

Edited by Jennifer Sills

Save the world's primates in peril

IN HIS IN DEPTH News story “Chimpanzee sanctuaries open door to more research” (29 July, p. 433), D. Grimm argues that partnerships between sanctuaries and research centers could see laboratory chimpanzees become extinct. This conclusion might be optimistic, given that new demands for precision medicine and neuroscience projects may lead to greater use of some species of primates in biomedical research. Worse yet, continued investment in research animals exacerbates the situation of wild primates in peril.

More than 70,000 monkeys are used in experiments every year in the United States (1). The federal government plans to invest over \$434 million in the BRAIN Initiative alone in 2017 (2). However, very little funding is set aside for primate conservation. The continuing imbalance in interest and funding will see more wild primates becoming extinct, although accurate data are hard to find. The population of wild rhesus monkeys (*Macaca mulatta*)—the most common experimental primates in China—declined from 254,000 in 1998 to 77,000 in 2008 (3).

In addition, we are concerned that Grimm's story might deflect attention away from the plight of endangered wild chimpanzees. In the past 30 years, the Ebola virus has killed nearly one-third of the world's chimpanzees and gorillas (4). According to the International Union for Conservation of Nature, almost 50% of the world's 634 species of primates are in danger of extinction because of increasing human population, urbanization, tree felling, illegal capture, and climate change (5).

Most nonhuman primate species are found in developing countries that lack adequate capital, management, and technology to protect their wild primates. By contrast, many developed countries that lack indigenous primates tend to prioritize the value of primates for biomedical research rather than their conservation. Developed and developing countries should work together to address this issue. For example, to combat the decline of chimpanzees in Asia, where approximately 71% of species face extinction (6), the International Primatological Society should contact the decision-making departments in relevant Asian countries and establish an “Asian primatology alliance” to sustain



The population of wild rhesus monkeys (*Macaca mulatta*), a species commonly used in research, is declining.

wild primate populations. Such long-term international collaborations could redress the imbalance in capital and technology and save endangered primate species.

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Adapting Chinese cities to climate change

ON 15 SEPTEMBER, Typhoon Meranti—the strongest recorded tropical cyclone to date in 2016 (1)—made landfall over the city of Xiamen, China. The winds and floods caused 10.2 billion RMB (1.6 billion USD) in direct economic losses (2). The havoc wreaked by Meranti makes clear that

rapidly urbanizing coastal cities must prioritize adaptation to climate change.

The destruction and degradation of coastal ecosystems impair urban resilience to typhoon disasters, which will become more intense as the environment grows warmer (3). More than 90% of Xiamen's natural mangroves, and a large area of casuarina trees and mud flats, have been lost to coastal reclamation since the 1960s (4). As a result, the natural coastal ecosystem no longer provides the ecosystem service of an effective barrier to destructive winds and storm surges. This in turn has led to further loss: More than 0.65 million (about 90% of the total) street trees were uprooted during Meranti's landfall (2). The rapid urbanization has also led to increased impervious surfaces in built-up areas of Chinese cities (5), which has caused increased urban flooding and related economic losses.

Chinese cities excel at mobilizing people quickly [e.g., more than 47,000 people were evacuated shortly before Meranti's landfall (2)], and they have enhanced early-warning systems that are crucial to natural disaster preparedness. However, they have lagged behind cities in other countries in incorporating adaptations to climate change into city planning (6). As Meranti demonstrated, and the New Urban Agenda highlights, these changes are key to reducing urban vulnerability and building coastal resilience (7).

Urbanizing Chinese coastal cities should develop climate-smart marine and coastal spatial planning that is resilient to climate change and minimizes carbon emissions (8). In addition, China needs ecosystem-based marine functional zoning, which identifies the critical components and

processes of the marine ecosystem, to address conflicts between sea use and environment protection (9). Chinese urban decision-making and planning should be risk-informed, taking into account the risks of natural and man-made disasters, including both short-term and long-term effects of climate change, such as extreme weather and sea-level rise (10). The prevailing sector-by-sector planning system should be replaced by an integrated and unified system to ensure spatial consistencies. Chinese coastal cities should also invest in ecological restoration projects (11) and green infrastructure technology, such as the recent “sponge city” pilot program, which reduced impervious surface areas so that rainfall can be retained, stored, and reused to reduce severe urban flooding (12).

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ONLINE BUZZ

Autonomous vehicles

IN THEIR REPORT “The social dilemma of autonomous vehicles” (24 June, p. 1573), J.-F. Bonnefon *et al.* found that, in theory, people support autonomous vehicles programmed to sacrifice passengers to save others, but they wouldn’t want to drive or ride in one. Readers commented on the study design as well as possible next steps to make autonomous vehicles more practical. Excerpts from those comments are below. Read the full comments, and post your own, at <http://science.sciencemag.org/content/352/6293/1573.e-letters>.

A selection of your thoughts:

THE AUTHORS POSE a “social dilemma” for autonomous vehicles (AVs) with scenarios they describe as “unlikely” while relying on surveys (static self-reports) to make predictions about human preferences to these AV decisions. But we have known for decades that preferences self-reported by humans often misalign with human behavior... [S]elf-reported surveys [would be more effective for] these more likely ethical scenarios (see www.aaii.org/Symposia/Spring/sss16symposia.php#ss01): When four AVs approach an intersection with one AV “aware” that its human driver is impaired, should the AVs coordinate with each other to protect their human occupants? Should we as a society allow a robot pilot of a team to take control when the robot becomes “aware” of an impending suicide by the airliner’s human copilot? Should a robot take command of a USS submarine prepared for rapid ascent to prevent the submarine from hitting a Japanese tour boat?

William F. Lawless

THE MAIN PROBLEM for the autonomous vehicles (AVs) that are created today is...that [they] are created for the existing environment, with pedestrians and humans operating vehicles.... [H]uman-driven vehicles and ships must not be used in the environment where the automatically driven vehicles and ships are used, and vice versa....

Vladimir Postnikov

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