by — the material from other controversial New World sites such as Calico, Pendejo and Old Crow. The thesis has effectively been through stringent — and public — peer review.

Regardless of the lack of early sites in North America, there is now solid archaeological evidence for a human presence in the New World tens of thousands of years ago. All other issues — such as when or how many times the Beringia land-bridge may have been crossed, or the technological origins of the Clovis point, or why the Piaui stone tool industry is so archaic — become secondary to that. There will no doubt remain sceptics, especially in North America. But in December an international meeting is to take place in Piaui to which the foremost of them have been invited. Seeing may then be believing. □

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PSYCHOLOGY

Weighing of the talents

John Sloboda

WHAT determines whether people make exceptional contributions to a particular field of endeavour? High scholastic grades or psychometric measures of intellectual ability — such as IQ test scores, or other estimates of general cognitive activity ('*g*') — are by no means the best predictors of eventual excellence. Talent comes in many forms, and such qualities as perseverence, curiosity and self-confidence, as well as relevant experience, are often more crucial to high achievement.

Such was the seemingly uncontentious message to emerge from a recent meeting* (though very little else in this field can be described as uncontentious). The underlying question to be addressed was an age-old one, that of whether individual differences in achievement are best accounted for in terms of genetic differences or environmental differences. A bald 'either-or' stance is inappropriate — there is general acknowledgement that the characteristics of an individual are a result of an interaction of genetics and environment. There are well-established methods for estimating the relative contribution of heredity and environment to a behavioural measure within a population, by examining the degree to which it varies among people of greater and lesser degrees of genetic and environmental relatedness (for example identical twins, fraternal twins and children raised apart from their biological parents). These studies have typically shown contributions of heredity to IQ of the order of 50 per cent[1].

There is an unhappy tendency to jump from such findings to the conclusion that genius is in some sense predetermined in one's genes, and that, no matter how favourable the environment, a person without a special genetic 'spark' will never reach the heights of achievement. There are several cogent objections to such a sweeping conclusion, amounting, in the words of one participant (H. Gardner, Harvard University), to a denial of the "hegenomy of *g*".

In the first place, to show that some behavioural measure is heritable does not imply that it is immutable. Several speakers referred to *mono-savants*, individuals of low IQ who nonetheless show outstanding performance in one specific area of expertise[2]. There are, for example, *savants* whose abilities to memorize music equal or even outstrip the feats reported of Mozart. It is clear that these levels of performance were achieved through continual practice, even if, as some at the meeting claimed, individuals with high IQ might have achieved the same levels of performance with less effort.

Second, familial studies provide only a crude gross measure of similarity of genetic material between different individuals, making detailed causal explanations of correlations between genetics and behavioural outcomes impossible. However, advances in molecular gen-

* *Ciba Foundation Symposium No. 178, Origins and Development of High Ability*, London, 25–27 January 1993.

RÉSUMÉ

Bright spark

IF you can make lasers with photons, why not with pions, subatomic particles created in high-energy collisions? Like photons, pions have integral spin, which means they obey the laws of Bose–Einstein statistical physics. One consequence of these rules is that the emission of one bose particle encourages the emission of another — that is how a laser amplifies light radiation. The trouble is calculating what actually happens in the strongly interacting nuclear plasmas generated in high-energy collisions. But S. Pratt has succeeded in devising a fast program to do this (*Phys. Lett.* B**301**, 159–164; 1993). Collisions using relativistic lead nuclei, planned for CERN in 1994 to recreate the conditions of the Big Bang, should also create the circumstances necessary for pion lasers, he estimates.

Protection business

OUR DNA is vulnerable to many unwholesome influences, and were there no mechanisms for scanning the genome for lesions and then repairing them we should soon fall prey to such conditions as xeroderma pigmentosum, which often leads to skin cancer. Chu and his associates identified a protein missing in one variant of the disease and have now taken the first steps towards characterizing its action (B. J. Hwang & G. Chu *Biochemistry* **32**, 1657–1666; 1993). It is a monomer, found only in the nucleus, and merely two molecules per megabase are needed to maintain constant surveillance of the DNA. This is because it binds to damaged nucleotides more strongly than to pristine ones by six orders of magnitude. The supposition is that having found its target it attracts other proteins that effect the process of excision and repair.

No two ways

MULTIFACETED buckminsterfullerene is now findings its way into electronic devices. A. J. Heeger and colleagues have made a diode by sandwiching a layer of C_{60} and a layer of the conjugated polymer MEH-PPV between gold and indium/tin oxide electrodes (N. S. Sariciftci *et al. Appl. Phys. Lett.* **62**, 585–587; 1993). The polymer is a semiconducting material, already used in prototype devices (Heeger's group has made a flexible light-emitting diode with the material). And C_{60} has been shown to be an '*n*-type' semiconductor, able to accept electrons from *p*-type materials (such as MEH-PPV). Having seen photoinduced electron transfer at MEH-PPV/C_{60} interfaces, Heeger and colleagues set about making the *pn* diode. As hoped, they found the forward current to be 10^4 times the reverse current, and illuminated, the diode gives photocurrents and photovoltages.