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, Sadaoui 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 identified to function in molecular regulation, thus emerges as a dual mechanical and molecular organizer of development. —BAP
Science, this issue p. 453

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-diamane.” 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

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. 446

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. Reinhard 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. 418

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
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. Stavrinides 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

J. Am. Chem. Soc. 10.1021/jacs.9b11569 (2019).

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

Optica 6, 1498 (2019).
Synthesizing single-layer diamond
Brent Grocholski

Science 367 (6476), 402.
DOI: 10.1126/science.367.6476.402-c

Use of this article is subject to the Terms of Service

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. The title Science is a registered trademark of AAAS. Copyright © 2020 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works