PHOTOS: (DOGS) ROGER DE LA HARPE/WWW.AFRICAIMAGERY.COM; (ELEPHANTS) LAUREN EVANS/WWW.GEOG.CAM.AC.UK/PEOPLE/L.EVANS AND WWW.SPACEFORGIANTS.ORG

LETTERS

Edited by **Jennifer Sills**

In defense of fences

HUMAN-DRIVEN HABITAT fragmentation reduces global biodiversity and ecosystem functioning (*1*). R. Woodroffe *et al.* ("To fence or not to fence," Perspective, 4 April, p. 46) claim that fencing, despite some positive outcomes (*2*, *3*), overwhelmingly exacerbates fragmentation and negatively affects wildlife conservation. They suggest that fencing should only be considered as a last resort and that fence removal is important for climate change preparedness.

Woodroffe *et al.* underplay the critical role fences play in habitat conservation and protection of livelihoods in tropical Africa, where scattered islands of natural habitat persist amidst a sea of agricultural encroachment, spared often through physical demarcation of protected area boundaries (*4*). In Africa, biomass extraction and subsistence/smallholder agriculture remain the dominant drivers of degradation (*5*). Although fencing can be problematic, especially for gene-flow [but see (*6*)] and large-scale mammal migration, it successfully arrests the gradual erosion of habitats, combats poaching, and can facilitate wildlife tolerance among communities (*7*).

Woodroffe *et al.* cite growing populations of unfenced carnivores/megaherbivores in North America as a model for other regions. Yet in Africa, the notion of rural communities enthusiastically sharing dwindling environmental space with wildlife is an ideal for which both wildlife and the rural poor suffer considerable costs (*8*). While it may be tempting to generalize across biogeographic realms, the billion-strong African population is expected to quadruple this century (*9*), with rising demands for land and increased potential for human-wildlife conflict. There is little evidence that large, sometimes dangerous, animals can successfully move through agricultural landscapes in the absence of fences, and it would be unwise to assume that islands of irreplaceable biodiversity would remain intact should fencing be removed.

Fences should be recognized as a fundamental conservation tool that may often be the best option for a specific set of circumstances. Decisions on fencing must be based on context-dependent evaluation of all alternatives, rather than dismissed as a last resort.

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Response

THE CONCLUSION OF PFEIFER *et al.*—that wildlife fencing should be context-dependent—echoes our own call for fencing decisions to be based on realistic assessments of the costs and benefits. We did not, as Pfeifer *et al.* suggest, state that fencing impacts were invariably negative, nor did we express a view that fence removal was imperative.

Pfeifer *et al.* emphasize circumstances in which fences encircle isolated wildlife areas embedded in a matrix of human activity. However, as stated in our Perspective, many fences are constructed within contiguous wildlife habitat. Some of these fences are constructed for conservation purposes (e.g., to contain rhinos within a well-guarded area) and some serve other purposes (e.g., to delineate private property). Whatever their purpose, the resulting barriers to wildlife movement will have environmental impacts that should be considered when deciding whether to construct or remove fences.

We agree with Pfeifer *et al.* that appropriately designed and well-maintained fences may contribute to wildlife conservation in small areas that are irretrievably isolated by human development. However, even in these circumstances, the likely benefits and costs need to be assessed carefully. As

detailed in our Perspective, the anticipated benefits of fencing are often not realized, and so the prospects of success need to be realistically evaluated. Moreover, it is important to bear in mind that patches of wildlife habitat may be less isolated than they appear. In contrast with Pfeifer *et al.*'s statement, there is growing evidence of dispersal between apparently isolated wildlife areas, for example by tigers (*1*), wolves (*2*), and elephants (*3*). Such movements across the human-dominated matrix may improve the viability of relatively isolated populations, and the consequences of breaking such connectivity through fencing need to be carefully considered.

We cited the paucity of fencing around reserves in North America as an illustration of alternatives rather than a model for other regions. Tolerance of wildlife movement in and out of many North American national parks may be related to sustainable use (including recreational hunting) on adjoining lands. This approach may or may not be appropriate elsewhere, but its success indicates that fencing is not the only way for societies to conserve large mammals while also pursuing economic development.

Fencing interventions are often less straightforward than they seem, and may have lasting and irreversible impacts. Conservationists need to pay attention to both positive and negative impacts, and consider a range of interventions, not just fencing, to design long-term solutions to wildlife conservation.

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Early Americans: Misstated results

IN THE 16 MAY ISSUE of *Science*, we were part of a research team that reported the analysis of a late Pleistocene–age human skeleton found below sea level within a cave on Mexico's Yucatan Peninsula (*1*). Mitochondrial DNA extracted from this individual's tooth identified a subhaplogroup that is found today only among Native Americans. Based on our findings, we hypothesized that the morphological differences between these early people and modern Native Americans resulted from in situ evolution rather than separate ancestry. In the accompanying News & Analysis story "Bones from a watery 'black hole' confirm first American origins" (16 May, p. 680), M. Balter quoted J. C. Chatters discussing ideas that are his alone. Chatters is quoted as characterizing early Native Americans "with their large skulls and more forward-projecting faces" as a "human 'wild type'" distinct from modern Native Americans "with rounder and flatter faces" that "reflect a more 'domestic' form." The quoted comments do not reflect the research results and interpretations reported in our paper, and we do not endorse the ideas presented in this section of the News article. Our study has no bearing on the sociobehavioral life of ancestral Americans or other human populations. We joined the Hoyo Negro project because of our interest in understanding the physical, cultural, and genetic diversity of human beings through time and across space.

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Early Americans: Respecting ancestors

AS ANTHROPOLOGISTS, archaeologists, and biologists, and as members of the National Academy of Sciences, we were startled to read J. C. Chatters' statement that the cranial morphology of early Native Americans "represented a human 'wild type,'" whereas more recent Native American cranial morphology reflected a "domesticated" form ("Bones from a watery 'black hole' confirm first American origins," M. Balter, News & Analysis, 16 May, p. 680). We are deeply offended by Chatters' implicit comparison of early Americans to the wild ancestors of today's domesticated animals.

We are disheartened to learn that there are those who continue to believe that cranial morphology carries implications of a presumed "wild" state. By so doing, they demean the very people they attempt to understand.

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Response

THE IDEAS I DISCUSSED with Balter, which were abbreviated in the story, are excerpted from a peer-reviewed article by me titled "Wild-type colonizers and high frequencies of violence among the Paleoamericans" (*1*). Domestication is not a foreign concept in discussions of human evolution. Literature on human self-domestication includes, among others, contributions by Leach (*2*) and Taylor (*3*). It is important to remember that, as Darwin effectively demonstrated more than 140 years ago in his *Descent of Man* (*4*), humans are subject to the same evolutionary processes as other species.

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