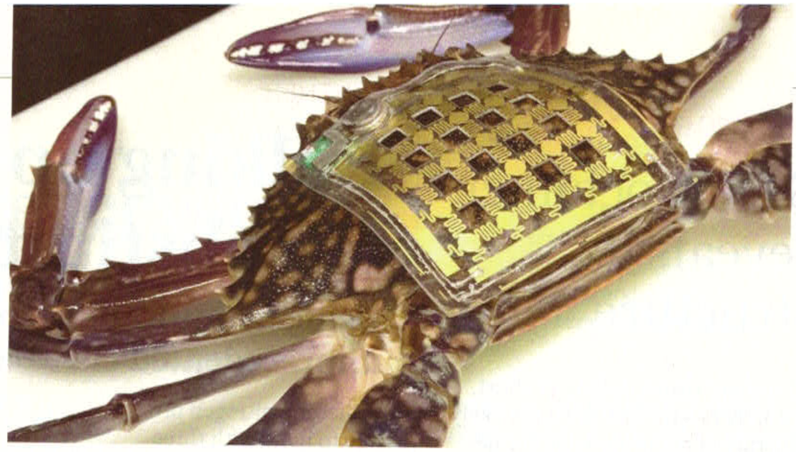
NATURAL PRODUCTS

▶ Periwinkle reveals cancer-busting secrets

The humble Madagascar periwinkle (*Catharanthus roseus*) produces two potent alkaloids, vinblastine and vincristine, which are used to treat various cancers. The little plant's mighty biosynthetic feat involves more than 30 chemical steps. Now, researchers have provided the first complete picture of the alkaloids' synthesis (*Science* 2018, DOI: 10.1126/science.aat4100). A decades-long mystery centered on how the periwinkle transforms stemmadenine acetate into tabersonine and catharanthine, which ultimately couple to make the cancer-fighting compounds. Vincent Courdavault at the University of Tours and Sarah E. O'Connor at the John Innes Centre used gene-silencing experiments to show that the periwinkle lost its ability to make tabersonine and catharanthine without four crucial enzymes: precondylocarpine acetate synthase (PAS), dihydroprecondylocarpine synthase, tabersonine synthase, and catharanthine synthase. In principle, these enzymes could be expressed in a bacterium or yeast to help produce the anticancer alkaloids in a fermentation process; today's supplies are sourced exclusively from the periwinkle itself. Indeed, the team has already modified *Escherichia coli* to make three of the enzymes, but PAS has proved much less cooperative: "One of the first challenges is to work out how to express PAS in a convenient host," O'Connor says.—MARK PEPLOW, special to C&EN

The Madagascar periwinkle is the primary source of anticancer agents vinblastine and vincristine.



CHEMICAL SENSING

Crabs gather data with high-tech skin

Scientists studying marine environments could soon get much more detailed information, thanks to a cutting-edge electronic skin that can be affixed to crabs. Electronic sensors for aquatic animals, particularly small critters, must be extremely lightweight so they don't interfere with the creature's normal behavior. Researchers at King Abdullah University of Science & Technology created an ultralightweight electronic skin that's waterproof, flexible, and stretchable and contains sensors that can measure ocean salinity, temperature, and depth (*npj Flexible Electron.* 2018, DOI: 10.1038/s41528-018-0025-1). The device is also equipped with memory and Bluetooth communications technology so it can log and transmit the data it gathers. The researchers, led by Muhammad M. Hussain, built the electronic skin on a polydimethylsiloxane elastomer so that it wouldn't degrade when exposed to microorganisms in the ocean. They superglued the skin, which is just 300 µm thick and has a length and width similar to the short side of a credit card, to a swimming crab (*Portunus pelagicus*, shown). Then they monitored the crustacean as it scuttled around the shore of the Red Sea. "We are still in the prototype phase," Hussain says, "but we are working with others to further expand testing on a variety of animals such a dolphins and whale sharks."—BETHANY HALFORD

CATALYSIS

▶ User-friendly model predicts electrocatalytic activity

Designing single-metal-atom catalysts that efficiently drive green chemical reactions is simply a matter of looking up readily available data and using that information to choose the metal and its support material, according to a theoretical study (*Nat. Catal.* 2018, DOI: 10.1038/s41929-018-0063-z). Low-cost, energy-efficient strategies for producing hydrogen—for example, via catalytic water splitting—and for using hydrogen as a non-carbon-emitting fuel—for example, in fuel cells—rank among today's most important energy research problems. Traditionally, researchers used a trial-and-error approach to design the catalytic electrodes that drive those processes. Now, Xiao Cheng Zeng of the University of Nebraska, Lincoln, and coworkers have developed a set of simple, theory-based design principles. The predictive model ties the electrocatalytic activity of single metal atoms supported on graphene—a promising family of inexpensive catalysts—to readily available data, such as the metal's coordination number and the electronegativities of the metal and its nearest neighbors. The goal is to have a way for researchers to plug in these values and obtain a back-of-the-envelope calculation for catalytic activity, Zeng says. The team built the model by evaluating nearly 30 transition metals in 112 configurations and showed it agrees with available experimental results.—MITCH JACOBY

MICROSCOPY

▶ Hybrid method boosts imaging resolution

Two methods are better than one, at least when it comes to improving resolution in microscopy. Stimulated emission depletion (STED) microscopy uses a dough-