on solution-synthesized copper sulfide nanorods. In principle, more than 65,000 different variations of materials and their interfaces can be made, depending on the order and extent of cation exchange. —PDS

Science, this issue p. 458

EMERGING INFECTIONS

Taking the bite out of diseases

Arthropods are the most abundant animals on Earth and can transmit diseases such as dengue or West Nile virus to humans. Bryden et al. tried to manipulate the immune reaction at the site of mosquito bites to restrict viral dissemination. They found that local Toll-like receptor 7 (TLR7) activation shortly after infection dampened replication of a model alphavirus in mice. This held true for clinically relevant arboviruses and in human skin explants. Viral restriction was due to activation of skin macrophages and heightened type I interferon production. Topical TLR7 activation after mosquito bites could be a broad-acting approach to abrogate arboviruses. —LP


DEVELOPMENTAL BIOLOGY

Shaping the early amniote embryo

Gastrulation is an essential step in development in which the internal tissues of the body are set apart. In birds and mammals, a similar cascade of molecular events is known to specify embryonic territories, but how they are physically remodeled has remained elusive. Working with avian embryos, Saadaoui et al. identified a cable that encircles the embryo as the engine of gastrulation and described the collective cell movements as similar to the motion of a fluid. One side of this contractile ring pulls more strongly than the other, entraining the large-scale tissue movements that shape the early body plan. The embryo margin, previously known to function in molecular regulation, thus emerges as a dual mechanical and molecular organizer of development. —BAP

Science, this issue p. 453

ORGANIC CHEMISTRY

A twisted small-molecule synthesis

Some molecules are easy to draw on paper, whereas others contain rings and contortions that require one to think in three dimensions. Reisberg et al. set out to synthesize the bicyclic small molecule tryptorubin A but found that their initial attempt produced a molecule with the right bonds but the wrong molecular shape, a form of noncanonical atropisomerism. The authors then devised a synthesis where they locked in the correct isomer before forming the second ring, which produced a product indistinguishable from the authentic natural product. Such structural isomers may be lurking when working with complex small molecules with constrained rotation. —MAF

Science, this issue p. 458

CANCER IMMUNOTHERAPY

A one-two, CAR-T cell punch

Chimeric antigen receptor (CAR)–T cells have been clinically effective in killing certain hematological malignancies, but achieving long-term patient responses for solid tumors remains a challenge. Reisberg et al. describe a two-part “CARVac” strategy to overcome poor CAR-T cell stimulation and responses in vivo. They introduce the tight junction protein claudin 6 (CLDN6) as a new CAR-T cell target and designed a nanoparticulate RNA vaccine encoding a chimeric receptor directed toward CLDN6. This lipoplex RNA vaccine promotes CLDN6 expression on the surface of dendritic cells, which in turn stimulates and enhances the efficacy of CLDN6-CAR-T cells for improved tumor therapy. —PNK

Science, this issue p. 446

IN OTHER JOURNALS

Edited by Caroline Ash and Jesse Smith

CONSERVATION

Good news from the Cayman Islands

Groupers are large tropical marine fish that show remarkable mass-spawning behaviors. Predictably, regular aggregations of large fish make easy targets for exploitation by fishermen. As a result, an important food species, the Nassau grouper (Epinephelus striatus), has become critically endangered throughout the Caribbean. Waterhouse et al. show how coordinated management action over 15 years among government personnel, academics, and nonprofit organizations has been effective in replenishing the species on Little Cayman in the Cayman Islands. Spatial and seasonal fishing closures were implemented, supported by a stock monitoring program. A combination of modeling and diver-based census shows that the population of this species has tripled locally. Similar programs could be adopted elsewhere in tropical fisheries where mass-spawning species are vulnerable to overexploitation. —CA


