Australian National University

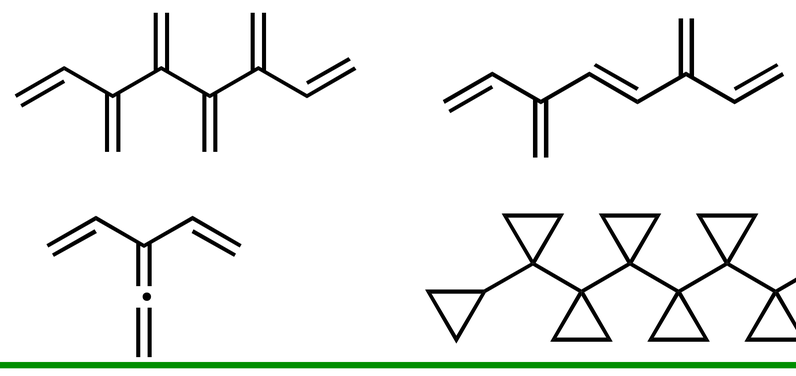
Sherburn Group Research

http://rsc.anu.edu.au/~sherburn/

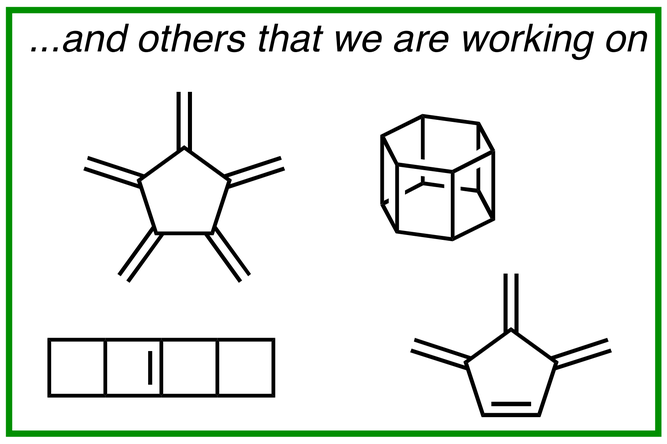
"Cannot Be Made"!

Synthetic chemists are often inspired by nature's chemical structures, but non-natural structures can also spark the development of important new methods, concepts and principles. We have made several molecules thought too difficult, or impossible, to make!

fundamental structures that we were the first to make...



