have remained elusive. Using chicken skin as a model system, Shyer et al. found that the periodic spacing of feathers is triggered by mechanical rather than molecular events (see the Perspective by Grill). Furthermore, these mechanical events shape both the structure of pre feathers and their molecular identity. —BAP

**SCIENCE**

Infectious Disease

For Zika virus, experience counts

For the immune system, practice makes perfect. Previous exposure to an infection elicits a stronger, faster memory response. But how does the immune system respond to a similar but not identical infection? Rogers et al. tracked the neutralizing antibody response to Zika virus infection in individuals with and without previous exposure to the closely related dengue viruses. Zika virus infection primed the preexisting dengue virus response, but this cross-reactive response was poorly neutralizing. In contrast, de novo Zika virus responses were potently neutralizing. Thus, Zika virus vaccines should target epitopes that dengue virus subtypes lack. —ACC


**STRUCTURAL BIOLOGY**

Adapting to the right light

In plants, photosystem II is the first protein complex in the machinery that converts sunlight into chemical energy. It comprises antennae complexes (LHCII), which collect the light energy, and a dimeric core that contains the reaction center where water is split into oxygen and protons. Su et al. report cryo–electron microscopy structures of a supercomplex consisting of the dimeric core, two strongly bound LHCII, and two moderately bound LHCII (see the Perspective by Croce and van Amerongen). Under high-light conditions, the moderately bound LHCII might detach to down-regulate the efficiency of light harvesting and prevent damage. —VV

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**NEUROSCIENCE**

Brain mechanisms of pitch perception

To emphasize a word, we briefly raise our pitch; this alone can change the meaning of a sentence. Tang et al. performed high-density brain recordings on clinically monitored neurosurgical patients. They discovered that intonational pitch is represented by a highly specialized and dedicated neural population in the auditory cortex. Discrete cortical sites extracted intonational information in real time from the speech signal. These sites were overlapping with, but functionally independent from, sites that encode other critical aspects of speech, such as the phonemes and information about the speaker. —PRS

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**IN OTHER JOURNALS**

Edited by Sacha Vignieri and Jesse Smith

Eyepots on prey give sticklebacks pause.

**BEHAVIORAL ECOLOGY**

Be afraid

Eyepots are found across many animal species, with the presumed function of dissuading predators from attacking. However, it is difficult to determine whether predators respond to the aposematic effect of the spots, or whether they really see them as eyeli keye. Kjerno and Merilaatai teasing apart these two drivers by showing sticklebacks a series of patterns, some eyelikeye and some not, and found that the fish appreciably delayed attack of associated prey only in the presence of eyelikeye patterns. In addition, fish exposed to cues from their own predators (perch) delayed their attacks even further, suggesting that the response is both innate and learned. —SNV


**CANCER THERAPY**

Personalized melanoma vaccines

Two separate clinical trials show that personalized vaccines can prevent tumor relapse in certain patients with advanced-stage melanoma. The studies used RNA or DNA sequencing to identify new mutations, termed neoantigens, that were specific to melanoma cells and absent in healthy cells. A computer algorithm helped the researchers predict which neoantigens were likely the best targets for each patient. Tailored vaccines were then generated, made up of synthetic forms of the specific neoantigens in the patients’ melanoma. Such personalized
INNATE IMMUNITY

Signaling to senescence

“Damage-induced” senescence is a key component of many distinct physiological and pathological processes including cancer, aging, and wound healing. The detection of cytosolic DNA by cyclic GMP-AMP synthase (cGAS) is a key strategy by which the innate immune system senses the presence of pathogens. Activation of cGAS can also be evoked by self-DNA. Glück et al. found that cGAS detects cytosolic DNA fragments in stressed proliferating cells, which triggers cell cycle arrest and enforces premature senescence. Multiple distinct stimuli of cellular senescence engaged cGAS signaling in vitro. Furthermore, irradiated mice exhibited a cGAS-dependent senescence response in the liver and lung. Thus, in addition to its role in antiviral defense, cGAS is a cell-intrinsic sensor of DNA replication stress that protects against uncontrolled proliferation of damaged cells. —SMH


WORKFORCE

Correct perceptions, increase engagement

One way to increase the engagement of U.S. students in science, technology, engineering, and mathematics (STEM) would be to understand their perceptions of opportunities available in STEM and try to correct misconceptions. Brown et al. investigated U.S. student perceptions of communal engagement opportunities in STEM and compared them with those of Asian students. U.S. students perceived STEM as providing fewer communal opportunities and reported fewer communal experiences in STEM. When the U.S. students then read about the communally oriented work of a scientist, their beliefs and attitudes about STEM were affected, suggesting that the communal aspect was new information to them. Correcting perceptions about communal opportunities in STEM may provide a simple method for improving U.S. student engagement. —MMc


IMMUNOLOGY

Tumor suppressor is a thymic booster

Thymic epithelial cells (TECs) choreograph the development of functional self-tolerant T cells. However, factors such as aging and chemotherapy can lead to TEC dysfunction, resulting in autoimmunity and impaired immunosurveillance. Rodrigues et al. conditionally deleted the tumor suppressor protein p53 in TECs and found that their numbers were reduced in the medulla, although cortical TEC organization and T cell development in early life were normal. Yet with age, these defects spread to the cortex. Likewise, thymic involution and hallmarks of peripheral autoimmune disease were enhanced. p53 appears to fine-tune RANK, a known mediator of TEC function, but RNA sequencing suggests that other pathways may be important. These findings increase our understanding of how p53 regulates immune homeostasis, but also suggest caution in the use of p53 inhibitors to lessen side effects in chemotherapy. —STS


SURFACE CHEMISTRY

Circle the molecules

Supramolecular networks of molecular corrals that form on metal surfaces from aromatic molecules are usually driven by hydrogen bonding or other contacts within the plane and have π-interactions mainly with the metal surface. Jethwa et al. show that nonplanar 1,5-triazoles adsorbed on (111) close-packed surfaces of copper, silver, or gold can form rings of 11 to 18 molecules, whereas similar 1,4-triazoles adopt the conventional flat geometry. The 1,5-triazole links a biphenyl and a phenanthrene group; the first two groups lie flat against the metal surface, whereas the phenanthrenes tilt away from it and π-stack to form closed rings. —PDS


How whales change their tune

The beautiful songs of male humpback whales are composed of a sequence of sounds that is repeated to form a theme, and themes are sung in a particular order to form the song. Whale songs sometimes change rapidly, with males in one population quickly adopting the song type of another. To understand how learning of a new song takes place, Garland et al. studied two rapid changes during which four clear recordings of the rare transitional stage between old and new songs were made. The males learned the new songs by joining new and old themes, sometimes creating a hybrid theme. This learning had aspects in common with that observed in certain songbirds and even humans. —BJ


vaccines efficiently trained the immune system to unleash T cells to selectively kill tumors and reduce the spread of cancer. Sahin et al. observed favorable responses in 8 of 13 patients for nearly 2 years after vaccination, whereas Ott et al. found that four of six patients remained tumor-free up to 32 months. —PNK

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Be afraid
Sacha Vignieri

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