

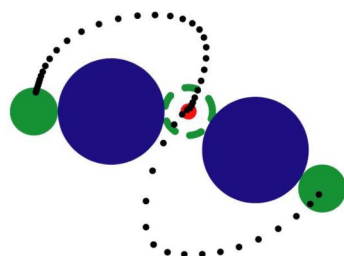
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## NEUROSCIENCE

## Making a plan of action

Were the brain to rely completely on sensory feedback to direct movement during activities like reaching, primate arms would move infuriatingly slowly. Grant Mulliken *et al.* investigated



Example trajectories for obstacle (blue circles) task.

how a region of the brain develops a representation of arm movement that overcomes the long sensory feedback delays. The posterior parietal cortex (PPC) area of the brain serves as a functional bridge between the areas that sense input, like visual cues, and those that direct motor function. Because sensory input alone is generally too slow for the PPC to

develop an estimate of the state of the hand during movement, the authors investigated whether downstream motor movement information is harnessed by the PPC to anticipate the next state of a movement. They measured the activity of neurons in the PPC while monkeys operated a joystick to move a cursor toward a target. The neural activity showed that the PPC develops a forward-state representation of action, with neurons encoding an estimate of the current direction of the cursor, as well as its future direction. Because the PPC develops a continuously updated forward representation of action for goal-directed movement, it would be an attractive region for the development of neural prosthetics, the authors say. — T.H.D.

*“Forward estimation of movement state in posterior parietal cortex”* by Grant H. Mulliken, Sam Musallam, and Richard A. Andersen (see pages 8170–8177)

## MEDICAL SCIENCES

## Starvation enhances chemotherapy

One popular approach to chemotherapy involves targeting the unique characteristics of cancer cells. Researchers have turned this idea upside down and used their knowledge of antiaging and stress-resistance systems to develop a differential stress resistance

method to make the organism, but not the cancer cells, resistant to chemotherapy. Lizzia Raffaghello *et al.* examined the response of normal and cancer cells to chemotherapy after the cells were starved of blood or glucose.

The authors found that yeast cells with antiaging genetic alterations, but without the *Ras2<sup>val19</sup>* cancer gene ortholog, were 1,000 times better protected than those with the gene. They also found that normal glial cells were protected by starvation, whereas six cancerous brain cell lines remained susceptible to hydrogen peroxide or cyclophosphamide. Starvation did not block the toxicity of the drug etoposide to cancer cells that were injected into mice, but it provided remarkable protection to the mice. The mice, which had been starved for 2 days, showed no signs of toxicity to high doses of the chemotherapy drug and gained back the weight they had lost. The authors say they are making progress on methods and drugs to obtain the same anticancer effect with normal feeding. — P.D.



Normally fed mice were moribund after high-dose chemotherapy.

*“Starvation-dependent differential stress resistance protects normal but not cancer cells against high-dose chemotherapy”* by Lizzia Raffaghello, Changhan Lee, Fernando M. Safdie, Min Wei, Federica Madia, Giovanna Bianchi, and Valter D. Longo (see pages 8215–8220)

## APPLIED PHYSICAL SCIENCES

## Nanocomposite materials

Carbon nanotubes have unusual electrical and thermodynamic properties that make them potentially useful in a number of applications, including electronics and optics. The formation of nanocomposite materials—mixed nanotubes with polymers—plays a key role in utilizing these properties. Andriy Kyrlyuk and Paul van der Schoot conducted a theoretical investigation of the interactions that occur as nanotubes load onto matrix materials during the fluid stage of nanocomposite construction. The authors show that the host matrix induces interactions between the nanotubes and the matrix material during the loading process. These interactions, and the connections between the

