IMMUNODEFICIENCIES
An inherited disorder makes WAVEs

The WAVE regulatory complex (WRC) is a multiunit complex that regulates actin cytoskeleton formation. Although other actin-regulatory proteins modulate human immune responses, the precise role for the WRC has not yet been established. Cook et al. studied five patients from four unrelated families who harbor missense variants of the gene encoding the WRC component HEM1. These patients presented with recurrent infections and poor antibody responses, along with enhanced allergic and autoimmune disorders. HEM1 was found to be required for the regulation of cortical actin and granule release in T cells and also interacted with a key metabolic signaling complex contributing to the disease phenotype. By linking these interactions to immune function, this work suggests potential targets for future immunotherapies. —STS

Science, this issue p. 202

QUANTUM PHYSICS
Strongly coupled at distance

The development of hybrid quantum systems provides a flexibility that allows for various components to be coupled together, thereby expanding the opportunity to build quantum sensors and devices that can be designed for specific purposes. Key to doing so is being able to strongly couple the different components. Most developments to date have relied on the components being in close proximity, which can hamper design flexibility. Karg et al. used a laser to induce strong coupling between a cloud of atoms and an optomechanical membrane. With the components separated by 1 meter, this approach demonstrates a methodology of coupling quantum systems and easing up restrictions on spatial proximity. —ISO

Science, this issue p. 173

ARCTIC PRODUCTIVITY
Food for thought

Phytoplankton abundances in the Arctic Ocean have been increasing over recent decades as the region has warmed and sea ice has disappeared. The presumptive causes of this increase were expanding open water area and a longer growing season—at least until now. Lewis et al. show that although these factors may have driven the productivity trends before, over the past decade, phytoplankton primary production rose by more than half because of increased phytoplankton concentrations (see the Perspective by Babin). This finding means that there has been an influx of new nutrients into the region, suggesting that the Arctic Ocean could become more productive and export additional carbon in the future. —HJS

Science, this issue p. 198; see also p. 137

AGING
Plasma transfers exercise benefit in mice

Exercise has a broad range of beneficial healthful effects. Horowitz et al. tested whether the beneficial effects of exercise on neurogenesis in the brain and improved cognition in aged mice could be transferred in plasma (blood without its cellular components) from one mouse to another (see the Perspective by Ansere and Freeman). Indeed, aged mice that received plasma from young or old mice that had exercised showed beneficial effects in their brains without hitting the treadmill. The authors identified glycosylphosphatidylinositol-specific phospholipase D1 as a factor in plasma that might, in part, mediate this favorable effect. —LBR

Science, this issue p. 167; see also p. 144

EPIDEMIOLOGY
Early warning signs

Modeling an emerging infectious disease is an inexact science. At an early stage of an epidemic, we only have sparse data, little knowledge of the mechanisms driving emergence, and an urgent need to devise control measures that will be effective. Using epidemiological incidence reports, Brett and Rohani have developed a detection algorithm for disease (re)emergence that is agnostic to the mechanisms involved. This supervised statistical learning algorithm was
Although macaques have the auditory anatomy for speech and making music, they do not speak because they lack control in the upper vocal tract.

**Neuroscience**

**Monkeys with the piano**

The anatomical organization of auditory cortical pathways in nonhuman primates (NHPs) shows remarkable similarities with humans. So why don’t NHPs have a more speech-like communication system? Archakov et al. trained macaques to perform an auditory-motor task using a purpose-built piano. Mapping brain activity by functional magnetic resonance imaging showed that sound sequences activated the auditory midbrain and cortex. More importantly, sound sequences that had been learned by self-production also activated motor cortex and basal ganglia. This shows that monkeys can form auditory-motor links and that this is not the reason why they do not speak. Instead, the origin of speech in humans may have required the evolution of a command apparatus that controls the upper vocal tract. —PRS


**Psychology**

**Greater variability, greater punishment**

Prior research has linked unpredictability in outcomes to a heightened sense of vulnerability. It has also been found that feelings of vulnerability can generate more severe forms of morality. Building on these lines of research, Ding et al. investigated whether exposing people to greater variability in outcomes may lead to harsher moral judgment. Participants who saw graphs presenting more extreme data or who rolled dice that came up more extreme were more likely to support harsher punishment and to engage in more punitive behaviors in economic games. These findings have implications for how individuals may cope with increasingly unpredictable and variable environments. —TSR


**Education**

**Getting active to increase equity**

Attrition and underrepresentation in science, technology, engineering, and math (STEM) go hand in hand. Part of this relationship is due to underrepresented students experiencing achievement gaps, especially in “gateway” courses. Theobald et al. investigated whether underrepresented students in active-learning classrooms experience narrower achievement gaps than underrepresented students in a traditional lecture course. The research team collected data on exam scores and failure rates for ~54,000 students in both traditional lecturing and active-learning STEM courses taught by the same instructor. On average, active learning reduced achievement gaps in exam scores and passing rates and offered disproportionate benefits for underrepresented groups. These results provide more support for replacing traditional lecturing with active learning, which now has the added benefit of being a strategy for increasing equity in higher education. —MMc


**Biomolecular Imaging**

**Holding protein pairs in place**

Superresolution fluorescence imaging can determine where protein interactions occur in cells. However, this method can suffer from false positives because the detection of protein proximity is a function of optical resolution. Clowesley et al. ensured that the detected signals come from a particular pair of interacting proteins by using the DNA-PAINT (point accumulation imaging in nanoscale topography) method. In this method, proteins bind to two different antibodies that in turn are bound to DNA constructs. DNA-imaging strands are active only if the two constructs are close enough to enable DNA dimerization. This was used to image cardiac proteins in isolated cardiomyocytes with nanoscale resolution. —PDS


**Physiology**

**DNA repair in the placenta**

The human developmental disorder called Cornelia de Lange syndrome (CdLS) is caused by mutations that impair the function of cohesin, a protein complex that is important for genome organization and DNA repair. Singh et al. examined placenta in mouse models of CdLS and found evidence of persistent DNA damage, exit from the cell cycle (senescence), and inflammatory cytokine production. This identifies DNA damage responses as an important facet of placenta homeostasis that can affect embryo health. Further studies are needed to determine whether DNA damage responses in the placenta affect embryo development more broadly. —GKA


**Education**

**Active-learning STEM courses effective**

Both traditional lecturing and active-learning STEM courses had positive effects on exam scores and failure rates for ~54,000 students in a traditional lecture course. The research team collected data on exam scores and failure rates for ~54,000 students in both traditional lecturing and active-learning STEM courses. The research team collected data on exam scores and failure rates for ~54,000 students in both traditional lecturing and active-learning STEM courses taught by the same instructor. On average, active learning reduced achievement gaps in exam scores and passing rates and offered disproportionate benefits for underrepresented groups. These results provide more support for replacing traditional lecturing with active learning, which now has the added benefit of being a strategy for increasing equity in higher education. —MMc

DNA repair in the placenta
Gemma Alderton

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