http://www.nasonline.org/news-and-multimedia/news/pnas-cozzarelli-2021.html
https://doi.org/10.1073/pnas.2015207118

Class III: Engineering and Applied Sciences

Winner: **Optical computation of a spin glass dynamics with tunable complexity**

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Spin glasses are complex disordered systems that serve as models for investigating phenomena as diverse as brain function, random lasers, and quantum dynamics. However, calculating the energy of the equilibrium states of spin glasses is challenging. The authors of this study fashioned an optical method to calculate the energy of a spin glass state. The authors represented the system's state using an adaptive-optics mirror, which separates a laser input into multiple segments, and read the energy of the spin glass state by collecting the intensities of the scattered laser segments. The authors' optical method is advantageous over digital algorithms for parallel energy calculation for large-scale disordered systems. The findings carry potential implications for improving neural networks for sound recognition, image reconstruction, and high-definition fiber endoscopy in medical diagnosis.