CHEM 426/626
Reactive Intermediates

According to Concordia’s Centre for Teaching and Learning Services:

Fun
Interesting
Rules
Syllabus
Test (pre-)
Community
Lesson plan
Expectations
Support
Syllabus
Typical class grade distribution in the past

Winter 03 (26-6/20)

<table>
<thead>
<tr>
<th>Mark range</th>
<th>UG</th>
<th>Grad</th>
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1 grad
3 undergrads
regular practice and reading
great presentation
1 grad
1 undergrad
Who needs to know about reactive intermediates?

1. The chemist

**Singlet O₂ Feat**

Simple, nonchiral molecule resolves racemates with surprising selectivity

*Maureen Rouhi*


2. The biochemist

**Nitric Oxide Battles Tuberculosis**

Experimental drugs release NO, which kills dormant as well as active tuberculosis cells

*Sophie L. Rovner*

*Science* **2008**, 322, 1392. Release of the highly reactive NO is "akin to a bomb blast that kills the bacteria from within," says *Clifton E. Barry III* of the National Institute of Allergy & Infectious Diseases, in Bethesda, Md.
2. The biochemist continued

*Pseudomonas putida* P450 (P450cam)

P450 from the soil bacterium *P. putida* is best characterized. The bacterium degrades camphor to obtain a carbon source for energy. First step:

\[
\text{P450cam} \quad 2e^- , O_2 , 2H^+ \rightarrow \text{OH}
\]

Something odd here?!

**Mechanism of alkane hydroxylation**

Sono et al., Chem. Rev. 2850, 96 (1996)
Nobel prizes
The ultimate prize for recognizing what is “important”.

1967
(Manfred Eigen), Ronald Norrish, George Porter
for their studies of extremely fast chemical reactions,
effected by disturbing the equilibrium by means of very short pulses of energy
(flash photolysis)

1971
Gerhard Herzberg
for his contributions to the knowledge of electronic structure and geometry
of molecules, particularly free radicals

http://nobelprize.org/chemistry/laureates/
1994
George Olah
for his contribution to **carbocation** chemistry

1999
Ahmed Zewail
for his studies of the transition states of chemical reactions
using **femtosecond spectroscopy**

http://nobelprize.org/chemistry/laureates/
Some introduction

Science has always strived to see smaller and smaller things and faster and faster events.
Bengt Nordén, Presentation Speech, The Nobel Prize in Chemistry 1999 (Zewail)

• Which reactive intermediates do you know? mechanisms!

• How are they formed? breaking bonds

• Here we are (mostly) interested in carbon species. carbon valencies

• Which common molecules could be considered reactive intermediates?