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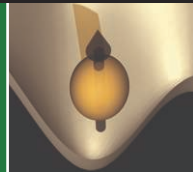
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LETTERS

edited by Jennifer Sills

Conservation with Sense

WITH HABITAT LOSS AND DEGRADATION OCCURRING AT AN UNPRECEDENTED rate, the protection of imperiled ecosystems has become a priority in conservation efforts (1). Amidst the urgency to conserve wildlife, we propose a word of caution: Relying on the human perceptual world, instead of the sometimes very different perceptual worlds of animals, may compromise conservation endeavors.

Humans have traditionally relied on anthropogenic senses to understand the animals' "world." In fact, our perceptual fields differ profoundly from most animals. Many animals possess unique sensory systems [such as echolocation (2), electroreception (3), magnetoreception (4), and thermoreception (5)] or familiar senses with unfamiliar properties [such as polarization (6) and ultraviolet (7) vision, and infra- and ultrasound (2)].



A different view. Less familiar sensory systems, such as polarization vision in the dragonfly (*Rhodothemis* sp.), should be taken into account in conservation efforts.

Little is known about the way that human-driven habitat degradation affects animals. For instance, changes in ambient light and microhabitat from deforestation or other habitat disturbance can affect the behavior of animals

that rely on vision (8–10), sound (2), or olfaction (11). Sensory systems that influence habitat choice and behavior of nocturnal and crepuscular animals require further exploration. For example, our previous assumptions that nocturnal animals lacked color vision (12) and camouflage colorations (13) have been proven wrong.

The adoption of conservation informed by sensory ecology is clearly needed to decipher optimal habitats and to mitigate the effects of habitat alterations. This approach is vital not only to conservation, but also to behavioral ecology, animal husbandry, and forestry.

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Scientific Meetings: Worth Attending

AS AN OCEAN SCIENTIST CONCERNED ABOUT ocean acidification and other environmental impacts from carbon emissions, I was interested to read B. Lester's News Focus story "Greening the meeting" (5 October 2007, p. 36) for ideas on how scientists can reduce the carbon footprint of our professional activities. I thought his aim was off-target, however, when he set his sights on the Fall Meeting of the American Geophysical Union (AGU). This is the one time of the year that an international group of scientists from all fields relevant to climate science share their

as-yet-unpublished results. Furthermore, the Fall AGU Meeting saves carbon dioxide, time, and money by eliminating the need for over 100 other separate gatherings (agency town halls, committee meetings, and workshops). In addition, more than 70 AGU committee meetings take place at the Fall Meeting, and it is an important venue for communicating with the press, including reporters from *Science!* Indeed, we all need to look for ways to reduce our carbon emissions, but there are other ways to do it that don't sacrifice the unique contribution we can make to solving the problem as professional scientists.

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Scientific Meetings: Call In Instead

B. LESTER'S NEWS FOCUS STORY (5 OCTOBER 2007, p. 36) highlights one major plague affecting modern science: There are far too many meetings in faraway, upscale places. It is especially ironic that we in the science community, who are so familiar with modern communication tools, have failed to take full advantage of this technology.

For nearly a decade, when invited to give a lecture, I have excused myself from international travel (even with all expenses and honorarium paid!). Instead, I provide my lecture in PowerPoint with voice and take live

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LETTERS

questions on a telephone (from Singapore or India or Europe). It works extremely well, and the hosts love it. They save a lot of money and get to keep the CD, copy it, and pass it around all the local universities. I keep the carbon credits and the time.

I await a position paper from AAAS on this subject!

RUSTUM ROY

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Putting a Human Face on Energy Usage

IN THE NEWS FOCUS STORY, "GREENING THE meeting" (5 October 2007, p. 36), B. Lester compares the fossil fuel energy required to transport scientists to and from a conference by airplane to the energy used by "2250 Honda Civics during a year's worth of normal driving." Another way to put a human face on fossil energy usage is to think in terms of "Virtual Persons" (VPs).

One VP represents 100 watts of average annual fossil energy usage, which corresponds to the nominal dietary energy of one healthy person: 2000 calories per day (96.9 watts). Dividing the world average energy use rate of ~13-trillion watts by 6.5-billion humans gives 2000 watts per person, or 20 VPs. This means that, on average, each living person is, from an energy point of view, equivalent to 20 people.

Of course, energy usage is not distributed evenly. For the United States, the ratio of energy use to population works out to ~115 VPs per person. It is as if each American has the physical power of 115 people. Each European has about half the VPs of each American. If you subtract Americans and Europeans and their energy usage from the world total, each of the remaining human beings has only ~13 VPs, on average.