...and others that we are working on

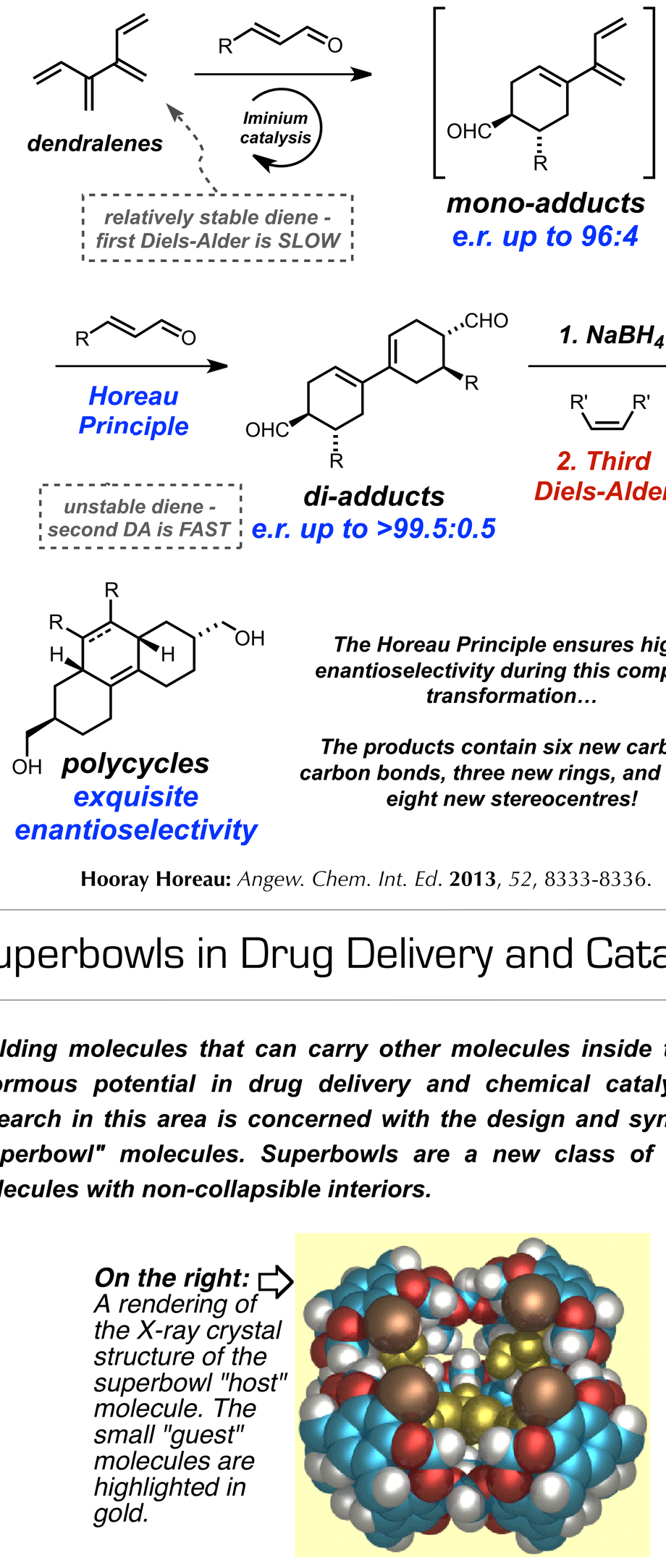


Making these molecules will defy organic chemistry's current limits.

Ivyanes: *Chemical Science* **2011**, *2*, 229-232.
Dendralenes review: *Angew. Chem. Int. Ed.* **2012**, *51*, 2298–2338.
Divinylallene: *Angew. Chem. Int. Ed.* **2011**, *50*, 10425-10428.
Dendralenes: *Angew. Chem. Int. Ed.* **2009**, *121*, 4930-4933.
Check out the dendralenes Wikipedia page!

Next Generation Organic Synthesis

Our new, highly unsaturated synthetic precursors lead to sequences of reactions generating high levels of complexity in highly efficient and selective manners. We recently set a new benchmark in organocatalysis.



