NEUROSCIENCE

Advances in neuroscience

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The burgeoning field of neuroscience is at an important nexus of discovery. The pace of innovation is accelerating along with increased curiosity about how the most mysterious organ of the body works. Emerging technologies, such as optogenetics, permit an inquiry into brain function at unprecedented levels of detail and sophistication. Large-scale collaborations and Open Science frameworks make neural data available to more researchers, thereby expanding and democratizing the scientific process. These efforts generate big data sets, spanning multiple methodologies that benefit from machine learning and other analytic tools to elucidate brain-behavior relationships. As exemplified by the U.S. BRAIN Initiative, funding agencies are recognizing how investments in cutting-edge neuroscience transform knowledge in ways that can directly benefit society—from new clinical treatments to improved brain-computer interfaces and beyond.

Due to its inherent interdisciplinarity and broad reach to many sectors of science, neuroscience is a natural fit within the scope of *Science Advances*. To formalize an emphasis in this area, we have assembled a team of neuroscience experts on the Editorial Board. We envision *Science Advances* as an open-access home for important breakthroughs in brain science that push the boundaries of the field, provide seminal insights, capitalize on technical innovations, and appeal to a diverse readership. Our online format more readily accommodates a variety of manuscript lengths and packaging than the other journals in the *Science* family.

In the current issue, we present findings by Griffin *et al.* (*1*), who used an epigenetic approach in a rodent model to investigate how alcohol use primes the brain for cocaine addiction. Rats with previous exposure to alcohol were more susceptible to the effects of cocaine self-administration than control rats, even displaying compulsive use in contexts associated with negative consequences. Long-term alcohol use degraded nuclear histone deacetylases 4 and 5 in the nucleus accumbens, which creates a permissive epigenetic environment for cocaine-induced expression in a key brain region for reward learning. These results converge with previous research on nicotine to suggest common epigenetic pathways for the action of gateway drugs that increase vulnerability to other forms of addiction.

In addition, we recently published a pair of empirical papers that summarize key results from the ReSource Project, a large-scale, longitudinal mental skill training intervention. Engert *et al.* (*2*) compared the impact of attentional, affective, and social cognitive trainings on biobehavioral indices of psychosocial stress. Both affective and social cognitive trainings attenuated cortisol secretion on a laboratory stress induction paradigm, whereas attentive mindfulness training did not. Valk *et al.* (*3*) extended this work to determine whether the sequential 3-month-long interventions altered brain structure as measured by neuroimaging. Each type of training yielded differential, region-specific increases in cortical thickness that correlated with performance improvements in the specific behavioral domains targeted by the interventions. These outcomes indicate how short, daily mental practices can promote stress resilience over a period of months via plastic mechanisms in modular pathways of the brain.

From epigenetics to social neuroscience, scientific endeavors are leading the way to a new, integrative understanding of the neural bases of complex disorders and mental states. These advances in neuroscience herald a promising era for translating basic knowledge into practical tools to improve the human condition. Our *Science Advances* team looks forward to communicating future discoveries like these across the wide-ranging spectrum of ventures that encompass the brain sciences.

– Kevin S. LaBar

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10.1126/sciadv.aar2953

Citation: K. S. LaBar, Advances in neuroscience. *Sci. Adv.* **3**, eaar2953 (2017).

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Sci Adv **3** (11), eaar2953.
DOI: 10.1126/sciadv.aar2953