The 115 VPs of each American are used for heating and cooling, cooking, personal transport, food production and delivery, lighting, and computers. Averaged over a year, one round-trip flight from Washington, DC, to

London works out to ~4 VPs [assuming 70 passenger-miles per gallon]. Domestic utility usage in a 2000-square-foot house (without air conditioning) in Chevy Chase, Maryland, comes to 60 VPs, shared among those who live there. A 100-watt computer that operates year round is about 3.5 VPs (the "energy rate" of the fuel burned to generate and deliver 100 watts of electric power is about 350 watts). A 20-mpg SUV that goes 10,000 miles in a year is ~20 VPs.

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Fair Game for Chimpanzees

RECENTLY, JENSEN *ET AL.* ("CHIMPANZEES ARE rational maximizers in an ultimatum game," Reports, 5 October 2007, p. 107) contributed to the debate on the origins of cooperation and fairness by reporting that in a modified version of the ultimatum game, chimpanzees fail to act fairly. In the ultimatum game, the human responder refuses to play if the proposer offers too small a share. Generally, the proposer takes this into account by making fair offers. Given that the responder chimpanzees willingly accept all types of offers (even those that a typical human player would deem unfair), we suggest that the chimpanzee proposers have no motivation to play fairly instead of acting as rational maximizers.

Picture yourself in the position of a captive chimpanzee with a history of little control over the availability of food in terms of timing, quality, and quantity. Why, when paired with a group member in the ultimatum game, should you expect that refusing an inequitable offer influences the outcome of later trials? Only by repeated experience could you learn this. But the chimpanzees tested by Jensen *et al.* apparently suffer from a sense of powerlessness, as they accepted all offers, including zero food over 33% of the time. Now, picture yourself in the position of a proposer chimpanzee facing a responder that accepts your offer regardless of how uneven it is. Why should you not be greedy, or learn to be so? We argue that being greedy is a likely consequence of interacting with a compliant partner: The two attitudes feed off each other. In short, do the results really inform us about chimpanzees' sense of fairness, given such compliant partners?

Regarding the recent rise of articles concerning fairness and inequity aversion in non-human primates (1-4), we note that there is another explanation for why chimpanzees should not consider themselves as equals that deserve fairness. Valuing fairness to others is a rather recent human moral principle, at least in Western cultures, grounded in the theoretical

Letters to the Editor

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stance—expressed by French Enlightenment philosophers—that people are equal.

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Response

E. VISALBERGHI AND J. ANDERSON THINK THAT it is unreasonable to expect chimpanzee proposers to be fair given their captive environment, as in our Report (5 October 2007, p. 107). We feel that this argument is backward. Proposers, including human proposers, are expected to try to maximize personal gains. In the dictator game, in which the responder is powerless (1, 2), humans make selfish offers, but in the ultimatum game, the threat of rejection by the responder drives the proposer to make offers approaching parity

(1, 3). The interesting subject, therefore, is the responder. According to standard economic models of utility maximization, responder rejection of any nonzero offer is not rational because he must forfeit gains to lower those of the proposer. The interesting question then is not to “picture yourself in the position of a proposer chimpanzee,” but to ask why the responder chimpanzee should be insensitive to receiving less than the proposer—a question that is not easily answered through an appeal to captive conditions.

Our captive chimpanzees do not exhibit “learned helplessness” in feeding contexts. For instance, they show a respect for possession (4) when feeding in the group, and they retaliate against others who steal their food (5). Learned helplessness is therefore unlikely to account for acceptance of any food offers. If responders do learn to reject low unfair offers through repeated testing, as Visalberghi and Anderson suggest, this finding would not provide a measure of social preferences. Such a result would suggest instrumental learning—i.e., learning to play a long-term maximizing strategy over repeated interactions—in a testing situation, rather than sensitivity to fairness. In fact, we

found no change in proposer offers or responder rejections across the course of our study. Still, the point of repeated games and reciprocity bears testing, particularly with other chimpanzee populations and more species.

Concerning the second point on fairness and inequity aversion, Visalberghi and Anderson conflate equality with fairness. Norms of fairness do not always dictate equality. Cross-cultural studies [e.g., (6)] suggest that although fairness norms are culturally universal, the absolute values for what constitutes fairness differ widely. Chimpanzees in our study could thus have shown fairness without relying on any sense of equality.

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