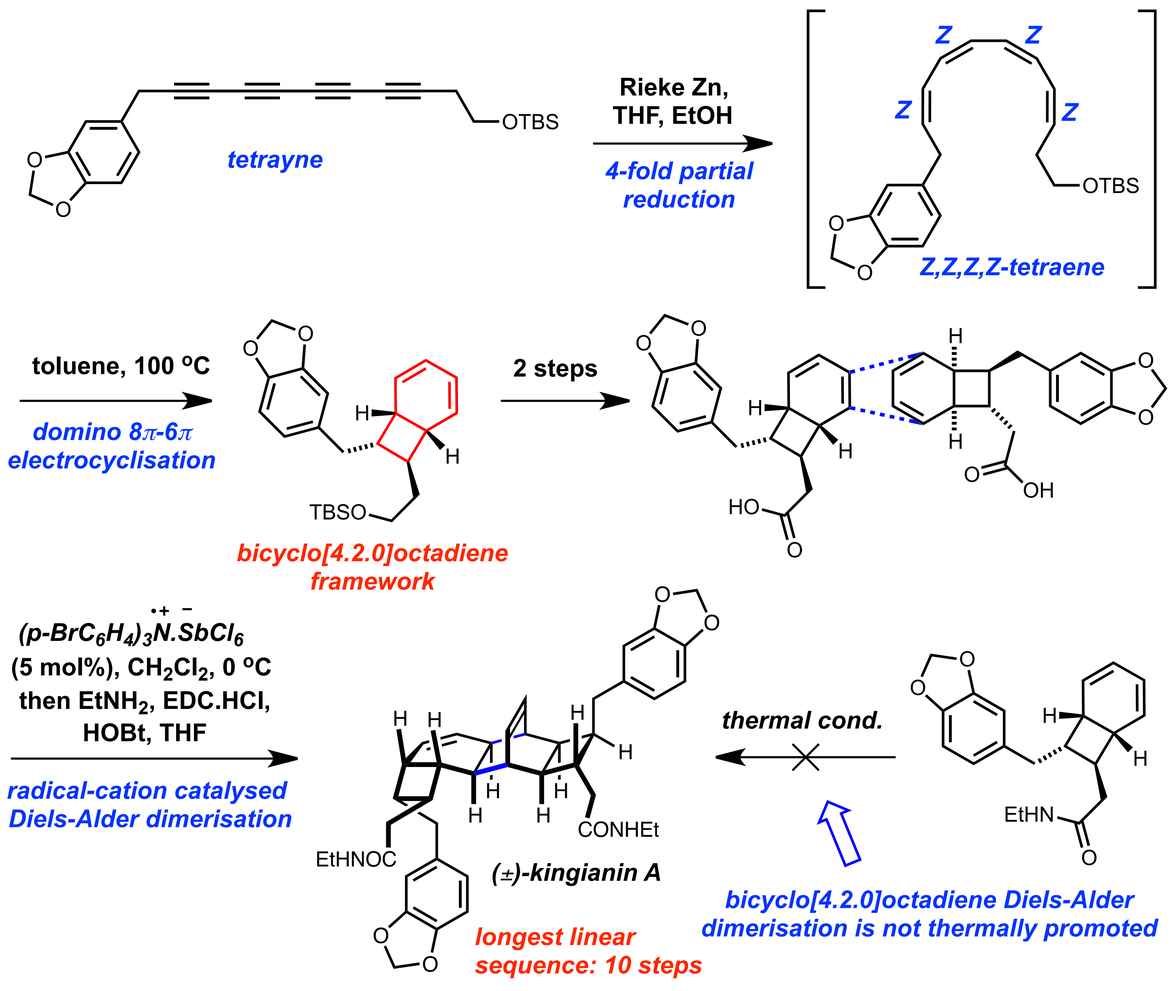
The Horeau Principle ensures high enantioselectivity during this complex transformation…

The products contain six new carbon-carbon bonds, three new rings, and up to eight new stereocentres!

Hooray Horeau: *Angew. Chem. Int. Ed.* **2013**, *52*, 8333-8336.

Synthesis Fit For A King

Our crazy hydrocarbons can be used to make natural products, too. Our biomimetic approach to kingianins A, D, and F utilized an unprecedented sequence of reactions that enabled the fastest access to the pentacyclic kingianin natural products (only ten steps!). The key Diels-Alder dimerisation was achieved using electron transfer catalysis.



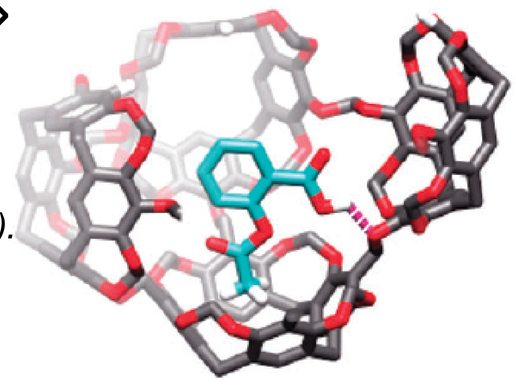
Conquering the kingianins: *Angew. Chem. Int. Ed.* **2013**, *52*, 4221.
Highlighted: Totally Synthetic column of chemistryworld
Kingianin A. Docherty, P. 1st May 2013

Superbowls in Drug Delivery and Catalysis

Building molecules that can carry other molecules inside them has enormous potential in drug delivery and chemical catalysis. Our research in this area is concerned with the design and synthesis of "superbowl" molecules. Superbowls are a new class of synthetic molecules with non-collapsible interiors.

On the right: *A rendering of the X-ray crystal structure of the superbowl "host" molecule. The small "guest" molecules are highlighted in gold.*

On the right: *A side view of the superbowl binding an aspirin molecule (highlighted blue). The front part of the superbowl is omitted for clarity.*



Superbowls: *J. Am. Chem. Soc.* **2004**, 126, 16747-16749.
Binding Aspirin: *Chem. Commun.* **2010**, 46, 5921-5923.
Try Googling '**superbowl molecules**' to see us in the news!