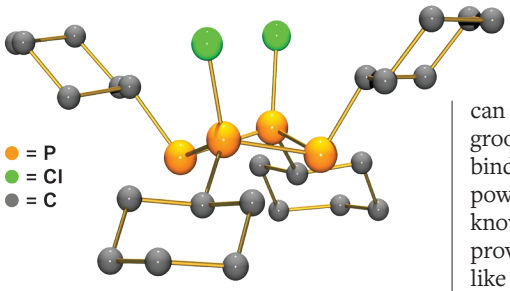
management of HIV/AIDS in patients. CD4 is a receptor on the surface of T cells in the immune system, and a CD4+ T-cell count below 200 cells per μL signals the onset of AIDS. Columbia University's Samuel K. Sia and coworkers are now reporting a microfluidic device that uses chemiluminescence detection to track CD4+ T cells at the clinically significant 200 cells per μL level (*Anal. Chem.*, DOI: 10.1021/ac902144w). "Chemiluminescence detection works without the need of an external light source, which takes us a step closer to the development of a portable diagnostics device with minimal instrumentation," Sia says. The researchers isolate CD4+ T cells from whole blood by trapping the cells on microfabricated pillars that are coated with anti-CD4 antibody. To avoid measuring monocytes, which also express CD4, they detect the T cells with anti-CD3 antibodies that are conjugated to horseradish peroxidase. The researchers incubate the cells with the chemiluminescent substrates luminol and hydrogen peroxide and then measure the photocurrent produced as a result of the chemiluminescent reaction.—CHA

POLYPHOSPHORUS CATIONS PROLIFERATE

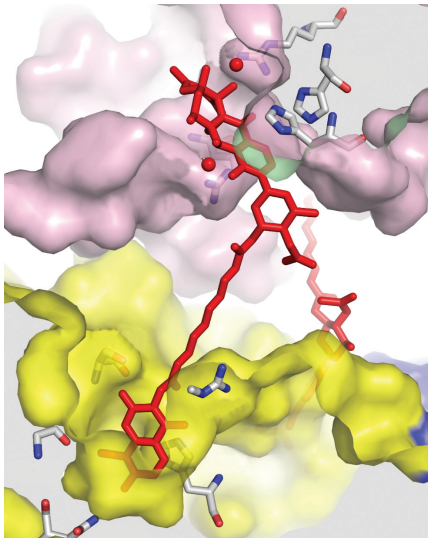
Novel synthetic procedures developed by an international chemical team have added diversity to the difficult-to-prepare family of cyclic phosphino-phosphonium salts (*J. Am. Chem. Soc.*, DOI: 10.1021/ja907693t). These catenated polyphosphorus cations containing organic substituents make up a unique class of compounds that potentially could be used in catalysis and materials development. Controlling the formation of complex architectures based on catenated phosphorus has been near impossible because P–P bonds are intrinsically weak, says Jan J. Weigand of Westfälische Wilhelms University, in Münster, Germany, who led the team with Neil Burford of Dalhousie University, in Halifax, Nova Scotia. Building on previous work from Burford's group, the researchers show that overcoming that weakness is possible if a positive charge is controllably introduced into the system. For example, the team chlorinated cyclic tetracyclohexyltetraphosphine to form a phosphino-chlorophosphonium dication in which two phosphorus atoms of the P_4 ring host a chlorine in addition to a cyclohexyl (shown). Reacting this dication with trimethylphosphine and other organophosphines dissociates the P_4 ring to form various charged linear and heterocyclic carbon-phosphorus compounds, demonstrating the ability to further expand on polyphosphorus chemistry, Weigand says.—SR



***catena*-Phosphorus dication**

ANTIBIOTIC GROOVES

As widespread resistance to existing antibiotics looms, drug developers are on the hunt for new ways to kill bacteria. Researchers led by Anthony Maxwell of the John Innes Centre, in Norwich, England, have found a new strategy: previously unknown grooves in the bacterial protein DNA gyrase (*Science* **2009,** *326,* 1415). Gyrase catalyzes the supercoiling of microbial DNA and is not found in humans, making the protein a valuable drug target because potential side effects can be reduced. For example, ciprofloxacin, a drug that can kill the causative agent of anthrax, targets gyrase. The new binding pockets were discovered when Maxwell's team solved the X-ray crystal structure of a gyrase bound to an antibiotic called simocyclinone, which is derived from soil bacteria. In particular, simocyclinone can simultaneously dip into the two gyrase grooves, blocking the gyrase's ability to bind DNA. Although simocyclinone is not powerful enough to develop into a drug, knowing where it binds in gyrase should provide inspiration to scientists who would like to chemically tweak the antibiotic to boost its bactericidal effects, Maxwell says. The binding pockets could also be inspiration for the design of entirely new molecules that might inhibit gyrase.—SE

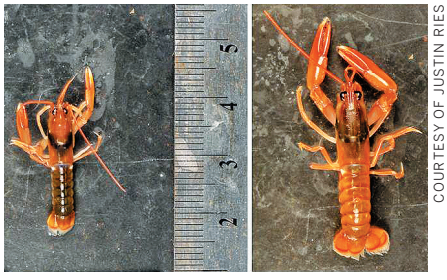


SCIENCE

The antibiotic simocyclinone (red) blocks the two newly discovered binding pockets of a gyrase.

EXTRA CARBON DIOXIDE BULKS UP LOBSTERS

Rising levels of atmospheric CO_2 may lead to larger lobsters, shrimp, and crabs, but this change is more likely to disrupt ocean food webs than to benefit seafood buffets, according to a study by Justin B. Ries of the University of North Carolina, Chapel Hill, and colleagues (*Geology* **2009,** *37,* 1131). Some of the additional CO_2 has been sinking into the world's oceans, dropping the water's pH by 0.1 units. Ries and coworkers decided to check out how this ocean acidification might alter the shells of 18 marine organisms, and they found that the effects were more varied than expected. The calcium carbonate shells of 10 creatures, such as sea urchins and clams, began to diminish when exposed to more acidic conditions. But other creatures, including lobsters, bulked up. The different reactions to acidification could reflect differences in how the organisms regulate pH, or whether their outer shell layer is protected by an organic covering, Ries notes. Because both carbonate winners and losers are part of the same food web, creatures that could stand to benefit by bulking up may find themselves with too little to eat and may not prosper after all, the researchers suggest.—SE



COURTESY OF JUSTIN RIES

Lobsters beefed up in CO_2-acidified water (400 ppm CO_2 at left; 2,850 ppm CO_2 at right).