been put forward to explain what has driven this variation, with many accepting life history or nesting explanations. Stoddard et al. looked at nearly 50,000 eggs from more than 1400 species from morphological, biophysical, and evolutionary perspectives and found little support for previous hypotheses (see the Perspective by Spottiswoode). Instead, their results suggest that selection for flight adaptations is most likely to be responsible for the variation. —SNV

Science, this issue p. 1249; see also p. 1234

ENGINEERING

Instant tough bonding of hydrogels
Soft electronic devices, including electronic skin, adaptive lenses, and stretchable batteries, are made possible through the use of tough, water-laden hydrogels that instantaneously bond to plastics, metals, and bone. Wirthl et al. blended cyanoacrylate-based adhesives that are dispersed in alkanes with either conventional or newer types of hydrogels. They used these to produce materials that form heavy-duty bonds with hard or soft materials in a matter of minutes. The materials take advantage of fast interdiffusion of cyanoacrylate-alkane mixtures and hydrogels and facile hydrogen bond formation between cyanoacrylates and hard or soft substrates. Potential applications range from robotics to wearable electronics to energy-harvesting technology. —LAA


ROBOTICS

Optimum human input
Exoskeletons can be used to augment human abilities—for example, to lift very heavy loads or to provide greater endurance. For each user, though, a device will need to be adjusted for optimum effect, which can be time-consuming. Zhang et al. show that the human can be included in the optimization process, with real-time adaptation of an ankle exoskeleton (see the Perspective by Malcolm et al.). By using indirect calorimetry to measure metabolic rates, the authors were able to adjust the torque provided by the device while users were walking, running, and carrying a load. —MSL

Science, this issue p. 1280; see also p. 1230

IN OTHER JOURNALS

Edited by Caroline Ash and Jesse Smith

STAR FORMATION

Timing the life cycle of molecular clouds
Giant molecular clouds (GMCs) are large gravitationally bound assemblies of gas and dust in galaxies. GMCs can collapse under their own gravity, forming clusters of new stars; the radiation emitted by young stars then disperses the GMC and halts star formation. Corbelli et al. have identified the positions of hundreds of GMCs and young star clusters in the nearby spiral galaxy Messier 33. Some young clusters still lie within their parent GMC, while others have already destroyed it. By comparing the two populations, the authors determined how long GMCs survive before collapsing and the speed of the subsequent disruption process. —KTS


VIROLOGY

How much does a virus cost?
Without cells, viruses cease to be biologically functional. They need to consume a host’s energy to replicate, and they can rewire cell metabolism to do so. To quantify the degree of selection that a virus exerts and experiences, Mahmoudabadi et al. asked what the energetic cost of viral replication is. Influenza virus and the bacteriophage T4 were taken as examples of high (6000 particles) and low (200 particles) burst sizes, respectively. Breaking down the viral life cycle into entry, intracellular transport, genome replication, transcription, translation, assembly, and exit, calculations showed that translation creates the greatest energetic demand. T4 consumes about 30% of the host’s energy supply and possesses auxiliary metabolic genes to ensure that it gets the energy it needs. In contrast, the higher burst size of the influenza virus costs just 1% of the total cell budget because the metabolic energy capacity of a eukaryotic cell is much greater than that of a bacterium. —CA


DIET

Balanced diets can prevent binge-like eating
Binge-like eating (BE) predominately affects females and usually manifests in late adolescence. Previous studies have linked eating disorders to early life stress, and it is known that perinatal stress increases susceptibility to a variety of psychiatric disorders. Schroeder et al. have discovered a prenatal stress (PNS)—induced epigenetic predisposition to BE that can be mitigated by adolescent diet. When overexpression of maternal corticotropin-releasing factor was used to trigger PNS in mice, female offspring were found to be predisposed to BE behavior. This was coincident with reduced expression of DNA methyltransferases in the hypothalamus, resulting in hypomethylation and dysregulation of downstream gene expression. Mice subsequently given a methyl-balanced
diet in adolescence had normalized DNA methyltransferase expression and did not exhibit BE behavior; this approach thus provides a noninvasive prevention strategy. —CHG

Cell Metab. 25,1(2017).

SYNTHETIC BIOLOGY
Monitoring inflammation from within
Inflammation in the gut, whether caused by infection or autoimmunity, is challenging to detect, monitor, and treat. Riglar et al. engineered a strain of Escherichia coli obtained from the gut of a mouse to record exposure to tetrathionate, a downstream product of reactive oxygen species generated during inflammation. They used these programmed bacteria to sense in situ levels of tetrathionate. The bugs effectively monitored inflammation during Salmonella-induced colitis in mice and responded in a mouse model of inflammatory bowel disease. They exhibited long-term genetic stability, and the synthetic genetic circuits continued to function as intended in bacteria colonizing the mammalian gut. Thus, engineered bacteria have the potential to stably and reliably probe pathophysiological processes for which traditional diagnostics may not be feasible or cost-effective. —SMH

Nat. Biotech. 10.1038/nbt.3879 (2017).

PLANT SCIENCE
Small RNA retunes photosynthesis
When iron is limited, photosynthetic pathways are remodeled to accommodate the deficit. Iron transport systems and alternative redox carriers are mobilized. Georg et al. now show that a 68-nucleotide small RNA named iron-stress-activated RNA1 (IsaR1) is central to this accommodation in the cyanobacterium Synechocystis. IsaR1 is conserved across cyanobacterial species and expressed in response to iron starvation. With iron deprivation, IsaR1 adjusts components of photosynthetic electron transfer, pigment biosynthesis, and Fe-S cluster biogenesis to make the most of the available light with the materials at hand. —PJH


PHYSICS
Nailing down the elusive statistics
Many exotic materials, such as quantum spin liquids, are characterized by a lack of ordering. Proving the absence of something is tricky, however; a positive experimental signature is preferable. Morampudi et al. find theoretically that the fractional quantum statistics of quasiparticle excitations that appear in such phases might be detectable by neutron scattering. They predict that near the threshold for the creation of such excitations, the neutron scattering cross section should exhibit a power law energy dependence, with the exponent directly reflecting the nature of the quantum statistics. The prediction can be tested in gapped quantum spin liquids with electrically neutral excitations, as well as in cold atoms systems that simulate such materials. —JS


DECISIONS AND NETWORKS
Experimentation on the Tube
The morning commute actually got better for many Londoners thanks to a transit strike, particularly in regions where information about the transit network is murky. Several stations on the London Underground were closed in February 2014 because of a strike. Larcom et al. found that commuters who were forced to try new routes because of the strike were less likely to follow their prestrike routes after the strike ended, suggesting that forced experimentation led to more optimal strategies. Suboptimal prestrike routes were influenced by noisy information, such as poor knowledge of different train speeds and distorted distances between stations on the schematic map of the Underground system. —BW