of the conformational changes that occur in the nanoseconds to milliseconds after photoactivation. These changes begin at the active site, propagate toward the extracellular side of the protein, and mediate internal protonation exchanges that achieve proton transport. —VV
Science, this issue p. 1552

CATALYSIS

Boron nitride catalysis
Propene is one of the highest-volume organic chemicals produced. Propene has mainly been made from naphtha, but changes in the global supply chain are creating shortages. Direct conversion from propane, a component of natural gas, via reaction with oxygen is an attractive alternative, but existing approaches produce a large fraction of unwanted CO and CO₂. Grant et al. report that boron nitride, normally an unreactive material, has high selectivity to catalyze the production of propene (77%) and ethene (13%). —PDS
Science, this issue p. 1570

IMMUNOLOGY

A balance between staying and leaving
Mobilization of neutrophils from the bone marrow is determined by the balance between two opposing chemokines that either keep neutrophils in the bone marrow or recruit them to tissues. Both chemokines activate the small guanosine triphosphatase Rac. Campa et al. found that the time that it took active Rac to return to baseline determined how long neutrophils stayed in the bone marrow. Mice lacking a Rac inhibitor had more neutrophils in the bone marrow and fewer circulating neutrophils than control mice had. —WW

MIGRATION

Mass movement of “invisibles”
We know a lot about vertebrate migrations globally. However, the majority of animals that live on this planet are invertebrates, and we know very little about their movements. Hu et al. monitored the migration of large and small insects over the southern United Kingdom for a decade. They found that more than a trillion insects move across this region annually. The movement of such a large biomass has considerable impacts on the ecosystems between which the insects migrate. —SNV
Science, this issue p. 1584

PLANT SCIENCE

Prohormone processing by subtilases
A flower that has gone to seed will drop its petals in a regulated process called abscission. Schardon et al. analyzed the production of the peptide hormone that regulates floral organ abscission in the model plant Arabidopsis thaliana. They used tissue-specific expression of proteinase inhibitors to identify the subtilisin-like proteinases that act as prohormone convertases required for peptide hormone production in plants. —PJH
Science, this issue p. 1594

CANCER

Combining drugs as the doctor ordered
Cancer immunotherapy is being used for a growing number of cancers. Chemotherapy is still the mainstay of cancer treatment, however, and it can be difficult to find good ways to combine the two approaches. Mathios et al. systematically evaluated the effectiveness of local or systemic chemotherapy before or after immune checkpoint inhibition in mouse models of glioblastoma. Local chemotherapy was particularly effective in combination with checkpoint inhibition, whereas systemic chemotherapy was too damaging to the immune system for the combination to be useful. —YN

NEUROSCIENCE

Tracking extracellular space in the brain
Extracellular space takes up a large percentage of the brain. Its size changes with the sleep-wake cycle but also during brain development and normal aging, as well as under pathological conditions such as neurodegeneration. Godin et al. injected near-infrared luminescent carbon nanotubes into rat brains and tracked their diffusion in the extracellular space. This method revealed the dimensions of the extracellular space in live brain

IN OTHER JOURNALS

Edited by Sacha Vignieri and Jesse Smith

ICE SHELVES

Unwelcome rifts
Ice sheets have ice shelves, which continually break apart to form icebergs when the shelves grow too large for their environment. This is normal and typically occurs independently of the conditions of the ocean on which they float. However, a recent rifting event in the middle of the Pine Island Glacier of Antarctica seems to be the result of ocean forcing, report Jeong et al. This development is not a welcome one, because Pine Island Glacier appears already to have begun an irreversible retreat due to global warming, one of the effects of which is to increase ocean temperatures near many ice shelves. —HJS

Rifts in floating ice shelves lead to their disintegration and mass loss from ice sheets.
NEURODEVELOPMENT

Blood and brain intertwined during development

During brain development, blood vasculature grows rapidly to keep up with growing brain tissue. Studying the mouse hindbrain, Tata et al. show how these events are coordinated. Peak angiogenesis during embryonic development correlates with a surge in mitotic activity of neural progenitor cells. Processes from these cells wrap around developing vessels or tag the perineural vascular plexus. The interaction depends on neuropilin-1 (NRPI), a cell surface receptor that is expressed in endothelial cells of the developing vasculature. Without NRPI, neural progenitor cells fail to proliferate normally, resulting in fewer than normal progenitors and compromising hindbrain growth. —PJH


MATERIALS CHEMISTRY

Reacting into new frameworks

Covalent organic frameworks (COFs) are formed through moderately strong bonds between multidentate centers and organic linkers. One difficulty in using very strong linkages to create more robust materials is that the process of crystallization must allow for error correction, so the linkages must be weak enough to be reversible. Waller et al. bypassed this problem by converting the imine linkages in two COFs into stronger amide linkages, using mild oxidizing conditions. Both materials retained their crystallinity and porosity and displayed much greater stability; they were stable after 24 hours in 12 M hydrochloric acid, as well as 1 M sodium hydroxide. —PDS

J. Am. Chem. Soc. 10.1021/jacs.6b08377 (2016).

ELECTROCHEMISTRY

Tracing the trends in oxygen reduction

Fuel cells currently rely too heavily on expensive platinum catalysts to reduce oxygen. Cheaper metals still have not matched the efficiency of platinum. Pegis et al. studied a series of well-defined iron porphyrin complexes in solution, in the interest of discerning which factors would be most productive to optimize. They found that the turnover frequencies correlated with overpotential, despite rate-limiting oxygen binding. Further grounds for optimization emerged from distinctions between the iron redox properties and the proton transfer characteristics of substituent interactions in the second coordination sphere. —JSY


IMMUNOLOGY

A view to a kill, preventing collateral damage

Natural killer (NK) cells are immune cells that kill virally infected target cells. To do this, NK cells dock with their sickened targets and unleash on them the destructive contents of their cytotoxic lytic granules. Hsu et al. looked at the detailed cellular rearrangements involved in killing. They regulated signaling pathways and used acoustic trap microscopy to arrange NK target cells in a way that the lytic granules would be released in a directed fashion toward the targets or in a nondirected fashion. Perhaps unsurprisingly, when the NK cells had the chance to line up and release their lytic granules directly toward their targets, fewer bystander cells were damaged. Furthermore, killing of the target cells was more efficient. Inhibiting the microtubule motor dynein or blocking cell adhesion molecules interfered with targeted killing and increased nondirected granule release, thereby damaging more bystander cells. —SMH

J. Cell Biol. 10.1083/jcb.201604136 (2016).

Vascularization helps brain progenitors grow.