



Science Concentrates

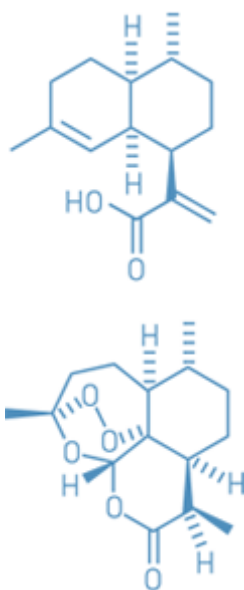
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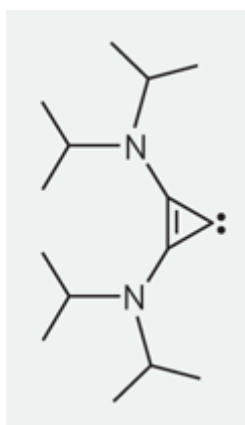
Malaria drug precursor made in yeast



The total synthesis of the antimalarial drug artemisinin (bottom) is difficult and expensive, but synthesizing it from its immediate biosynthetic precursor, artemisinic acid (top), could be a cost-effective approach to increasing supplies of the drug. [Jay D. Keasling](#) and coworkers at the University of California, Berkeley, have used a three-pronged approach to make yeast produce significant amounts (115 mg/L) of artemisinic acid (*Nature* **2006**, *440*, 940). First, they manipulated the yeast farnesyl pyrophosphate

(FPP) biosynthetic pathway to increase production of FPP and prevent FPP from being used for sterol synthesis. Then they introduced a gene for amorphaadiene synthase, which converts FPP to amorphaadiene. Finally, they introduced a novel cytochrome P450 that performs a three-step oxidation of amorphaadiene to artemisinic acid. The engineered yeast produced much more quickly an amount of artemisinic acid comparable to the amount produced by the plant that usually makes it. Additional work will be required to optimize the yield and scale up the process.

Stable version of interstellar carbene made



Cyclopropenylidene is a triangular carbene that has long been observed in outer space. Like other carbenes, it has a dicoordinate carbon center with only six valence electrons. Although cyclopropenylidene can easily survive in the near-vacuum of space, it has been considered to be too reactive to exist under ordinary conditions. Now, [Guy Bertrand](#) of the University of California, Riverside, and colleagues have synthesized a cyclopropenylidene derivative (shown) with a diisopropylamino group attached to each of the carbene center's adjacent carbons (*Science*, published online April 13, [dx.doi.org/10.1126/science.1126675](https://doi.org/10.1126/science.1126675)). The air-sensitive compound can be heated, and even melted (109 °C), with little decomposition. Previously, the best way to stabilize carbene centers was to replace adjacent carbon atoms with electron donors like nitrogen. Bertrand says the new strategy could be useful for synthesizing stable versions of other unstable interstellar molecules and could help scientists understand how such molecules form in

space.

Catalytic two-step for better diesel

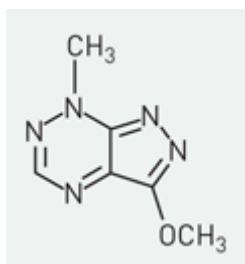
With petroleum prices soaring, an 80-year-old process that can convert carbon sources like coal and biomass into liquid fuel is taking on a new luster. One reason the [Fischer-Tropsch](#) (F-T) diesel making process hasn't taken off globally is that it yields a complex hydrocarbon brew. A portion of it consists of the fuel "sweet spot:" alkanes in the C_9 to C_{20} range. It takes refining steps to either remove or rework the components that are smaller and larger than those in that range. [Alan S. Goldman](#) of Rutgers University, [Maurice Brookhart](#) of the University of North Carolina, Chapel Hill, and coworkers have devised a two-catalyst approach that might help (*Science* **2006**, 312, 258). One catalyst dehydrogenates alkanes, such as hexane, into alkenes. The second catalyst orchestrates metathesis reactions involving the alkenes. Hydrogenation with the first catalyst gives longer, fuel-friendly alkanes. "This could ultimately make the overall process more economical," Goldman says. Charles Benham of [Rentech](#), a Denver-based firm working toward commercial F-T diesel production, has seen plenty of good ideas, but catalyst cost and stability are frequent showstoppers, he says.

White organic LEDs advance

If organic light-emitting diodes that glow white (so-called WOLEDs) can be made sufficiently robust, energy-efficient, and economical to manufacture, they may one day supplant incandescent bulbs and other lighting technologies. The latest advance on this long road is a new WOLED architecture that uses a fluorescent blue-emitting dopant in combination with phosphorescent green and red dopants to convert electricity into white light (*Nature* **2006**, 440, 908). Previous WOLEDs used phosphorescent blue, green, and red dopants, but the blue phosphor required too much power to excite, according to Stephen R. Forrest of the University of Michigan, Ann Arbor. Forrest, until recently at Princeton University, and his colleagues there and at the University of Southern California replaced the blue phosphor with a commercial blue fluorescent

compound, 4,4'-bis(9-ethyl-3-carbazovinylen)-1,1'-biphenyl. In this way, they were able to boost the power efficiency by about 20% and achieve a stable white color regardless of the brightness level. The device eventually could become four to five times more efficient than standard incandescent light bulbs, Forrest tells C&EN.

Reassigning pseudoiodinine



The brightly colored members of the pyrazolo[4,3-e][1,2,4]triazine family of natural products have the distinction of being one of only two naturally occurring ring systems in which nitrogen atoms outnumber carbon atoms. Seven compounds bearing this characteristic skeleton have been isolated and characterized, but no efforts have been made toward their total synthesis, until now. [T. Ross Kelly](#), Eric L. Elliott, and colleagues at Boston College report the total synthesis of three of these compounds: nostocine A, fluvio A, and pseudoiodinine (*J. Am. Chem. Soc.* **2006**, 128, 5646). In their efforts to synthesize pseudoiodinine, the researchers discovered that the original structural assignment for it—reported more than 30 years ago—is incorrect. The challenge in identifying the compound's correct structure is that there are six potential methylation spots within the molecule, one on the oxygen atom and five on the nitrogen atoms. With a little chemical detective work, the team was able to identify the atoms that were methylated and correctly reassign the structure of pseudoiodinine (shown).

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