Nassau grouper (Epinephelus striatus) from the Cayman Islands

CANCER

Ethnicity reflected in tumor genomes

In the United States, African Americans are more likely to develop and succumb to lung cancer than European Americans. Several factors likely contribute to this racial disparity, including the possibility that disease biology differs between the two groups. Tumor genome sequencing can shed light on this hypothesis. Through targeted sequencing of 129 tumors, Mitchell et al. found somatic mutations in the PTPRT and JAK2 genes in more than 30% of lung adenocarcinomas from African Americans versus 10% of tumors from European Americans. The proteins encoded by PTPRT and JAK2 function in cellular signaling pathways implicated in cancer. Whether identification of these mutations will lead to new therapies is unclear, but the study broadly supports the idea that tumor biology may differ across racial groups. —PAK


THIN FILMS

Synthesizing single-layer diamond

The carbon allotropes of diamond and graphene have different types of bonding that lead to their exceptional properties. Bakharev et al. pull off the impressive trick of making a monolayer carbon film that is diamond-like in its bonding. The authors accomplish this by attaching fluorine atoms to the carbon film, creating “F-diamond.” Diamane is a long-sought-after, but challenging to make, material that should have useful properties. F-diamane may find use in a variety of applications, from microelectronics as a semiconductor to a seed material for growing single-crystal diamond films. —BG


HUMAN GENETICS

Predicting transmission risk for de novo mutation

The reduction in sequencing costs and the increase
in prediction accuracy make individual assessment of genetic risk from mutations more attractive and valuable. Examining mutation rates in blood and sperm, Breuss et al. surveyed families in which a child has been diagnosed with autism spectrum disorder. The authors found a small set of individuals in which a mosaic of potentially causative mutations was observed in the father’s blood or sperm. Differential mutational processes seem to govern when the genetic variants arise. Screening for paternal mosaicism might help determine the risk of autism in future children of fathers that carry a de novo mutation. —LMZ


PLANT SCIENCE

Some seeds store better than others

Seeds from species of the genus Coffea, although intolerant to complete drying, reflect a range of tolerance to desiccation. Stavriniades et al. studied seed transcriptomes and proteomes to investigate the divergent response to desiccation. In two Coffea species that produce seeds tolerant to desiccation, stress-related genes were up-regulated during seed development and mitochondrial physiology was down-regulated. In a Coffea species with seeds less tolerant to desiccation, genes involved in auxin production and response were up-regulated. The authors conclude that the seeds best positioned to withstand desiccation are those that can shut down respiration and tolerate oxidative stress. —PJH


MACHINE LEARNING

Guiding solvothermal synthesis

Machine learning is rapidly revolutionizing computer-aided synthesis design, occasionally producing vivid use cases when the reaction parameters important for the synthesis are hidden in a complex chemical space. Xie et al. report a machine learning–assisted framework for the synthesis of metal-organic nanocapsules (MONCs), giant molecular building units potentially useful in different fields, based on predicting the crystallization propensity using experimental attempts as a training dataset. Machine-learning algorithms achieve prediction accuracies of more than 90%, considerably outperforming trained chemists, and the generated synthesis parameters direct solvothermal crystallization to new structures of MONCs. The proposed strategy for the discovery of new materials can be applied more broadly beyond MONCs. —YS

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OPTICS

Linking microwaves to photons

Communication networks seldom have all components operating at a single frequency. Components are individually designed to operate at optimum frequencies, with the signal then converted from one component to another by means of a transducer. Hybrid quantum systems, for example, will typically require links between microwaves, which operate the qubits, and photons that will transport the quantum information across the network. Shao et al. developed a thin-film acoustic resonator that allows the conversion of microwaves into optical signals. The acoustic resonators and optical waveguide circuits are patterned within a suspended layer of lithium niobate. Control of the coupling between the microwaves driving the resonators and the resulting modulation of the optical signal demonstrates a platform to develop hybrid signal-processing technologies. —ISO

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Predicting transmission risk for de novo mutation
Laura M. Zahn

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