NEUROSCIENCE

Detecting Noisy Gradients

Growing neurons are faced with myriad cues as they try to find their designated target. The signals may be soluble or immobile, they may prompt attraction or repulsion, and they may deliver context-dependent messages. Last but not least, any single growth cone interprets its input via a variety of receptors spread across its surface; the growth cone may start or stall, grow quickly or slowly, turn right or left, or reverse course entirely. Mortimer *et al.* have developed a Bayesian model to explain how the growing tips of axons can identify the minute changes in noisy molecular gradients and then interpret them as guidance cues. The optimal strategy for a neuron gives more weight to feedback from receptors that are farther away from the center of the growth cone. Observations of explanted rat neurons facing constructed gradients of signaling ligands in collagen gels showed growth behaviors consistent with this interpretation. — PJH

Proc. Natl. Acad. Sci. U.S.A. **106**, 10296 (2009).

APPLIED PHYSICS

Liquid Russian Dolls

Oil and vinegar–based salad dressing is a classic example of an emulsion, wherein the droplets of one fluid are trapped inside the bulk of another. Though techniques exist for making higher-order emulsions (with two or more nested droplet layers), they tend either to be inefficient or else to produce droplets that vary widely in size. Abate and Weitz used lithography to fabricate polydimethylsiloxane devices that can efficiently create uniform distributions of emulsion droplets with up to five nested layers. Single emulsions were prepared using pinned-jet flow focusing—injection of the inner fluid from two side ports into a central stream of outer fluid. To increase the number of emulsion layers, additional injection ports with alternating wettability were added along the length of the flow channel. In order to ensure synchronized droplet formation for triple and higher-order emulsions, the nozzles at each injection port were designed to be slightly narrower than the emulsion arriving from upstream; a new droplet thus formed at the injection port only upon perturbation by an incoming droplet. The droplets exhibited very narrow size dispersity at all orders, as illustrated by their hexagonal packing when confined in two dimensions. — MSL

CREDIT: ABATE AND WEITZ, *SMALL* **5**, 10.1002/SMLL.200900569 (2009)

small **5**, 10.1002/smll.200900569 (2009).

CLIMATE SCIENCE

Learning to Share

Governmental representatives from almost every country will meet at the United Nations Climate Change Conference in Copenhagen, in December 2009, in order to attempt to agree on an effective international response to climate change. One of the thorniest and most important questions on the table is how best to determine CO_2 emission reduction targets for the various participating countries. This task is rendered more difficult by the asymmetry between developed nations, whose emissions have caused most of the increase in atmospheric CO_2 thus far; and less-developed nations, whose emissions have been low in the past but are expected to grow at a faster than average rate in the future. Chakravarty *et al.* propose that national reduction targets, for the near term, be based not on per capita emissions, but on the net excess emissions from the individual high emitters that are found in every country. This approach has the advantages of treating equally all those with the same emissions, regardless of nationality, and of not specifying how any nation meet its responsibilities for reducing CO_2 emissions. — HJS

Proc. Natl. Acad. Sci. U.S.A. **106**, 10.1073/pnas.0905232106 (2009).

MICROBIOLOGY

Fingers or Toes?

Countless hours have been spent on scrutinizing the morphological subtleties of planktonic organisms, particularly in trying to match shapes to species and to reconcile both with the huge genetic diversity; sometimes, the disconnect can be profoundly misleading. By tracking individuals in culture-well plates, Pizay *et al*. noticed that dinoflagellates changed shape in striking ways. *Ceratium ranipes* grew rigid chloroplast-filled fingers by day and became relatively lethargic, whereas at night, they absorbed the appendages and became more active. Why? One possibility is that the daytime appendages allow the organisms to maximize photosynthesis at the surface, and nighttime absorption allows them to sink a little, swim a little faster, and escape predator pressure. — CA

Protist **160**, 10.1016/j.protis.2009.04.003 (2009).

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