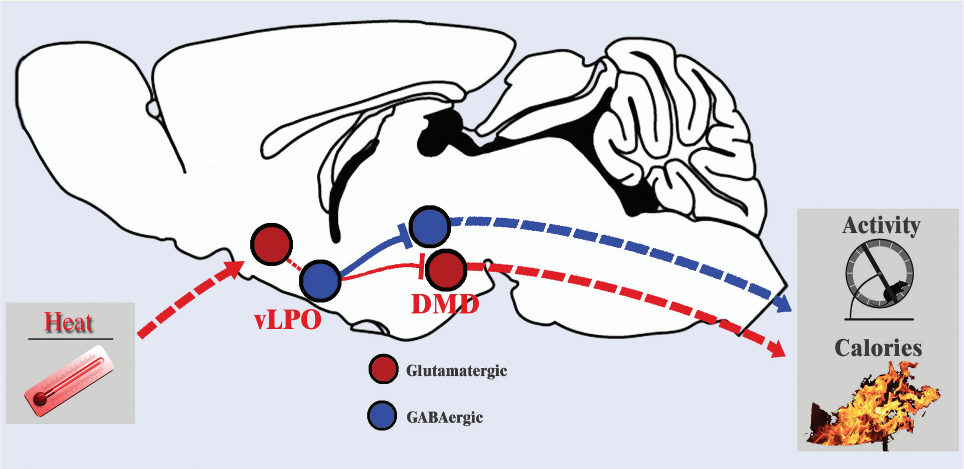
In this issue . . .

Brain circuit for body temperature control

Animals maintain optimal core body temperatures under changing ambient conditions by adjusting energy expenditure, heat generation, and physical activity. Studies have implicated temperature-sensitive neurons in regions of the brain's hypothalamus called the preoptic area (POA) and dorsomedial hypothalamus (DMH) in body temperature control. However, the underlying neural pathways remain imprecisely identified. Zheng-Dong Zhao et al. (pp. 2042–2047) report that exposing mice to 38 °C for 2 hours induced the activation of a subset of neurons in the ventral portion of the lateral preoptic nucleus (vLPO), which is located in the POA, and the dorsal portion of the DMH (DMD). Triggering or tamping down the activity of vLPO neurons using optogenetic tools resulted in reduced and fever-level body temperatures, respectively. The vLPO neurons are connected to and act upon DMD neurons, which were found to be activated by cold, to raise body temperature, and to induce physical activity when stimulated using molecular tools. The authors pinpoint a subset of DMD neurons, mostly GABAergic DMD neurons, as heat generators. Importantly, GABAergic vLPO neurons countervailed the activity of DMD neurons to reduce heat generation and maintain core body temperature. According to the authors, the findings uncover a previously unreported neural circuit involved in body temperature maintenance, which is a vital homeostatic function. — P.N.



Neural pathway for body temperature control. Image courtesy of Wei Shen and Blue-Rider Art Studio (ShanghaiTech University, Shanghai, China).

Ocean productivity and fisheries catch

A study identifies reasons for disparities between regional fish catch and ocean productivity and explores their implications under climate change. Photosynthesis drives marine food webs, but the differences among fish catch from marine ecosystems exceed the differences among regional values in algal production. To identify factors underlying contemporary catch patterns, Charles Stock et al. (pp. E1441–E1449) modeled catch patterns using a synthesis of global fishing effort, global fish catch data including small-scale fisheries, and plankton food web estimates from a high-resolution global earth system simulation. Large catch differences between heavily fished regions could be explained by an energy-based model that incorporated regional differences in food web structure and energy transfer efficiency, and integrated both benthic and pelagic energy sources. Algal production did not explain catch patterns by itself. A climate change projection relying on the energy-based model estimated more than 50% shifts in fish catch in some regions by the end of the 21st century under high-emissions scenarios. According to the authors, failing to account for the effect of regional variation in food web structure and energy transfer efficiencies could result in incorrect estimates of future catch trends and hinder adaptation to climate change. — L.C.