superconducting material. Very high values of J_c have been reported by Los Alamos in the IBAD YBCO film, reaching 1.3 MA cm^{-2} at 77 K and zero field over a thickness of 1.2 μm. This film was deposited on a 125-μm substrate, so that J_e is much smaller but still significant at 12,500 A cm^{-2}. For comparison, ASC, Sumitomo Electric and others have reported multifilamentary deformation-processed BSCCO wires reaching comparable levels[2] (J_e=9,000 A cm^{-2}). Thus, comparisons are now much closer than press reports might suggest.

Both technologies have prospects of improving significantly, with the J_e potential of IBAD significantly higher if the substrate thickness can be reduced and film thickness increased. If the Los Alamos result were obtained on a 1-mm substrate (which is just practical for a long-length tape), J_e would exceed 60,000 A cm^{-2}. By comparison, if record short-length BSCCO results on peeled layers[3] can be translated into multifilamentary wires with a 33% fill factor, one could expect 37,000 A cm^{-2}.

Another issue involves a.c. coil applications; a.c. coil losses will be high in the IBAD flat-tape configuration, while there is more flexibility to cut down these losses in a multifilamentary, twisted composite BSCCO technology. Where IBAD YBCO could really shine is in d.c. applications at higher fields and temperatures.

The real question for the future concerns ease of manufacture. Deformation-processed wires are at present being pilot-manufactured in sufficient quantity to allow development of prototypes worldwide in such applications as motors, transmission cables and transformers. An HTS research magnet from Sumitomo Electric has recently produced a record 4-T field at 4.2 K, and an ASC HTS magnet reached more than 0.6 T at 77 K. The 77 K performance of the BSCCO wires is thus sufficient for power-transmission cables and iron-core magnets such as those in transformers. Applications at higher fields will require lower temperatures. This technology is rapidly moving towards a first generation of commercial products.

The exciting new IBAD results are on short-length samples, while early efforts at Fujikura and Sumitomo Electric to scale up the process with a reel-to-reel system are yielding metre-long tapes. There is a long way to go in scaling up manufacture, and unless deposition rates can be improved by one or two orders of magnitude, the process will be too costly for bulk application. Such progress is conceivable, though not certain, and will require research.

IBAD is an important new option for future HTS bulk wire technology, but one could expect it to be involved in a second generation of commercial products. Research investigating the manufacturing-related issues should proceed apace.

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Controversial cheetahs?

SIR — May[1] has discussed some[2,3] of the recent reappraisals (for example, refs 2–5) of O'Brien and colleagues' evidence that the cheetah's genetic impoverishment is threatening the species' persistence[6-8]. Some comments, however, particularly those of O'Brien[8], may be misleading.

First, we can find little indication that the scale or causes of cheetah cub mortality in the lair (72% (n=125) of cubs died by emergence, approximately 73% of cub deaths due to predation[9]) were inflated by researchers in the Serengeti, as O'Brien suggested[8]. Extensive precautions were taken, minimizing vehicle tracks and the time spent watching cubs, avoiding entering lairs when a predator or cheetah mother was in sight, and moving away at night[10]. Statistical comparisons of litters that survived or died from different causes could not find an effect of the observer on the scale or causes of cub deaths[10]. Lions and spotted hyaenas in the Serengeti study site appear habituated to vehicles and generally ignore them whereas observations of predation events suggested that the cheetah mother herself gave away the position of the lair by sitting up, entering or leaving the lair[5,10].

Second, although arguably no area in Africa is now 'pristine', the Serengeti National Park, with some human disturbance around its fringes, is probably no more disturbed than others. The Serengeti ecosystem has the lowest (0.004) predator/prey ratio of nine protected areas across Africa (mean 0.013, range 0.004–0.027)[11], and so this cannot account for high cheetah cub mortality[1]. Cheetahs are not becoming crowded in protected areas[3]. Accurate estimates of carnivores are scant, but cheetah densities have been stable over the past 25 years in the two reserves in East Africa with appropriate data (1 per 9 km^2 in Nairobi National Park[12]; 1 per 42 km^2 Masai Mara Game Reserve; unpublished data).

Although the evidence for lack of variation at the major histocompatibility complex is suspect, we also acknowledged[4] that the cheetah remains potentially vulnerable to pathogens. Nonetheless, few data support this thesis. The feline infectious peritonitis outbreak is poor evidence, because the response of infected captive cheetahs was not homogeneous, with approximately half the animals surviving infection. Also, serology and vaccine trials have shown that cheetahs can recognize and respond to a range of pathogens[4].

Finally, we would like to highlight the fact that the finding by O'Brien *et al.* of higher juvenile mortality rates in captive cheetahs than captive rodents or ungulates[7], used as a third piece of evidence that cheetahs were suffering from homozygosity, is severely flawed[2–5]. Analyses of mortality rates across orders, zoos and time, and without reference to causes are inappropriate. Intrinsic sources of mortality are insignificant compared with extrinsic sources, both in the wild and in captivity[5]. Moreover, deleterious recessive alleles can become purged during inbreeding[14].

The history of the cheetah controversy is instructive for the way science develops. Originally, an empirical finding of homozygosity in cheetahs[6] was used to predict consequences of inbreeding for the species. Strands of evidence gleaned from captivity and the wild appeared to support these predictions[7]. However, better analyses and empirical data fail to corroborate these predictions[2–5]. Thus, within a 12-year period we have come full circle. Ecology can be as important as genetics, and interdisciplinary cooperation in conservation problems is essential.

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Picture credit

In "The planktonic life of octopuses" by R. Villanueva, C. Nozais and S. v. Boletzky (Vol. 377, page 107), published in the 14 September issue of *Nature*, the photograph in Fig. 1 should have been credited to Jean Lecomte, CNRS, Observatoire Océanologique de Banyuls, France. The cover picture for that issue should also have been credited to Jean Lecomte.