

nature neuroscience

The mythical brain

It is not enough to refute common myths about the brain: scientists need to highlight interesting real science as well.

Myths about the brain abound and have captured the imagination of self-help gurus, the lay public and filmmakers. *Lucy*, a new film by director Luc Besson, is a prime example of how some ideas about the brain, no matter how erroneous, enjoy the longevity and popular appeal that might be the envy of many theorists trying to get their work noticed. *Lucy* is based on the premise that people ordinarily use only 10% of their brain and that somehow allowing one to tap into the unused 90% of our brain unlocks superhuman powers. Of course, *Lucy*, like many Hollywood movies, does not purport to be grounded in scientific fact and is meant to entertain rather than educate. Nonetheless, the popularity of such movies is a testament to the intrinsic appeal of neuroscience. Neuroscientists should not hesitate in leveraging this interest to engage more with media artists and should do more to provide alternative narratives that are grounded in scientific success stories to both the popular media as well as to the public in general.

The 10% myth has been around at least since the early 1900s¹ and has been decried as having no scientific basis for nearly a century. It is rivaled only by the similarly impervious-to-logic idea of analytical left-brained and creative right-brained personalities. This idea continues to be a staple of pop-science personality questionnaires, despite a similarly thorough debunking. This longevity and public appetite for such discredited ideas can be frustrating for actual neuroscientists, but it is easy to understand why such myths may be appealing. The idea that there is a large, untapped potential in all of us, however ordinary our current lives might be, is appealing. It is especially appealing for 'what if' scenarios that speculative fiction deals in, and is an excellent plot driver. Similarly, an easy, straightforward way to understand ourselves and other people is attractive, especially when it appears to be grounded in information about the biology of the brain: research demonstrates that injecting irrelevant, but apparently hard science, information into an otherwise bad explanation is enough to convince people².

In that sense, the popular appeal of these myths is a bit of a back-handed compliment: it reflects the considerable interest that ordinary people have in understanding how the brain works, as well as a vote of confidence that ideas seemingly grounded in science (erroneous though this belief may be) are more valid. Scientists certainly need to do more to leverage this trust to alter the popular discourse about how the brain works. For example, a recent poll in the UK found that 90% of the people polled trusted scientists (<http://tinyurl.com/kpd4gm6>), an enviable statistic when trust in other public institutions, such as the government, is at a record low (<http://tinyurl.com/o5x46r8>). Rather than simply rolling our eyes in disgust at this 'misuse' of neuroscience, it is important that we do more to highlight the many interesting findings about the brain that fire the imagination.

The irony is that many recent advances in neuroscience would have been the stuff of science fiction just a few years ago. For example, a recent study³ had rats communicating mind-to-mind, with the animals learning to use information that was being received by the brain of another rat via

the magic of brain-machine interfaces. This study received widespread coverage in the media, and compared with the now fusty trope of untapped potential that the 10% myth exploits, this provides more interesting fodder for a creative imagination. Similarly, Ursula Voss and colleagues recently demonstrated⁴ that lucid dreaming can be experimentally triggered by stimulating the brain at specific frequencies, suggesting that a fictional premise of manipulation of dreams in people—as shown in *Inception*—may not be so far-fetched after all. Movies on memory alteration also stand to benefit from the increasingly rich studies in this sphere. The 2004 movie *Eternal Sunshine of The Spotless Mind* portrayed a character who undergoes a procedure that erases his painful memories; recent studies have shown that it is actually possible to make specific memories stronger or weaker; for example, by reactivating them during slow-wave sleep or wakefulness, respectively⁵.

Many other, less obvious neuroscience findings would also make for great jumping off points for interesting works of fiction, and some scientists are trying to encourage media artists to pay more attention to real science. For example, an endeavor set up by scientists who also happen to be film fans promises potential clients that "we at Hollywood Math and Science Film Consulting don't want to destroy the fantasy of films" but instead aim "to provide the research relevant to and required by your project to ensure a credible and compelling storyline." Although the laudable desire to remain grounded in reality can sometime discourage scientists from collaborations in which science is used for entertainment, we would urge neuroscientists to support such initiatives and to continue the conversation with non-scientists. Such a conversation is especially important with makers of popular media, who shape so much of the discourse about science.

The traffic between scientists and the media need not be one-way either, with science serving only as the muse. Even more than films, many recent video games are visually stunning, and scientists have been recently taking advantage of the immersive nature of this medium as a tool to study and manipulate brain plasticity. Although these studies initially borrowed existing video games for scientific purposes, many groups are now actively collaborating with video game artists to come up with more effective ways of manipulating brain plasticity, both to improve normal function and to restore function in those with pathologies. Collaborations between artists and scientists therefore need not be limited to providing a benefit to artists only: the use of these made-to-measure video games demonstrates that such multidisciplinary collaborations can benefit science as well. In this and other ways, scientists stand to benefit from engaging with artists and filmmakers. We look forward to the further fruit of such cross-pollinations. ■

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3. Pais-Vieira, M. *et al.* *Sci. Rep.* **3**, 1319 (2013).
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5. Diekelmann, S. *et al.* *Nat. Neurosci.* **14**, 381–386 (2011).