

Is machine-based mind control on the near horizon?

[Laser beams](#), [ultrasound](#), [electromagnetic pulses](#), [mild alternating and direct current stimulation](#) and other methods now allow access to, and manipulation of, electrical activity in the brain... Billionaires Elon Musk of Tesla and Mark Zuckerberg of Facebook are leading the charge, pouring millions of dollars into developing brain-computer interface (BCI) technology.

[Musk says](#) he wants to provide a “superintelligence layer” in the human brain to help protect us from artificial intelligence, and Zuckerberg reportedly wants users [to upload their thoughts and emotions](#) over the internet without the bother of typing. But fact and fiction are easily blurred in these deliberations.

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No matter how much industrial power someone like Musk brings to the problem, Buschman explained mathematically that biology, not technology, is the real bottleneck. Even if we oversimplify neural coding by assigning a neuron to be either “on” or “off,” in a network of only 300 neurons we still have 2300 possible states — more than all the atoms in the known universe. “It is an impossible number of states,” [neuroscientist Timothy] Buschman said.

The biological obstacles of mind hacking are far greater than the technological challenges.

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