

Edited by Jennifer Sills

China's robotics successes abound

THE IN BRIEF NEWS STORY "China's lunar rover languishes" (6 June, p. 1067) should be put in the context of China's ambitious robotics development, which began more than 40 years ago. Recent advances in robotics have allowed China to explore extreme environments such as space, natural disaster areas, the deep sea, and the North and South Poles. The lunar rover Yutu ("Jade rabbit"), discussed in the News



Yutu, China's lunar rover.

story, landed successfully on the Moon in December 2013. Robotic manipulators and mobile robots are envisaged to play an important role in the ongoing Chinese Space Station project and future missions to the Moon and Mars. Three different types of robots were deployed to assist the search and rescues after the Ya'an earthquake in 2013 (1). In deep-sea exploration, Chinese manned submersible vessel Jiaolong reached a record depth of 7062 m in 2012 (2). China also applied robotic technologies during various expeditions to the Poles, including to the Arctic in 2008 and 2010 and to Antarctica in 2007 and 2012 (3, 4).

Recent events, such as Yutu's locomotion problem and the absence of underwater robots during the search for the missing flight MH370, reveal the limitations of existing robotic technologies and highlight directions for potential improvement. Chinese roboticists acknowledge the technical challenges in achieving robust, reliable, and autonomous operations in space and the deep sea. Their approach

has been to adopt state-of-the-art solutions proposed by the international robotics community rather than relying on home-grown innovations. This has worked particularly well with developing software-based techniques such as control and computing algorithms. The biggest weakness in advanced robotics in China is in high-performance mechatronics. This is because China lacks high-precision, industrial manufacturing capabilities, and as a result, depends on expensive imports of components from the United States, Europe, and Japan. The robotics community in China is striving to improve their influence in large national R&D programs as well as to foster concrete international collaborations to help enhance their capabilities in both theoretical research and hardware development.

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Semantic priming well established

AMIDST THE RECENT furor over failures to replicate some empirical results on behavior priming by social psychologists ("Fresh misconduct charges hit Dutch social psychology," F. v. Kolfschooten, *News & Analysis*, 9 May, p. 566; "Replication effort provokes praise—and 'bullying' charges," J. Bohannon, *In Depth*, 23 May, p. 788; "Psychologist's defense challenged," F. v. Kolfschooten, *In Depth*, 30 May, p. 957), it is important to emphasize that some basic behavior-priming effects are real, robust, and easily replicable even if others are much more problematic.

For example, if an English reader is presented with a printed word like "dog," then on average, s/he will be at least 10 to 20% faster at recognizing and responding to a subsequent associated word like "cat" when it is presented within a few seconds after the previous word. This psychological phenomenon, called "semantic priming," has been demonstrated many times

during past decades; the mental processes and brain mechanisms that mediate it are at least moderately well understood (1–3). Many other highly reliable priming phenomena like this have been found in human perception, memory, and language processing (4). Consequently, in his 23 May *In Depth* story, J. Bohannon's statement that "...for behavior priming...the results [of recent replication attempts] are particularly grim" should have been much more carefully qualified.

To be specific, the recent failed replication attempts concern much more exotic types of putative behavior priming [e.g., the ones reported originally in (5–8); see (9)]. Viewed from a metaphorical perspective, what some social psychologists have done is essentially like trying to show that presenting the printed word "dog" may incline English-reading adult male humans more toward visiting remote "cathouses" (slang for brothels) even after substantial amounts of time (several minutes or more) have elapsed since the original exposure to "dog." Much further research is needed for assessing to what extent such behavior-priming effects are real. Meanwhile, until the necessary research has been completed, journalists in the public news media [e.g., (10)] and scientist authors of popular best-selling books [e.g., (11)] that prominently tout these less-substantiated, albeit intriguing, phenomena should treat them with considerable caution, uncertainty, and skepticism.

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9. For example, Bargh et al. (5) claimed that surreptitiously exposing college students to printed words like "bingo," "gray," and "Florida," which may be related to old age in the United States, primed them to walk more slowly as they later exited the laboratory. However, multiple failures to replicate this specific behavior-priming effect have been subsequently reported (12, 13).
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