NMR is the anisotropy in the carbon chemical shift; although C_{60} is isotropic, the sixty sites have individually only mirror symmetry and therefore has three principal components of chemical shift. At room temperature these are averaged by rotation, but they can be extracted by fitting line envelopes in low-temperature ^{13}C NMR studies on powder samples[10]. Components of 220, 186 and 40 p.p.m. are found. This 'axial' pattern and large splitting are characteristic of aromatic carbons.

The question of the aromaticity of the fullerenes is clouded by the fact that we have two different pictures in mind; a fullerene is like graphite in that it has hexagonal rings and fits a delocalized molecular-orbital description; on the other hand it is like benzene because it has a closed electronic shell and a substantial 'band gap' between filled and empty levels. The two are ultimately incompatible[7] — as the cage size increases the delocalization stabilization rises but the band gap must fall, in line with the semi-metallic nature of graphite. Clearly the main point is whether either analogy will lead to prediction or rationalization of observables. To judge from the magnetic properties measured so far, sometimes they will and sometimes they won't. □

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HIGH-TEMPERATURE SUPERCONDUCTORS

Light at the end of the tunnel

M. R. Beasley

ONE of the ideas to be reinvigorated by the discovery of high-temperature superconductors a few years ago was the possibility of basing computer electronics on superconducting devices — particularly the 'tunnel junction'. As with previous attempts with conventional superconductors, turning the new high-temperature materials into tunnel junctions has proved hard, leading some to argue that the sensitivity of the tunnelling process to surface conditions will make it impossible. Nevertheless, three groups have now reported[1–3] substantial progress, so that although the prognosis is still ambivalent, the fog is partially clearing.

Why are the tunnel junctions so interesting? They are the device of choice in superconductive electronics, at least as practiced with the low-temperature superconductors such as niobium. Also, the details of the electrical characteristics of tunnel junctions yield information regarding the nature of the electronic interaction giving rise to the superconductivity — and hence the mechanism of the superconductivity itself.

To make a tunnel junction, in which the electrons pass from one conducting electrode to another by quantum mechanically tunnelling through a classically impassible region, one has to separate two layers of superconductor by a very thin tunnel barrier — a layer of insulating material. The problem has been forming such a barrier without affecting the underlying superconducting material. It was known early on that thin layers of gold or silver have a minimal chemical effect on the high-temperature, oxide superconductors' surfaces. So, many groups have tried to build their insulating tunnel barrier on such thin normal-metal overlayers and study the underlying high-temperature superconductor through its influence on the overlayer.

Superconductivity is induced in the nominally nonsuperconducting metal overlayer through the phenomenon of the proximity effect: superconducting electrons penetrate into the overlayer to endow it with superconductivity. It is this induced superconductivity that is actually observed in such proximity-effect tunnel junctions.

Despite the failure of earlier efforts, the new attempt[1] by workers at Philips Research Laboratories in the Netherlands seems to be relatively successful. These researchers covered a 20-nanometre layer of silver previously deposited on a thin film of $YBa_2Cu_3O_7$ superconductor with a further layer of insulating aluminium oxide followed by a top electrode made of lead (Fig. 1). The electrical characteristics of the junction (Fig. 2) are notable for the very low level of 'leakage' current, the current that persists at low voltages. They are also close to what one expects from conventional 'BCS' theory of

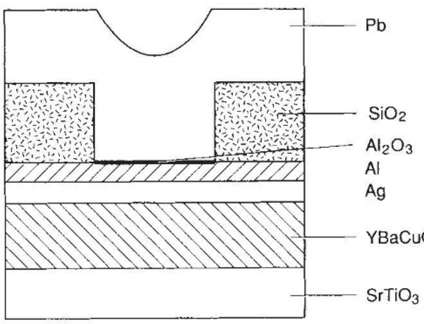

FIG. 1 Proximity-effect tunnel junction fabricated by Gijs *et al.*

RÉSUMÉ

Colour coding

THE theory that parasitic infection underlies the evolution of brightly coloured plumage in male birds takes a fresh blow with a report by S. G. Johnson in the latest issue of *Evolutionary Ecology* (**5**, 52–62; 1991). W. D. Hamilton and M. Zuk's 'revealing handicap model', proposed in 1982, holds that females choose to mate with brightly coloured males because showiness correlates with resistance to parasites; the model predicts that males from species subject to more intense parasitism will be more extravagantly plumaged. The results of early studies with North American and European passerines conformed to this prediction, but reanalysis by A. F. Read and P. H. Harvey, using brightness scores supplied by ornithologists unaware of the theory, found no relationship. Johnson now confirms Read and Harvey's result for a larger sample of North American species, and shows that variation in male brightness is more strongly associated with phylogeny and the risk of predation.

Cool for clouds

THE discovery last year of cold clouds of hydrogen in the distant Universe caused quite a stir: distant clouds are well known, but they are hot and are thought to be the size of galaxies, fitting in with popular notions about the evolving Universe. But for these clouds to be so cold, despite being subjected to intense ionizing radiation from even more distant quasars, they would have to be a million times smaller, so making an entirely new component in our construction of the distant Universe (see J. Peacock's News and Views article, *Nature* **349**, 190–191; 1991). Not necessarily, claim R.C. Duncan, E.T. Vishniac and J.P. Ostriker (*Astrophys. J.* **368**, L1–L5; 1991): cold means small only if the clouds are at equilibrium. These authors and others have previously argued that distant clouds should be expanding (or inflating) and that expansion efficiently cools them despite the ionizing radiation. This allows the cold clouds to be as large as their hot companions, thereby rescuing the old picture.

Out of sequence

EXONS can be spliced together in the 'wrong' order. This startling finding, reported by J. M. Nigro *et al.* (*Cell* **64**, 607–613; 1991), stems from experiments to identify the order of exons within a potential tumour-suppressor gene in humans. The mechanism of the aberrant splicing reactions is unclear, but could involve *trans*-splicing (which has not yet been observed in mammalian systems *in vivo*) or the looping back of a downstream exon so that its 3′ boundary fortuitously becomes aligned with the 5′ boundary of the upstream exon. Whatever the mechanism, the conclusion must be that pre-messenger RNA processing is less precise than previously thought, which in turn bears upon the way genetic diversity was introduced into an 'RNA world'.